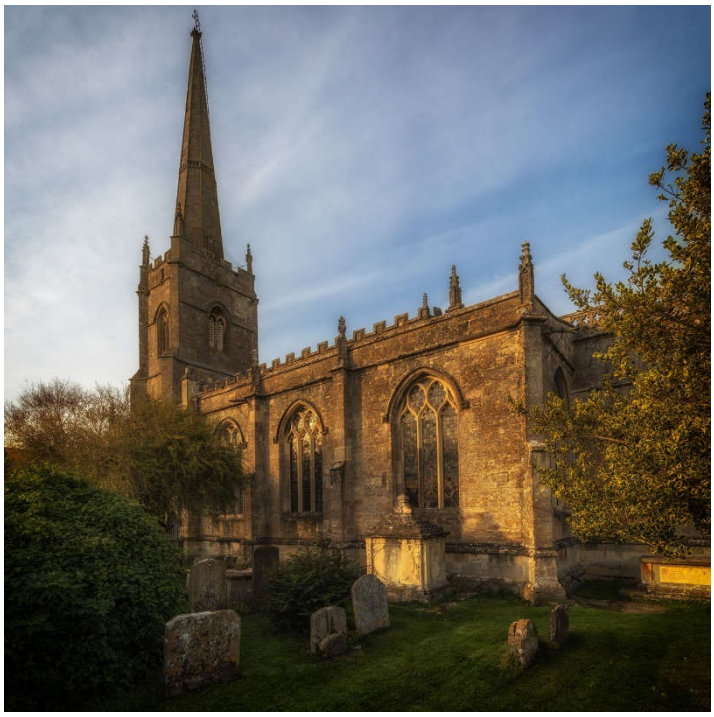
St Lawrence Church, Lechlade

Project Inspire, Stage 3 Report, Engineering Services Installations

October 2022

ENVIRONMENTAL
ENGINEERING
PARTNERSHIP

CONSULTING ENGINEERS



Document Revision	Author	Checked By	Date
A	DG/IP/PQ	DG/IP/PQ	Oct 2022
B	DG/IP/PQ	DG/IP/PQ	Nov 2022

Project reference: 4184

INDEX

1. Introduction

This RIBA Stage 3 report has been prepares to outline the proposals for the servicing of the reordering scheme for St Lawrence Church, Lechlade.

This report responds to the client brief for detailed design June 2022, version 2 – Project Inspire Group, supplementary information provided by the client e.g., kitchen requirements, discussions, and agreements with its members of the design team lead by Chedburn Codd Architects, and general liaison with and responses from the client during the design process.

In general, the Stage 3 designs have followed the proposals regarding space heating in particular described in the Mechanical and Electrical Service Feasibility Report no 99763/RO/ dated September 2020 prepared for St Lawrence Church by Martin Thomas Associates Ltd (MTA), Building Services Consulting Engineers.

2. Use of Report

This report has been prepared for the express use of the Employer (St Lawrence Church) and their professional advisors, in this present transaction, and shall not be used by any other party for any other purpose. No duty of care is acknowledged to any other persons or organisation in any circumstances whatsoever.

3. Existing Mechanical Services

3.1. Space Heating

The space heating system in the church is currently provided by two wall mounted domestic type gas boilers located in the basement boiler room. The boilers are of the 'room sealed' type with individual balanced flues which are run to terminate to atmosphere within the open access stair of the boiler room. The boilers are considered to have in the region of 10 years of further useful life and the client has decided that they will remain in position and form part of the church's space heating system, at least in the short term.

The boilers serve a pumped two pipe distribution system which perimeter radiators in the main which are supplemented by rather unusual floor mounted metal cased fan convectors with inclined top warm air discharges at various locations around the church. The pipework distribution system from the basement boiler room enters a system of floor ducts at the West end of the South aisle. The floor ducts are provided with cast iron floor gratings which extend towards the West end and the run South to North towards the North aisle. Pipework serving the panel radiators and fan convectors is mainly surface mounted against the church's perimeter walls.

