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MARBLE HILL HOUSE REPRESENTATION
RIBA STAGE 3 MECHANICAL & ELECTRICAL SERVICES REPORT

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MARBLE HILL HOUSE REPRESENTATION

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EXECUTIVE SUMMARY

This report and associated sketch drawings covers the mechanical and electrical services design proposals for the Marble Hill Representation project and covers the proposed Stable Block refurbishment only.

The report sets out the developed design concepts for Mechanical and Electrical engineering services in line with RIBA work Stage 3.

The services strategies for the Stable Block Café developed in this report are based on the English Heritage Café Option E and the associated sketch designs developed by van Heyningen and Haward (vHH).

The report aims to provide suitable information to allow the project cost consultant to prepare a robust cost plan and highlight where decisions and brief are currently outstanding.

With regard to the energy performance of the building, the report highlights the current short comings of the building in respect to Part L2A of the Building Regulations and provides information relating to the energy elements required by the Local Authority (London Borough of Richmond) and to assist the applicant, English Heritage, in compiling the Heritage Lottery Fund (HLF) Carbon Assessment Tool "HLF Footprint Reporter".

To further develop the design, establish specific criteria, and detail the current building design to ensure all the requirements are met, we will require input and information from the following consultants/specialist designers/suppliers during the next design stage:

- Architect
- Landscape Designers
- Cost Consultant
- Structural Engineer
- Acoustic Consultant
- Building Control Consultant/London Borough or Richmond
- CDM Consultant
- EH Conservator/Interpretation team
- EH Curatorial Team
- EH Catering team
- EH Fire Advisors
- EH Security Advisors
- EH Data & Communications Specialists

1. INTRODUCTION

The design strategy for the new Stable Block Café have been developed in conjunction with other members of the design team from the initial design proposals contained in our earlier reports, Marble Hill House Stables Mechanical & Electrical Services Appraisal RIBA Stage 1 99480-8.01 (Rev A) of August 2015 and 99480-8/R03 (rev A) of January 2017.

As noted in our previous report, the existing stable block electrical systems are not suitable for continued use and as such, will be replaced in their entirety, with the exception of the first floor flats which are to be retained and fall outside the scope of this project.

The basis of the Stable Block Café M&E Services design proposals are.

vHH Drawings

- Proposed Ground Floor Plan 533-L-2010
- Proposed Roof Plan 533-L-2011
- Proposed Section AA 533-L-2020
- Proposed Section BB 533-L-2021
- Propose Elevations 01 533-L-2030
- Proposed Elevations 02 533-L-2031

EH Stable Block Café Option E Budget 20.04.2018

Cooper8 Ltd Documents dated 23.07.2018

The Marble Hill House M&E Services design proposals are based, currently, on our Tender design package issue don 21 July 2017, suitably modified to take account of the proposed building layout and revised English Heritage brief for the scope of works and revised budget.

2. SCOPE OF WORKS

The following services installations are considered in this report:-

- Electrical Power
- Lighting
- Emergency Lighting
- Fire Alarm
- Intruder Alarm
- Data and communications
- Surge Protection
- TV & Radio
- Heating
- Natural Gas
- Domestic Hot and Cold Water services
- Mechanical and Natural Ventilation
- Above Ground Foul Water Drainage

3. DESIGN CRITERIA

The new services will generally be designed and installed in accordance with the following.

- a) English Heritage Trust Standards For Construction: Particular Employers Requirements for Building Services Engineering Installations EHT EDR 01(Rev 00, 08 April 2016)
- b) Relevant British Standards
- c) CDM Regulations.
- d) Health and Safety at Work Act
- e) Electricity at Work Act.
- f) Current CIBSE recommendations.
- g) The Building Regulations.
- h) The London Plan March 2016
- i) Non-domestic Building Services Compliance Guide: 2013 edition
- j) The Clean Air Act.
- k) Control of Pollution Act.
- l) Gas Safe Regulations.
- m) The Asbestos Regulations.
- n) The Water Supply (Water Fittings) Regulations 1999.
- o) HSG 274 Part 2, The control of legionella bacteria in hot and cold water systems
- p) BS6700;2006+A1:2009 Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages
- q) BS 8558:2011 Guide for the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilage.
- r) BS EN 806-1:2000, 806-2:2005, 806-3:2006, 806-4:2010 & 806-5:2012 Specification for installations inside buildings conveying water for human consumption.
- s) BS EN 12056:2000 Gravity drainage systems inside buildings.
BS 7671:2018 Requirements for Electrical Installations (IET Wiring Regulations), Eighteenth Edition

The overriding basic strategy for servicing the building is to provide good quality, reliable, simple to operate, energy efficient and low maintenance services.

3.1 WIRING REGULATIONS

BS 7671:2018 Requirements for Electrical Installations (IET Wiring Regulations), Eighteenth Edition was published on July 01st 2018 and is intended to come into effect on 1st January 2019. Installations designed after December 31st 2018 are to comply with BS7671:2018.

The regulations apply to the design, erection and verification of electrical installations, also additions and alterations to existing installations.

As the design for the project will not be complete before December 31st 2018, the electrical installation for the project will be designed to BS 7671:2018.

The major change that is likely to affect the project is the introduction of Arc Fault Detection Devices (AFFDs).

AFFDs are protective devices that are designed to reduce the risk of fire caused by faulty electrical installations.

“About one-third of all fires caused by electricity are attributed to hazardous arcing faults. Particular mention is to be made to serial arcing faults. Residual current protective devices (RCDs) and miniature circuit breakers (MCBs) are not designed to detect and safely disconnect serial arcing faults and do not offer adequate protection in such cases: for example damaged wire insulations, crushed or broken cables, bent connectors, loose contacts, or even defective electrical devices. The resulting electrical arcing faults can cause cable insulation to ignite, leading to a cable or even building fire.”

<https://www.siemens.com/global/en/home/products/energy/low-voltage/components/sentron-protection-devices/arc-fault-detection-devices.html>

Regulation 421.1.7 (a new clause for 18th edition) states

“arc fault detection devices conforming to BS EN 62606 are recommended as a means of providing additional protection against fire caused in AC final circuits.

If used, an AFDD shall be placed at the origin of the circuit to be protected.

NOTE: Examples of where such devices can be used include:

- *Premises with sleeping accommodation*
- *Locations with a risk of fire due to the nature of processed or stored materials*
- *Locations with combustible construction materials*
- *Fire propagating structures*
- *Locations with endangering of irreplaceable goods”*

We would suggest that

- The Café may fall into the first category (as there is sleeping accommodation located above)
- The Storage sheds fall into the third and fourth categories as the sheds are timber construction
- The Stable Block, as a listed building falls into the final category

Therefore we anticipate that AFFDs will be required.