The existing system is an open type with a feed and expansion tank located at high level in an exposed location in its West tower. The mains water feed open vent and cold feed from the tank rise from the floor duct into the corner of the tower to connect to the tank.

The whole system with exception of its boilers, its associated flues, header pipework which incorporates an in-line debris filter will be redundant under the new scheme proposals and will be removed.

3.2. Gas Services

The natural gas supply for boilers enters the below ground lobby to the basement boiler room and connects to a gas meter supported against the wall. This service will be retained under the scheme proposals but will be relocated in the same general location and re-supported to create space for additional equipment to be located in the area.

3.3. Incoming Mains Water

The incoming mains water service for the church is served for an external below ground supply with a stopcock chamber in its gravel surround to Shelley's walk at the West end of the church on the North side. The supply is understood to supply an existing sink in the vestry and a supply at the West end of the church including the rising main to the heating feed and expansion tank. The existing mains water service will become redundant under the new scheme proposals and a new service will be laid from the existing external stopcock chamber to enter the church under the ground floor of the tower at the West end.

3.4. Foul Drainage

The existing foul drainage is limited to discharges from the two sinks. There is a small inspection chamber in the gravelled area adjacent to Shelley's walk which picks up the sink discharges and the underground pipe from this inspection chamber runs into the main access chamber further to the West which also serves the adjacent building currently in Church ownership. The drain invert level in the main access chamber is approximately 1300mm from the cover level and the drain connection from the small access chamber discharges at a higher level in the chamber in a 'backdrop' arrangement. The existing underground foul drainage will become redundant with the exception of the main access chamber.

4. Existing Electrical Services

4.1. Incoming Electrical Supply and LV Distribution

The existing supply intake to the church is rated at a maximum of 100A SP&N which is insufficient for the proposed modifications to the building in particular the anticipated new mechanical services equipment.

The existing service enters the church at high level in the Nave from an overhead service cable, which connects back to the DNO (District Network Operator) network connection point mounted on Church Cottage. The cable enters the existing

electrical cupboard at the West end of the North aisle from above and is connect to the existing single-phase meter via a 100A fuse carrier; it is noted that the fuse carrier is sealed, and the exact rating of the existing fuse cannot be determined and could be as small as 63A single phase. Based on the possible range of fuse sizes the church has a supply allowance of between 14 and 23kW single phase.

The existing switchgear comprises multiple single phase distribution boards which, while they appear to be in reasonable condition no longer comply with the requirements of BS7671 in regard to board manufacture and the provision of Residual Current Protection for services.

The existing wiring within the Church is of various ages, with the earliest installations dating back to the 1960s. This is well beyond the expected lifespan of the installations and is beginning to fail in places.

4.2. Lighting and Emergency Lighting

The main body of the church is currently illuminated by spotlights mounted at high level just under the timber roof in the north and south Aisles and mounted along the ledges that run east and west along the Nave. These luminaires use a combination of incandescent and halogen lamps which are now outdated and energy inefficient technologies.

Switching of the internal lighting is by manual control only with a time-controlled installation for the external lighting.

There is minimal emergency lighting in the form of illuminated exit signs.

4.3. Small Power

The church is provided with a minimal small power installation in the form of switched socket outlets, and dedicated supplies in the form of switched fused spurs or isolators for dedicated supplies. Portions of this installation are in poor condition.

4.4. Voice and Data Voice and Data

The church is currently not provided with a dedicated voice and data installation, and instead uses a Wi-Fi connection provided from the Parish Office.

4.5. Audio Visual

The church is provided with a minimal AV installation, comprising a fixed induction loop, wireless microphones and column mounted speakers, with central equipment installed loose on a cupboard within the north Aisle.

4.6. Security Systems

The church is provided with a Hikvision CCTV system, which also provides coverage to the adjacent building. The system comprises 13 cameras, and a Network Video Recorder located in the Parish Office.

4.7. Fire Alarms

The church is not currently provided with a Fire Alarm installation.

5. Design Criteria for the Engineering Services

It is proposed that the following design criteria be used when progressing the design to RIBA Stage 4.