4. STABLES AND COACH HOUSE

4.1 INCOMING SERVICES

There are a number of historical (May 2010) utility record drawings of the existing incoming services available for

- British Telecom
- National Grid (gas)
- Thames Water
- Virgin Media

To supplement the design team’s understanding of the site’s below ground services a ground radar survey has been carried out by English Heritage. The purpose of this survey is to identify the location of all existing below ground services, structures and voids which may have an impact upon the proposed works.

4.2 DOMESTIC SERVICES

a) Existing Domestic Services

The ground radar survey shows the presence of an “unknown service”, this service has since been identified by hand dug trial pits as being a 65mm cast-iron water originating within Orleans Road and routed beneath the footpath to the west of the Stable Block and on to serve Marble Hill House.

The incoming cold water main serving the existing public toilets enters the northern end of the Stable Block via the garage, and is routed to serve a cold water storage tank located within the ground floor roof void above the male toilets. This cold water storage cistern is accessed via a high level hatch formed in the party wall between the toilets and garage.

Hot water to the public toilets is provided by 2 no cistern type electric water heaters installed in the early 1990's and fed from the central cold water storage tank. The hot water heaters whilst functioning would not be suitable for reuse as a part of the proposed works.

The water main serving the café enters the south side of the building via an incoming service located within the kitchen staff WC. This water main continues to rise to high level to serve the first floor flat above.

Hot water to the café is provided by a direct gas fired water heater. This is functional but aged and is not suitable for reuse.

All existing hot and cold water pipework serving the ground floor of the existing Stable Block shall be removed entirely, including the roof void mounted cold water storage tank and the existing gas and electric hot water heaters.

The routing of the mains cold water services pipework internal to the café/public toilets and the first floor flats is currently unknown due to its concealment within the building's fabric. It is however believed that the flats, public toilets and café are served from the 2No internal shared/common incoming main water connections. This system includes shared sections of the internal mains cold water pipework.

Therefore as a part of any works to the public toilets and the café, allowance is to be made for the separation of the flats from adjoining areas, and the routing of new pipework to allow each flat and the café to be isolated via their own dedicated incoming water supply and external stopcock and valve pit.

b) Proposed Domestic Services

External Works

A new 50mm MDPE water main shall be extended from the existing 65mm cast-iron water main, and routed below ground on the eastern elevation of the stable block.

This new incoming water main will be extended to enter the stable block via the plantroom. 2No number 25mm MDPE mains cold water connections shall be extended from the below ground incoming water main en-route to the plantroom, provided complete with new external stop cocks, external water meters/ valve boxes and incoming pipework to serve each of the 2no first floor residential flats.

The internal above ground cold water supplies to the 2No first floor flats shall be re-piped so that each flat is isolatable via its own secure stopcock.

Since the works affecting the water supply will involve a connection being made into the section of below ground pipework owned by English Heritage, consent will not be required from Thames Water.

Coldwater Services

Upon entry to the building, the incoming mains cold water shall be routed to serve a new potable cold water break tank and booster set within the plantroom. This shall be arranged to deliver pressurised potable water to the hot water calorifier and all remaining cold water taps, including coffee machine, beverage boiler, WCs, WHBs, dishwashers, pot wash and prep sinks.

To minimise this item of plant causing noise nuisance to the occupants of the first floor flats or to the adjoining domestic properties. Cost allowance is to be made for the provision of a purpose made acoustic enclosure to serve the booster set pumps.

Where practical, the WCs local to the plantroom shall be served by a low pressure gravity connection directly from the break tank, this arrangement is proposed to minimise energy consumed, noise nuisance and pump wear associated with providing a pressurised cold water supply to the WCs.

The domestic hot and cold water supplies to the public toilets and staff toilets shall be provided with automatic two port isolation valves which will be controlled via the use of PIRs (Passive Infra-Red detectors) located within each of the spaces served. These PIR detectors via the solenoid valves shall be installed to isolate the water supply to the WCs and WHBs when the toilets are not occupied.

In line with the objectives of the London Plan to reduce the consumption of both energy and water, all wash hand basin taps shall be provided with spray pattern/aerated pushed button taps. To minimise the cost of the works it is proposed that each WHB be provided with a single warm water tap arranged to provide water at a pre-blended temperature of 41°C.

Domestic Hot water Generation

Domestic hot water shall be generated by an unvented indirect hot water calorifier complete with a LTHW coil.

The hot water cylinder shall also be provided with a 3kW immersion heater, capable of providing a limited volume of hot water in the event of an LTHW boiler failure.

To prevent the hot water pipework cooling between the HWS calorifier and the outlet, a pumped hot water secondary return system shall be provided to maintain the water at the correct temperature, complete with thermal insulation applied to both the HWSF and HWSR pipework.

Electro-magnetic physical water conditioners shall be installed on the cold feed and on the secondary HWS return connection to the calorifier. These units shall be controlled to minimise the formation of lime scale within the hot water system.

Domestic hot water pipework distribution between the plantroom and the south-end of the Stable Block (café kitchen) shall be distributed using pre-insulated below ground pipework. The HWS pipework shall utilise the same trenches required by the new below ground electrical services and new LTHW service.

The boosted cold water supply shall be distributed to the south-end via below ground pipework, however to prevent the cold water being warmed by the LTHW and domestic hot water services en-route, the cold water pipework shall be routed within a separate trench position sufficiently clear of the hot water services and using uninsulated blue MDPE pipework.

Pipework distribution between the plantroom and north-end of the Stable Block shall be routed within the ground floor roof void above the public toilets.

In public accessible areas, domestic services pipework shall be fully concealed within secure boxings.

Domestic hot and cold water pipework shall be installed in copper tube to BS EN 1057 with crimp press fittings. This requirement is set to minimise the requirements for hot works.

All concealed pipework, pipework run within service voids and ceiling voids shall be insulated.

Sanitary ware and brassware (taps) shall be in accordance with the Architect's specification.

All insulation shall be zero ODP and GWP of less than 5.

The mechanical sub-contractor shall terminate the domestic services pipework within 1m of the kitchen appliances served, with the kitchen specialist providing the final connection to the appliances.

The plantroom shall be provided with a domestic bib tap for the purpose of general cleaning/ landscape irrigation. This bib tap will be suitable only for use with a domestic hand held trigger action controlled spray. This tap is not to be used of non-domestic type applications.

Domestic Services Design Criteria

System temperatures:-

Domestic Hot water Heaters = 65 °C (+/- 2°C)

Wash Hand Basins	41°C
Kitchen Sinks	60°C

Domestic Hot water Return = Not less than 55°C for any 20 minute period

Hot and cold water dead legs shall be kept to an absolute minimum.

The sanitary appliances/brassware shall be selected in accordance with the requirements of the Architect so as not to exceed the following water consumption rates.

<u>Appliance Type</u>	<u>Design Flowrate</u>
Wash Hand Basin Taps	4.5 litres/minute/ tap
Kitchen Sinks	In accordance with the kitchen specialist's requirements
Pre-rinse nozzles	In accordance with the kitchen specialist's requirements
Domestic dishwashers	In accordance with the kitchen specialist's requirements
Domestic washing machines	In accordance with the kitchen specialist's requirements
Commercial dishwashers	In accordance with the kitchen specialist's requirements
WCs	6 litres effective single flush volume

4.2.2 Electricity

a) Existing Stable Block Supply

The existing single phase 100A UKPN electrical supply serving the Stable Block enters the Stable Block building in the existing café on the East side of the Stable Block building.

The existing supply is to be removed in its entirety, the following works are to be undertaken by the Electrical Contractor, including all liaison with UKPN and relevant meter suppliers

- Removal of the existing UKPN fused cut out
- Removal of the existing meters

Removal shall not take place before the new electrical supplies serving Flat 1 and Flat 2 are in place. All arrangements and liaison with necessary utility undertakers and meter operators for the removal of the supply and associated meters shall be undertaken by the Electrical Contractor.

b) New Café & Kitchen Supply

A new Three Phase and neutral, 100A electrical supply is to be provided, derived from the local UKPN LV network. The supply will serve the Café seating area, kitchen and servery.

Initial enquiries have been made with UKPN and a quotation for the necessary works obtained, reference 8100084904/QID 3100073065 Dated 01 February 2017. The total cost of the UKPN works (excluding on site trenching, reinstatement and civil engineering work) is £5922.00 excluding VAT.

The new supply shall be located in a new GRP enclosure, with lock, to meet the requirements of UKPN, including appropriate structural base to be provided by the Main Contractor to UKPN standard details.

The GRP enclosure lock shall be provided with a minimum of three keys.

The enclosure shall be located to the South of the existing storage sheds and shall contain the UKPN incoming service, associated meter and the Customer Main Isolator.

c) Plantroom, WCs Storage Sheds, Flat 1 and Flat 2 Supplies

A second new Three Phase and neutral, 100A electrical supply is to be provided, derived from the local UKPN LV network.

Initial enquiries have been made with UKPN and a quotation for the necessary works obtained, as noted in (b) above.

The new three phase supply shall be located in the Southern Storage Shed. The Shed shall contain the UKPN incoming service and associated meter and Customer Main Isolator for the Plantroom, WCs and storage sheds and the associated Customer Main Isolators and the meters for both Flat 1 and Flat 2.

4.3 NATURAL GAS

a) Existing Natural Gas Supply

The site's gas supplies appear to be fed from Orleans Road. The records are very faint, but suggests that a 90PE main enters the site and splits to serve the main house and each side of the stable block. This would appear to be borne out by our internal survey. The location of the kitchen meter is in the kitchen store, with the remaining two meters being located internal to their respective flats.

Both connections are of similar size with a 50mm incoming main connection from outside, which matches that recorded on the record drawings.

b) Proposed Café Gas Supply

The gas meter serving the café and all associated upstream and downstream gas pipework shall be removed.

A new replacement gas meter and external GRP enclosure shall be provided to serve the ground floor of the stable block, and shall be located on the external southern elevation of the existing shed building positioned to the north of the stables.

From this kiosk, a new suitably rated below ground private gas supply shall be extended to serve the new boiler plant and appliances within the kitchen requiring a gas supply.

Subject to receipt of listed building consent, it is proposed that the gas pipework shall enter the building via a short section of pipework rising externally to the building and entering the plantroom at low level.

The gas supply system serving the plantroom shall be provided with an automatic gas safe system incorporating a gas solenoid valve arranged to isolate the supply of gas to the boiler room in the event of: -

- Detection of carbon monoxide
- Detection of a gas leak
- A fire within the building or internal to the plantroom.
- Activation of a plantroom panic button.

A gas supply shall be extended to serve all appliances within the Kitchen requiring a gas supply. This shall include the provision of a second automatic gas safe system incorporating a gas solenoid valve.

As agreed with the Catering Consultant, the supply and installation of the gas safe system including the free issue of the solenoid valve to the mechanical contractor shall be undertaken by the Catering Specialist. With the Mechanical Sub-contractor installing the gas solenoid valve and all of the gas pipework within the kitchen up to the point of connection to the appliance served.

As required to route the gas pipework from the intake position within the kitchen to that of the centre island unit, it is proposed that allowance be made for a section of "Tracpipe" to be routed within the floor construction.

c) Top Floor Flats.

The existing gas meters located within the 2No flats and all associated gas pipework downstream of this meter shall be retained in service. The gas pipework upstream of these meters shall be replaced with new, to suit a revised gas intake location on the eastern side of the café seating area.

A request for a revised gas supply has yet to be submitted to SGN (Southern Gas Networks) for the small adjustment in gas loads between that of the previous scheme and that of this scheme. It is therefore advised that the existing quotation for a new gas supply including a suitable allowance for inflation be made for the cost of these works.

4.3.2 Telephone & Data

a) Existing Telephone Services

Existing telephone services within the Stable Block appear to enter the building in the Proposed Office (existing Rangers Office) to the North of the Stable Block, with surface cabling distribution lines around the building.

The number of 'live' lines is unknown.

b) Proposed Telephone Services

At present the specific requirements for telephone and data provision have not been confirmed by the operational departments within English Heritage.

The current proposal is to provide a structured wiring system housed in a wall mounted 600 x 450 12U data cabinet located in the Staff Office.

No active network equipment will be provided as part of the refurbishment project. All Routers, switches, hardware, phone system, wireless access points etc. will be provided by the Historic England central IT department.

All data and telephone outlets in the new extension will comprise RJ45 outlets wired in Cat 6 UTP structured cabling.

All incoming telephone lines will be ordered by the client, although the programming of works and liaison with BT following client order and payment will be undertaken by the Electrical Contractor on behalf of the client. Incoming telephone services will enter the office via a new underground duct to be provided by the main contractor.

It is anticipated that the following incoming telephone lines will be provided:-

- Office Telephone line
- Dedicated ARC line
- Dedicated Broadband line
- Dedicated EPOS line – Café
- Dedicated EPOS line – Kiosk
- Dedicated EPOS line – Shop
- Shop Telephone line
- Café Telephone line
- Dedicated Flat 1 Telephone line
- Dedicated Flat 2 Telephone line

As with the telephone system, the extent of data provision is yet to be determined, although it is anticipated that a new structured wiring system will be provided. All data and telephone outlets in the new extension will comprise RJ45 outlets wired in Cat 6 UTP structured cabling emanating from a new data cabinet located in the Office.

4.4 ELECTRICAL DISTRIBUTION

4.4.1 Kitchen, Café, WC's and Plantroom

A new three phase and neutral electrical supply will be provided to serve the Kitchen and Café.

The new supply will be derived from one of the two new UKPN supplies and will terminate in a new Main MCB Distribution board DB2, from which supplies to distribution boards located in the kitchen and Café will be derived.