Mechanical

Internal Building Fabric Protection Temperature: 8°C

Building Fabric External Design Temperature: Minus 4.6°C.
(As MTH Feasibility Report Page 6) i.e., 13°C maximum uplift)

Internal Comfort Design Temperature: 19°C

Internal Church Sound Level during Occupation: NR 30 to 35

Internal Kitchen and Toilets Sound Level (Mechanical Ventilation): NR 45

Kitchen Extract Ventilation Rate: 10 Air Changes /hr

Toilet Extract Ventilation Rate: 6 Air Changes/hr

Bell Ringing Area (Summer House) Ventilation Rate: 6 Air Changes/hr

Electrical

The entrance area and WCs will be illuminated to 200 lux at floor level.

Circulation spaces and staircases, plant areas and boiler rooms will be illuminated to 100 lux at floor/stair tread level.

The worship spaces will be illuminated as follows:-

- Nave and Side Aisles — 150 Lux average at floor level
- Chancel — 300 lux average at floor level
- Areas requiring feature light i.e. Altar, Font — 500 lux average at working plane

Office areas will be illuminated to 350-400 lux at working plane dependent of floor and natural light conditions.

Emergency Lighting Conform to BS5266 Part 1 2016

Fire alarm will be installed to L1 standard in accordance with BS 5839.

6. New Mechanical Services

Below is a description of the mechanical services systems/equipment which it is proposed shall be provided as part of the reordering of the Church.

6.1. Space Heating

The new main space heating system will be designed to achieve two internal temperature levels as follows:

- Minimum conservation heating temperature level at all times of not less than 8°C
- Comfort temperature level for the occupants during main Church events of 19°C

6.1.1. Conservation Temperature System

Heating throughout all the main ground floor areas of the Church (excluding the Chancel, Sanctuary, South Chapel, Organ Area, Toilets and Vestry) will be provided by a 'wet' underfloor system to maintain the conservation temperature level from an external air source heat pump. The underfloor heating pipework will be run below the stone floor finish with a thick insulation layer below. The floor level over the majority of the Church is to be raised by approximately 240mm to be level with the top of the Chancel step.

This provides ample depths to provide for the thickness of the proposed floor finish, the underfloor heating layer, and thermal insulation through which the mechanical and electrical service runs can be accommodated above the existing tiled floor which is to be left in position. Other geotextile layers will be incorporated depending on which flooring system is finally selected. Details of the proposed two options for this are indicated on the Stage 3 mechanical service drawings as follows: -

- 'Dry' system (below floor finish) including screed replacement tiles above underfloor heating pipework layer, closed cell thermal insulation below laid over 20mm thick Fermacell boarding over 30mm thick loose slate levelling layer on top of existing floor tiles (Jupiter Heating Arrangement)

- 'Wet' system (below floor tiling) including 75mm thick limecrete screed incorporating underfloor heating pipework and clipping system, over compacted foam glass insulation with a geotextile membrane above and over a sand levelling layer laid on the existing floor tiles.

Note 1: Both systems require a thin cork edge strip at the perimeter where the floor abuts the walls or other obstructions.

Note 2: The existing floor in the Church is understood to be dry without evidence of moisture penetration.

The underfloor heating which utilises continuous circuits of small diameter plastic PEX pipework with an integrated oxygen barrier layer will be arranged in zones to provide individual control in the different areas served. The Nave and side Aisles, which are open to each other will also be provided with separate control zones at the client's request.

The individual circuits of underfloor heating pipework will be connected back to the 3 No manifolds positioned within low level enclosures against walls as indicated on the drawings. Each manifold will incorporate a control centre and individual solenoid control and balancing valves for each circuit.

Each manifold to be served from distribution pipework run back to the basement plantroom to connect to the central heat raising equipment.

The underfloor heating in the Nave and Side Aisles will be split into three control zones as follows:-

- South Aisle
- North Aisle
- Nave

6.1.2. Comfort Temperature Heating

Comfort temperature heating will be provided from fully variable speed controlled linear floor trench heaters in most locations which will be served from the existing gas fired boiler plant and a separate distribution pipework system. The pipework will all be thermally insulated and run-in concealed locations either directly under the trench heaters, within the floor build-up insulation layer or in the existing floor trench at the West end of the Church.