DB 2 will be a Group Schneider (Merlin Gerin) Acti 9 Isobar 250A Type B 16 Way MCB board fitted with 250A 4 pole incoming Isolator and appropriately sized outgoing Arc Fault Detection Devices (AFDD) RCBO & MCB devices.

Final Circuit Distribution Boards will be Group Schneider (Merlin Gerin) Acti9 Isobar distribution boards fitted with incoming isolators and outgoing Arc Fault Detection Devices (AFDD), Miniature Circuit Breakers (MCB) and Residual Current Breakers with Overcurrent protection (RCBO).

AFDD & RCBOs will be provided to all circuits serving sockets outlets.

Final Circuit Distribution Boards will be as noted below

DB 21 Servery Power Provided as part of the Servery fit out

4.4.2 Plantroom, WCs & Storage Sheds

A new single phase and neutral electrical supply will be provided to serve the Shop & Storage Sheds.

The new supply will be derived from one of the two new UKPN supplies and will terminate in a new Main MCB Distribution board DB2, located in the Southern Storage Shed from which supplies to distribution boards located in the Shop Store will be derived.

DB 1	External Storage Sheds	125A Type A 18 way SP&N
DB 12	Café Overflow Seating & Staff Office	125A Type A 14 way SP&N
DB13	Plantroom & WCs	125A Type A 14 way SP&N

Final circuit wiring will be installed using Low Smoke, Zero Halogen (LS0H) covered FP200 cable.

4.4.3 Existing Flats

The existing UKPN supplies and associated meters serving the two residential first floor flats will be removed from the proposed café seating area and relocated to a new UKPN enclosure adjacent to the timber stores building.

As yet it has not been possible to access both the flats to identify and agree locations for the new incoming service heads and meters. However, the new isolators will be located below the existing distribution boards at the top of the flat access staircases.

The North flat was accessed on 08 December 2016. The existing Distribution board is an 8 Way MK MCB distribution board fitted with a 60A/30mA double pole incoming Isolation RCCB and the following Type 2 MCBs:

- 32A Cooker
- 32A Shower
- 32A Ring Main
- 20A Heater

16A Spare
6A Near Lights
6A Far Lights
Spare

The protective devices fitted to the distribution board are BS 3871 Type 2 MCBs which date the installation to before July 1994. (BS 3871 was withdrawn in July 1994, having been superseded by BS EN 60898 which was first published in January 1992).

The distribution board bears a label confirming that the installation was tested in November 2016 (By LB Facilities Ltd) although the test report has not yet been made available.

The Labelling of the Distribution Board is confused, with many alterations, and should be replaced and updated as part of any remedial works noted during the inspection noted above.

For the purposes of the proposed stable block project, it is assumed that any remedial works identified will be undertaken immediately as part of the ongoing maintenance of the flats rather than forming part of the stable block project.

The existing electrical installations within each flat will require testing prior to the works being undertaken and any remedial works identified carried out to ensure that the installations meet current requirements.

4.5 SMALL POWER

The new power provision will be carefully reviewed to ensure that sufficient outlets are provided, in appropriate locations without over provision, requiring input from relevant English Heritage departments to determine power requirements for the various areas. The layout for socket outlets will be subject to review when equipment, furniture and display layouts are confirmed.

A generous number of socket outlets will be provided to cater for flexible furniture/display layouts in the future.

It is anticipated that the majority of outlets will be located on walls although it may be necessary with the shop to provide floor boxes at position to be agreed as above.

In general it is anticipated that socket outlets and other accessories will be flush mounted.

The provision of power outlets for catering equipment will be coordinated with the Cooper8 design for Kitchen, Servery and Café seating areas.

An external supply for charging of the mobile kiosk will be provided in the kitchen service yard area.

4.6 LIGHTING AND EMERGENCY LIGHTING

The new lighting installation will be designed to ensure that the needs of the building are met whilst complying with conservation criteria and maximising the use of appropriate low energy technology and automatic controls.

It is anticipated that dimming will not be provided to any area, although within the Café and Shop, it is envisaged that flexible switching will allow differing lighting levels and effects to be achieved.

It is envisaged that LED lighting will be used throughout to minimise power consumption, allow instant lighting when used with automatic controls and to minimise the ongoing maintenance burden of the building.

Automatic switching of lighting will be provided to the following areas,

Area	Detection Type
Plant room	Presence
Stores	Absence
WC Cubicles	Presence ¹
WC Open Areas	Presence ¹
Staff Welfare	Absence

Presence Detection = Automatic On, Automatic Off

Absence Detection = Manual On, Automatic Off

Indicative luminaire types are shown in Appendix A. The final selection will be undertaken with the Architect and relevant English Heritage Departments.

Lighting levels will be designed in accordance with CIBSE/SLL guidance for the relevant areas of the building, and/or in line with specific English Heritage requirements.

Area	Level (lux)	Source	Notes
Staff Room	150	CIBSE	
Shop	500	EH	500 Lux from ambient lighting in addition to focused lighting from retail units.
Kitchen	500	CIBSE	
Shop Store	100	CIBSE	
External Stores			Existing lighting to be retained
Plant Areas	150	CIBSE	
Switch room	200	CIBSE	
Toilets	100 - 150		Existing lighting may be retained, 100-150 lux applicable if new lighting is provided
Office	300	CIBSE	Existing lighting may be retained, 300 lux applicable if new lighting is provided
Hatch	300	CIBSE	
Servery	300	CIBSE	
Café	200	CIBSE	To be coordinated with interior design proposals

Wherever possible, emergency lighting will be provided by the use of integral emergency battery packs within the main luminaires, although where decorative pendant type fittings are used (as currently suggested for the Café and Servery areas), separate, standalone emergency fittings will be provided.

Emergency exit signs and emergency lighting will be provided to meet the requirements of the Escape Strategy and Fire Risk Assessment when available.

An external lighting scheme is proposed to provide amenity lighting in the immediate vicinity and to allow safe egress from the building in the event of power failure whilst minimising light pollution.

The external lighting scheme has been reduced from the earlier proposals, with ground mounted up-lights omitted from the current proposals.

Photo Cell and time control will be provided to the external lighting scheme.

4.7 INTRUDER ALARM SYSTEM

In advance of specific input from the English Heritage Security advisor, an intruder alarm system comprising the following is envisaged:-

- Magnetic contacts on all external doors
- Dual technology movement detectors in all spaces with opening windows
- Panic Alarm Push buttons in cash handling/lone working areas

At present a single Intruder Alarm Control Panel is envisaged, located in the kitchen store with a number of key pads proposed to allow the following areas to be set/unset separately.

- Kitchen and café
- Shop
- Staff Welfare

The Intruder Alarm system will be provided with dedicated phone line to allow connection to an Alarm Receiving Centre if required.

The existing audio door entry systems serving the flats will be retained.

Consideration will be given to providing keypads for the Stables/Café system within the flats to allow monitoring of the system and to silence alarms without the need for residents to leave the flat should an alarm activation occur.

English Heritage have confirmed that the existing Marble Hill House intruder alarm system links to the Southern Flat, occupied by the House Manager is not required to be retained.

4.8 CCTV

CCTV Coverage will not be provided as part of the project.

4.9 TV AND RADIO

There are two TV aerials located on the roof of the Stables, which are believed to serve Flat 1 and Flat 2. It is proposed that the existing systems are retained, although it would be sensible to provide new aerials in less prominent positions, subject to signal strength tests.

4.10 LIGHTNING PROTECTION

A structural Lightning Protection system is not being installed as part of the works however, surge protection devices will be provided as follows (at both ends of each cable):-

- Main Incoming Electrical Supply to Kitchen/Café,
- Main Incoming Electrical Supply to Shop & Stores,
- Main Incoming Electrical Supply to Flat 1
- Main Incoming Electrical Supply to Flat 2
- Outgoing lighting and power cables
- Incoming copper telephone cables
- Outgoing copper telephone and data cables

4.11 TELEPHONES AND DATA

At present the specific requirements for telephone and data provision have not been confirmed by the operational departments within English Heritage.

The current proposal is to provide a structured wiring system housed in two data cabinets one located in the Office Area serving the Office, Kitchen, Seryery and Café and the second, linked to the first by means of multimode optical fibre installed in an underground duct network.

The second cabinet, located in the Shop store will serve the shop and kiosk areas.

No active network equipment will be provided as part of the refurbishment project as it is assumed that all Routers, switches, hardware, phone system, wireless access points etc. will be provided by the Historic England central IT department.

All data and telephone outlets in the new extension will comprise RJ45 outlets wired in Cat 6 UTP structured cabling.

4.12 COMMUNIATIONS CONNECTIONS

English Heritage have confirmed that the existing Marble Hill House intruder and fire alarm system links to the Southern Flat, occupied by the House Manager are not required to be retained.

There will be no communications links between the house and the stable block/café as part of the current scope of works.

4.13 FIRE ALARM SYSTEM

The existing Fire Alarm System covering the flats was updated in 2017 with a new Radio based Fire Alarm System.

The system is an EMS Ltd, Fire Cell, analogue addressable system and has been installed by TecServe Ltd, although details of the system are not available. The new main panel is located in the Café.

We would recommend that the new fire detection and alarm system to be provided throughout the refurbished Stable Block is interfaced with the recent Flats system.

It will be necessary to maintain the Flats' system 'live' during the works to protect the occupants of the flats.

The following cause and effect philosophy shall be programmed into the system at commissioning stage.

1. Flat 1 & 2
 - Any one detector into alarm causes local alarm within the relevant flat to sound only
 - Any second detector or single activation of a Manual Call Point to cause a full evacuation of the Stable Block & Cafe
2. Stable Block
 - Any activation to cause a full evacuation of the Stable Block, including Flat 1 & 2

Provision will be made to connect the Fire Alarm Systems to an Alarm Receiving Centre. Both single and double knock signals to be transmitted to the Alarm Receiving Centre.

Subject to the findings of the fire risk assessment for the project, it envisaged that a Category L1 system is provided, consisting of smoke and heat detectors and manual break glass call points and loop powered sounder bases will be provided throughout the refurbished stable block and new café building.

The fire detection and alarm system shall be interfaced with the following systems and shall override controls in the case of a fire emergency:-

- Kitchen Ventilation Control Panel
- Kitchen Gas Safe Panel
- Plantroom Gas Safe Panel

4.14 HEATING

4.14.1 Existing Space Heating

The provision of a system of heating to the public toilets is not evident with the exception of a frost stat located in the draught lobby, that suggests that some form of heating (such as electric underfloor heating) has since been removed.

The Stable Block office is provided with a manually switched on-peak electric panel heater.

The café is heated via a single direct gas fired wall heater. The kitchen, store and staff WC have no heating currently installed. The 2No first floor flats are each served by natural gas combination boilers, the flues, condensate lines and pressure/ safety release pipework serving the same discharge at first floor level through the western elevation local to the entrance archway. The condensate lines from these boilers discharge into the ground floor eaves gutters via short sections of white 21.5mm UPVC overflow pipework.

4.14.2 Proposed LTHW Heating

The existing systems of space heating serving the ground floor of the Stable Block shall be removed in its entirety.

The ground floor of the Stable Block will be provided with a new system of space heating utilising a single high efficiency fully condensing LTHW natural gas boiler, this shall be controlled to maximise seasonal efficiency.

It is estimated that the boiler capacity needed to meet the building's requirement for space heating and hot water will be around 98kW, it is therefore propose that 1no Quinta Pro 115kW wall mounted condensing boiler be installed to meet the heating requirements of the building.

The provision of a single boiler is made on the basis of the cost saving achieved and acceptance by English Heritage that in the event of the single boiler failing the ground floor of the stable block (*café, kitchen and toilets*) will be left without a system of space heating, with ventilation to the kitchen also being lost during the majority of the heating system.

In the event of a boiler failure, a limited service of domestic hot water will be retained to the café and toilets through the use of the 3kW immersion heater fitted to the hot water calorifier.

To maximise boiler plant efficiencies during the provision of space heating, the kitchen AHU coils and kitchen fan coil unit are to be sized to operate at a reduced flow and return temperature of 60/40°C.

The boiler shall be controlled to modulate the primary circuit temperatures to meet the heating requirements of the weather compensated radiator circuit and the hot water calorifier. When these

circuits do not require water at 80°C, the boiler's flow and return temperatures are to be reduced to allow the boiler to operate in condensing mode.

To maintain stable temperature control to the AHU and radiator circuits and to minimise standing losses of distributing pipework, these two circuits will be arranged as variable temperature circuits using three-port mixing valves.

The boiler will be located within the dedicated plantroom within the existing Stable Block garage.

This plantroom will contain the LTHW pumps, air/dirt separator, fill unit, expansion vessel, and HWS calorifier

The boiler and hot water calorifier will be served by a standalone heating controller located with the plantroom.

The flue serving the boiler will be arranged as a fan assisted open flued boiler, with the products of combustion being discharge via a 110mm diameter black powder coated stainless steel flue terminating approximately 1.3m above first floor roof level. The end of the flue shall be fitted with an open screened mesh.

It is proposed that the flue shall be installed to appear similar in scale and finish as the existing external soil pipes/ rainwater goods.

In addition to the powder coated finish, the flue shall be hand painted using the same metal paint finish proposed for use on the external soil and vent pipes.

Combustion air serving the boiler shall be drawn directly from the plantroom, thereby requiring the following provision of combustion air ventilation to the plantroom.