The fan assisted trench heaters and its associated boiler plant will be activated prior to occupation of the Church and will achieve temperature control by varying the fan speeds from temperature sensors in each area served via a central control system. Once the desired comfort temperature is reached before occupation the fan speed will reduce automatically to the minimum level requested and will remain at that speed throughout occupation. Wall mounted fan speed controls can be provided for the units installed at the first-floor gallery level if required for adjustment to local conditions in those areas which are likely to have more than intermittent usage patterns.

In most instances the heaters which are 320mm wide and 130mm deep will be recessed into the floor, but in certain instances where this is not possible for structural reasons, the heaters will be surface mounted at low levels within painted metal cases to a RAL colour (to be determined). Several units of this type are required at the balcony level where steelwork in the floor prevents flush floor mounting. The location of all proposed units are indicated on the drawings which accompany this report.

6.2. Heating in Ancillary Areas

6.2.1. Vestry

Local electric heating is proposed for this area as it is likely to be used at times when comfort heating is required outside normal occupation times for the main Church.

The proposed furniture layout in the Vestry uses up all of the available wall space and hence electric ceiling infra-red heating panels (not the glowing type) are proposed to co-ordinate with the new ceiling mounted roof-light installation. The radiant effect of the ceiling heating panels will also help to offset the 'cold radiation' that is likely to be experienced from the roof lights.

6.2.2. Choir Pews

The enclosed choir pews that are positioned on the North and South sides of the Chancel will receive very little benefit from the heating provided for other areas. The proposal is therefore to make provision for a low wattage thermostatically controlled electric Pew heater under each Pew which can be switched on in banks for short periods when required.

6.2.3. Toilets

The floor area in the toilets is too small to gain sufficient benefit from the installation of underfloor heating and there is limited available wall space for the installation of a wall mounted panel heater. Electric ceiling mounted heating panels are therefore proposed for these areas, rated at 300W each.

6.2.4. Bell Ringing Chamber

It is proposed that this area be provided with two low level electrical fan convector heater units, for intermittent manual usage when required.

6.3. Air Source Heat Pump (ASHP) and Associate Equipment

The heat source for the underfloor heating system is proposed to be a single ASHP located externally to the Church to the South side of the tower. After considerable deliberation this is considered to be the preferred location after several other options were considered.

The heat output required is 22-23kw which is above the capacity of domestic size units currently available on the market and hence a small semi-commercial unit is required. Calculations for such a unit indicate that the noise generated when it is in operation may cause a limited amount of disturbance to the first-floor window of the closest adjacent property to the Southwest of the tower. Advice has been given that an acoustic screen may be required around the ASHP to achieve sufficient

sound attenuation to prevent potential nuisance. Such a screen would also provide protection for the ASHP unit from unauthorised interference. In positioning of the ASHP and the screen, account has been taken of the maintenance access required around the unit and the requirements to provide sufficient clearance to allow unimpeded air flow for the unit to operate correctly. A lockable access door will be required to provide access through the screen to the equipment within.

ASHP's when operating produce condensation which in cold weather can collect as ice on the evaporator coil. This condensation and the thawing of any ice layer during the units defrost cycle will result in water being discharged under the unit and a gravel soakaway will be required under the unit to receive the discharge.

To ensure that there is aways adequate water flow rate passing through the ASHP when it is operating and to limit the number of 'starts' of the unit compressor(s), a buffer vessel is required which acts as an interface between the ASHP and the underfloor heating system. In this instance it is proposed to provide a 300-litre insulated vessel in the space next to the existing gas meter at the bottom of the existing access stair to the basement boiler room. A new waterproof access will be required in the ground/hard standing at ground level above to enable the buffer vessel to be installed. The access does not require to have provision for regular maintenance but should be constructed to allow for its removal without damage in the unlikely event that removal of the vessel will be required.