Subject to receipt of listed building consent, the provision of combustion and cooling air to the plantroom shall be provided by 2No new louvered openings being formed into the northern external elevation of the plantroom, each having the below approximate face areas: -

- Low level louvre within the north wall of the plantroom having a face area of 1525 cm² (i.e. 390mm x 390mm) (Based upon a louvre with a 46% free percentage area)
- High level louvre within the north wall of the plantroom having a face area of 870cm² (i.e. 295mm x 295mm) (Based upon a louvre with a 46% free percentage area)

The LTHW heating system shall be provided with the following secondary circuits.

a) Circuit 1. Radiator circuit serving the ground floor of the Stable Block (including café seating, overflow seating, café kitchen,, staff welfare room and public toilets).

Pipework distribution between the plantroom and the south-end of the Stable Block (*café seating/ café kitchen*) shall be distributed using pre-insulated below ground pipework. The LTHW pipework shall utilise the same trenches required by the new below ground electrical services and new HWS service.

Pipework distribution between the plantroom and north-end of the Stable Block shall be routed at low level within the toilets.

To minimise the risk of vandalism, all above ground pipework shall be installed using mild steel tube and all radiators shall be provided with vandal resistant TRVs and spindle-less non-user adjustable lock shield valves.

All radiators within the public toilets shall be robust steel panel radiators, selected to resist wilful attack and to permit ease of cleaning, such as: - MHS, Monoplan Horizontal Standard Radiator.

Radiators located within supervised public areas such as the café seated area, café overflow seating shall be: - Stelrad Concord Planar radiators. Radiators in the staff welfare room which will be concealed from view will be Stelrad Compact Radiators.

The provision of heating to the public toilets shall be designed to provide a low level of back ground heating only (18°C). This is to provide a moderate level of comfort to users, while minimise the consumption of energy.

Due to each cubical being arranged as a small room with insufficient space in each cubical to site a radiator, it is proposed that heating to the toilets be arranged so that only the accessible WC is provided with its own radiator, with the remaining cubicles being heated indirectly via the radiator in the adjoining lobby. This arrangement cannot ensure that the temperatures within all the WC's will be maintained at the same temperature, or that the rooms' design temperatures will be maintained throughout the year.

The accessible toilet will be provided with space heating to a temperature of 20°C, due to potential of this user group being more prone to chilling/ discomfort due to reduced activity levels.

In accordance with part M of the building regulations, the accessible WC shall be provided complete with a wall hung low surface temperature radiator, such as a Stelrad Standard LST Radiator, with fully concealed pipework.

To permit ease of cleaning, all radiators shall be wall mounted rather than floor mounted.

A wall mounted LTHW fan convector shall be provided to serve the kitchen, this shall be provided with local user adjustable temperature control.

This circuit shall be provided with 3no two port zone control valves, these valves shall be controlled to allow independent operation of the following zones subject to the areas requirement for heat: -

- Zone A, Kitchen Fan convector,
- Zone B, Cafeteria area, overflow seating, staff welfare, public toilets

b) Circuit 2. AHU circuit serving the kitchen canopy supply air.

Pipework distribution between the plantroom and the externally mounted AHU compound local to the south-end of the Stable Block shall be distributed using pre-insulated below ground pipework. This pipework route shall utilise the same trench route required to serve the new domestic hot water services.

A system of electrical trace heating shall be provided to protect those sections of pipework local to the AHU which are above ground. The three-port valves and other associated valves shall be located internal to the plantroom away from the risk of frost/ vandalism.

To maximise boiler plant operating efficiencies and to minimise heat lost to the ground, the AHU coils are to be sized to operate at a reduced flow and return temperature of 60/40°C.

- The system does not incorporate heat recovery or provide supply air ventilation to the rooms served.
- The unit is oversized for the revised ventilation load.
- The routing of the ductwork is also unsuitable for reuse as the location of the rooms served have been substantially revised.

A large stainless steel commercial extract hood exists in the kitchen over the main range. This is in reasonable condition, although will not be suitable for reuse given the large increase and changes in layout proposed for the kitchen. There is no extract ventilation in the staff WC or make up air supply to the kitchen. Make up air is drawn from the café or via the door and windows.

Therefore as a part of the works it is proposed that all existing systems of ventilation serving the ground floor for the Stables Block be removed without trace.

4.15.2 Proposed Ventilation Strategy

Public Toilet Ventilation

A new system of supply and extract air ventilation shall be provided to serve the Public Toilets, this shall consist of a MVHR unit located within the Stable Block plantroom. This system of ventilation shall via an internal heat exchanger utilise waste heat from the extract air stream to pre- heat the supply make-up air.

The provision of this system will be subject to receipt of Listed Building Consent in the forming of 3No additional openings above the garage/ plantroom doors similar to those provided to discharge the existing toilet extract ventilation through the eaves/ wall plate on the north elevation of the plantroom. These new openings are required by the MVHR unit to draw fresh make-up air into the building.

Ductwork serving the Toilets shall be routed within the ground floor roof void.

To prevent noise nuisance being caused to the users of the building or to the neighbouring properties, the MHVR unit shall be provided with 2No air side and 2No system side attenuators.

Café Seating, Overflow Seating and Staff Welfare Ventilation.

It is proposed that ventilation within the café seating area, overflow seating and office be provided through the retention of the existing system of opening sash windows. Therefore as a part of the works, suitable allowance is to be made under the Architect's described works for the repair of all windows to ensure ease of operation.

Kitchen Ventilation

The Kitchen Specialist shall provide near balanced supply and extract ventilation to kitchen through the provision of a dedicated supply air AHU and a matched extract AHU. This arrangement will maintain the kitchen at a near balanced negative air pressure relative to the adjoining Café Seating and Overflow Seating areas.

This arrangement will maintain the seated areas at a slightly positive pressure relative to the kitchen to prevent odours from the kitchen entering the café. During the Kitchen Specialist's commissioning of the kitchen ventilation, it is proposed that the supply and extract systems be regulated to ensure that a sufficient pressure difference exists across the connecting doors, but so as not to provide excessive ventilation resulting in the overcooling of the Seating Areas in the Winter.

It is proposed that no formal return air path be provided between the kitchen and the Seating Areas, but air be allowed to enter the kitchen through the provision of the standard gaps that exist around the connecting doors.

General Ventilation Statements

All thermal insulation applied to ductwork shall employ insulation with a global warming potential of zero and an ozone depletion potential of less than 5.

In accordance with the fire officer's requirements fire dampers shall be provided as required to maintain the fire compartmentation of the building.

4.15.3 Ventilation Design Criteria

Dining Area/ Overflow Seating	5 litres/ second/ per person
Public Toilets	8 air changes per hour
Staff Welfare	10 litres/ second extract ventilation to the staff WC.
Kitchen	In accordance with the kitchen specialist's requirements.

4.16 ABOVE GROUND DRAINAGE

4.16.1 Existing Above Ground Drainage

The existing system of above ground drainage serving the kitchen consists of sections of UPVC pipework discharging to historic external brick waste hoppers located at various points around the external perimeter of the building.

In the public toilets, the above ground drainage is a mix of copper and UPVC pipework, either exposed to view or concealed behind the services panels used to conceal the WC cisterns and domestic services pipework.

Due to the proposed relocation/ layout of the Public Toilets and the provision of substantial revisions to the Kitchen, all redundant above ground drainage serving the existing Kitchen and Public toilets shall be removed without trace, with the associated redundant below ground drainage also being removed as a part of the Civil Engineering package of works.

4.16.2 Proposed Above Ground Drainage Stable Block

The Kitchen and Toilets shall be provide with a new system of internal above ground sanitary pipework serving all appliances requiring a foul water connection to drain.

The provision of grease control measures required to prevent fats/ oils and grease from causing nuisance blockages shall be provided as a part of the kitchen specialist's provision.

The provision of above ground drainage required to serve the external kitchen AHU shall be provided as a part of the kitchen specialist's package of works. The provision of trace heating required to protect the above ground drainage pipework from freezing shall be provided by the electrical trace heating extended from the same system serving the LTHW pipework. This system of trace heating shall be provided by the Mechanical Subcontractor.

All internal sanitary pipework shall be installed in MUPVC/ UPVC, with all internally exposed sections of sanitary pipework (*Stacks and branch pipework*) being installed using white self-coloured UPVC.

All pipework serving condensate lines from boilers, water heaters and flues shall be installed in white UPVC, and shall be installed to discharge upstream of a trap prior to connection into the foul water system.

Drainage pipework serving mechanical plant or specialist appliances capable of issuing a high temperature discharge shall be installed using copper tube.

In accordance with the fire officer's requirements. Intumescent fire collars will be provided as required to maintain the fire compartmentation of the building.

The sanitary pipework will be adequately ventilated to prevent water seal traps from being lost under negative and positive pressures. Heads of drain runs and those sections of drainage subject to surcharge shall be taken to terminate to atmosphere above roof level.

Access doors and rodding eyes shall be provided throughout the above ground drainage system, to ensure ease of rodding, with access points at every change of direction.

The new plantroom being installed in the location of the existing garage shall be provided with a waste connection for the disposal of boiler condensate waste arranged to connect into the system of above ground drainage provided to serve the adjoining Staff Welfare room/ Public Toilets.

The provision of new above ground drainage within the Kitchen and Public Toilet will require the installation of new sections of below ground drainage beneath the foot print of the existing building, and therefore will be subject to receipt of listed building consent.

Discharges from the break tank overflow, warning pipes and safety discharge pipework from the unvented water heater, shall be arranged to terminate at low level externally to the building. *(Subject to receipt of listed building consent)*

4.17 ABOVE GROUND SURFACE WATER DRAINAGE AND BELOW GROUND FOUL AND SURFACE WATER DRAINAGE.

Above Ground Surface Water Drainage and Below Ground Drainage will be carried out by others and does not form part of the scope of this report.

4.18 RENEWABLE ENERGY SOLUTIONS

The Stable Block is a Grade II listed building, set within listed parkland and surrounded by a large number of mature trees on the southern, western and northern elevations. A number of the trees are in the order of 26m in height. In addition to which, a number of domestic residential properties are located on the western side of the Stable Block.

As a result the available options for renewable and/or low carbon energy options are greatly limited.

Consideration has been given to the following: -

- Solar Thermal in the generation of domestic house water
- Solar Photovoltaic
- Biomass LTHW and Domestic Hot water Production
- CHP (combined heating and power)
- Ground Source Heat Pump LTHW and Domestic Hot water Production
- Air Source Heat Pump LTHW and Domestic Hot water Production

4.18.1 Solar Thermal

In the preparation of this report, due consideration has been given to the use of solar thermal collectors on the Stable Block to supplement the generation of domestic hot water and to offset the site's carbon emissions.

However, the use of solar thermal collectors have been discounted on the basis that they are not in keeping with the character of the Grade II listed Stable Block or the Grade II* listed status of the surrounding park land, and the existing Stable Block faces East/West, limiting the viability of solar collectors.

4.18.2 Biomass Boilers

This strategy for the generation of LTHW and domestic hot water was considered during the preparation of this report but was considered as being unsuitable due to: -

- In accordance with the clean air act, the Borough of Richmond is a smoke free zone.
- Smoke emissions causing nuisance to the neighbouring domestic properties.
- The additional requirement for plant space required by boilers and biomass fuel storage,
- The site's restricted access to the large vehicles used in the delivery of biomass fuel.
- Restrictions on the possible extent of the below ground excavations required to site fuel stores due to the presents of mature trees.
- Noise from fuel deliveries causing nuisance to domestic properties.

4.18.3 Combined Heat and Power (CHP)

This strategy for the generation of LTHW, domestic hot water and electricity was considered during the preparation of this report but was considered as being unsuitable due to the developments minimum requirement for heating. For CHP to be financially viable a continuous base load is required throughout the year.

4.18.4 Ground Source Heat Pumps (GSHP)

This strategy for the generation of LTHW and domestic hot water was considered during the preparation of this report but was considered as being unsuitable due to the number of mature trees within the surrounding park land.

These trees would be at risk of root damaged during the installation of the pipework. As well as changes to soil conditions/ soil temperatures following the extraction of heat from the ground.

The adoption of this strategy is also prevented due to the potential disturbance being caused to the archaeology of the site.

The adoption of this strategy is also prevented as the low flow temperatures generated by heat pumps would require the use of underfloor heating. The provision of such a heating system is prevented as the disturbance of the floors within a listed building is unlikely to receive listed building consent.

4.18.5 Air Source Heat Pumps (ASHP)

This strategy for the generation of LTHW and domestic hot water was considered during the preparation of this report but was considered as being unsuitable due to the potential for noise nuisance being caused to the historic park land and local residential properties neighbouring the site.

The adoption of this strategy is also prevented as the low flow temperatures generated by heat pumps would require the use of underfloor heating. The provision of such a heating system is prevented as the disturbance of the floors within a listed building is unlikely to receive listed building consent.

4.19 PART L COMPLIANCE

The following section of the report sets out the building's energy performance strategy as it relates to Part L2b of the Approved Building Regulations.

4.19.1 Part L2b, conservation of fuel and power in existing buildings other than dwellings.

a) Consequential Improvements

Under part L2B there is no requirement to undertake consequential improvements works to improve the energy performance of the Stable Block.

It should be noted that in line with the objectives of the London Plan, that it remains an objective of this project to increase the energy and water efficiency of the building where practical within the confines of a Grade II Listed Building, while minimising summer time overheating through the provision of the following works: -

- Replacing the building's existing non condensing gas fired warm air heater and electrical panel heaters with a high efficiency condensing gas fired boiler.
- Provision of a MVHR unit to provide heat recovery to the supply and extract ventilation serving the Public Toilets, Overflow Seating and Staff Welfare rooms.
- Provision of energy efficient controls to the replacement system of space heating, including time controls, and room by room temperature control.
- Provision of energy efficient LTHW pump control.
- Adoption of variable LTHW flow and return temperatures selected to maximise the seasonal operating efficiency of the condensing boilers.
- Replacement of the aged gas fired water heater serving the café with a HWS cylinder heated by a high efficiency gas fired condensing boiler.
- Provision of thermal insulation being applied to all replacement LTHW and domestic services pipework.
- Provision of occupancy switching to the lighting.
- Provision of water efficient self-closing taps.
- Provision of solenoid valves to the domestic services supply to the toilets to prevent water wastage when the rooms are not occupied.
- Replacement of the existing system of artificial lighting with a system of high efficacy lighting.
- Increased provision of thermal insulation applied to the existing roofs of the Kitchen and Public Toilets.

4.20 ACTIONS

To permit the progression of the Mechanical and Electrical Services design, it is advised that the following items be actioned within the next period: -

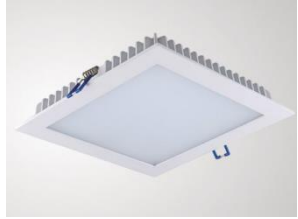





- a) Progression of “Listed Building Consent” required in the formation of additional builder’s work opening in the following locations: - (*Action: - vHH*)
- i. Removal of existing gas fired water heater flue serving the kitchen.
 - ii. Removal of the existing kitchen extract canopy discharge cowl
 - iii. Provision of a new boiler flue to terminate through the roof of the plantroom,
 - iv. Provision of high and low level ventilation openings within the northern elevation of the plantroom.
 - v. Provision of new builders work opening through the roof eaves of the plantroom to serve the MVHR unit supply air intake.
 - vi. Provision of new external gas main penetration through the external north wall of the plantroom.
 - vii. Excavations works required to route the new incoming and outgoing water, electrics, data, LTHW heating and domestic hot water services beneath the footprint of the plantroom.
 - viii. Excavations works required to route the new be ground drainage required in the plantroom to serve the plantroom floor gully.
 - ix. Excavations works required to route the new incoming water, electrics, and natural gas services to serve the first floor flats. Services to enter on the eastern elevation.
 - x. Forming a new penetration through the southern elevation of the proposed public WCs to allow for the routing of supply air ductwork into the kitchen.
 - xi. Excavations works required to route the new below ground drainage beneath the footprint of the building to serve new drainage connections within the kitchen, servery, public toilets and plantroom.
 - xii. Excavations works required to route natural gas supplies, LTHW and hot and cold-water services within the kitchen and servery.
 - xiii. External excavation works required to route below ground services between the plantroom and the AHU and southern end of the stables.
 - xiv. Modifications to the existing above ground external sanitary pipework on the western elevation of the building to permit the construction of the proposed extension.






4.21 RISKS

The following project risks are identified at this stage of the project: -

- Failure to receive “Listed Building Consent” required for the proposed services strategy.

APPENDIX A PROPOSED LUMINAIRES

Ref	Image	Manufacturer and Details
A		<p>Optelma Lighting: Flat 6; IP65; Shallow recessed; 230x230x28mm Matt White 23W LED; 90° Beam; 4000K; 2090lm AE Complete with integral 3 hour battery pack. http://www.optelma.com/products/ip-rated/flat-ip/flat-ip-6</p>
A1		<p>Optelma Lighting: Flat 5; IP65; Shallow recessed; 180x180x27mm Matt White 15W LED; 90° Beam; 4000K; 1390lm A1E Complete with integral 3 hour battery pack. http://www.optelma.com/products/ip-rated/flat-ip/flat-ip-5</p>
B		<p>ITAB Prolight LAC; IP65 Surface Mounted linear LED 27.4W 4000K; 4080 lm BE Complete with integral 3 hour battery pack LAC/12/F/48/4K & LAC/12/F/48E/4K http://www.itabprolightuk.com/Search-PDF/LAC.pdf</p>
B1		<p>ITAB Prolight Proline; Surface Mounted linear LED 31W 4000K; 4286 lm B1E Complete with integral 3 hour battery pack PLN/4T24/12/4K & PLN/4T24/12E/4K http://www.itabprolightuk.com/Search-PDF/Proline.pdf</p>
E		Denotes fitting provided with integral 3 Hour Emergency Battery Pack
E1		<p>Zumtobel: Resclite AW WALL P 65 LED surface wall mounted 3 hour non maintained emergency light. 117lm 200mm long x 130mm wide x 48.5mm deep. http://www.zumtobel.com/object/PDF/datasheet.aspx?CompanyID=1&GroupID=15688&ISO2=GB&Lang=EN Product Ref 42 180 463</p>
E2		<p>KB Lighting KB Product Ref OWL3/WB/WH OWL LED Recessed Self-contained Emergency downlight.</p>

E3		<p>Zumtobel: Resclite IP 65 LED surface mounted 3 hour non maintained emergency light. 130lm 200mm long x 130mm wide x 48.5mm deep. http://www.zumtobel.com/object/PDF/datasheet.aspx?CompanyID=1&ArticleID=203788&ModelID=21&Lang=EN&DatasheetType=1&is_o2=GB&templateLitech=StandardUK_web&file=ZS203788.pdf Product Ref 42 180 459</p>
EX 1		<p>Philip Payne: Classic Cylinder CBV; Ceiling Mounted, Maintained with integral 3 hour battery. 300CBV**LM ** Denotes finish, To be agreed with Interior Designer and architect prior to order. For tender purposes allow Satin Chrome Ref R. and 610mm arm length. http://www.philippayne.co.uk/product/300cbv/</p>
EX 2		<p>Philip Payne: Arca Surface wall mounted, Maintained with Integral 3 hour battery and 22/1/ARCA/W/LM http://www.philippayne.co.uk/product/arca/</p>
F		<p>TBC Allow provisional sum of £500 for the supply only of each fitting.</p>
G		<p>KB Lighting Sedge IP65 LED wall mounted eyelid. 12.5W 3000K. Finished in Black KB Product Ref 24843112</p>
G1		<p>KB Lighting Swift ECO 200mm ø IP54 LED ceiling bulkhead. 12W 4000K. Finished in White KB Product Ref 1.6834112/WT</p>
H		<p>Recessed LED Down light to be confirmed by Cooper8 as part of interior fit out.</p>
J		<p>Pendant Light to be confirmed by Cooper8 as part of interior fit out.</p>
K		<p>Recessed LED Directional Down light to be confirmed by Cooper8 as part of interior fit out.</p>