The ASHP and the buffer vessel will be connected by pre-insulated flow and return pipework buried below ground at the external perimeter of the Church without disturbing the Church wall foundations. The pipework circuits between the ASHP and the buffer vessel and the underfloor heating manifolds in the Church will both be provided with in line circulating pumps which will be accommodated at higher level in the existing basement boiler room. The circuits will be of a sealed type with small automatic pressurisation/fill units, and diaphragm expansion vessels also located in the basement boiler room.

6.4. Gas Boilers and Associated Heating Circuits Serving Fan Assisted Trench Heaters

The existing boilers and flues will remain in their existing location, but the heating circuit will be converted to a 'sealed' system with the associated equipment being located in the basement boiler room. The existing heating pump will be retained to serve the heating circuit for the fan assisted trench heaters. An automatic gas safety shut-off system will be provided for the gas supply to the boilers for automatic activation in the event of an emergency.

6.5. Heating System Controls

The new heating system will be a fully automatic unit with a small control panel with switches to isolate the various plant items located in the basement plant room. This will be linked to a central controller provisionally positioned in the new chair store

adjacent to the kitchen. This controller can be programmed to predetermined time schedules with manual over-ride facilities.

Control wiring will need to be run from the various temperature sensors for the heating zones in the Church back to the control panel and from there to the fan assisted trench heaters and the underfloor heating control centres.

Limiting timer switches will be included for rooms with electric heating.

6.6. Domestic Cold-Water Services

Domestic cold water services to serve the new kitchen and toilet accommodation in the Church will all be served from the mains supply via a new incoming supply pipe entering the building under the new floor at ground level in the tower where a new stop cock will be provided in the location of the redundant rising pipework serving the existing feed and expansion tank. From the new point of entry, thermally insulated pipework will be run through the existing floor duct where possible and then within the insulation layer, under the new floor to serve the various new outlets. A connection will also be run into the basement boiler room to serve the new pressurisation units including a 'quick fill' connection.

6.7. Domestic Hot Water Services

Domestic hot water in the new toilet areas will be served from two electric water heaters with limited storage capacity positioned at high level in concealed locations. It is proposed that one will be in the new cleaner's storage cupboard and the other in the general toilet area within a bulkhead. The domestic hot water demand for the new kitchen will be in excess of that which would be able to be provided from a local water heater and an unvented hot water cylinder with an electric immersion heater will therefore be provided in the basement boiler room for this propose. The space available within the basement boiler room is very limited and the capacity of the hot water cylinder will be the maximum that can be accommodated subject to a more detailed survey and space planning exercise during stage 4.

6.8. Mechanical Extract Ventilation

Separate systems of extract ventilation will be provided for the new kitchen and toilet areas. Both systems will comprise extract grilles mounted on the surface of builders work bulkheads provided at high level in the areas with circular ductwork connecting to in-line extract fans also located within the bulkheads with access for maintenance. The discharges from the extract fans will be ducted through the Church walls to terminate with masonry air bricks in locations indicated on the drawings. The system in the kitchen will be provided with a wall mounted local fan speed controller for manual operation. The system for the toilets will be activated from ceiling motion sensors.

The bell ringing chamber in the tower will also be provided with an extract fan incorporated with a flexible ducted arrangement within the centre timber section at

high level. The fan and ductwork will be arranged to be capable of dismantling to allow for the removal of the bells above when required. The discharge from the extract system will terminate within the bell area above, with final details to be determined at Stage 4. A local wall mounted fan speed controller will be provided within the bell chamber.

6.9. Foul Above and Below Ground Drainage

The discharges from the various new trapped appliances in the new toilet areas will run to a system of waste pipework at low level in concealed locations where-ever possible and then to new drainage points within the floor. The new drainage points will connect to a new system of drainage below the floor at the West end of the Church which will discharge by gravity into an internal inspection chamber formed in the floor of the general toilet area. The new inspection chamber will be provided with a double seal removable cover with a recessed top to enable the floor finish in the toilet area to be incorporated.

The new inspection chamber will connect to a new single drain discharge which will pass through the existing wall at the West end of the Church and then run with falls to connect to the existing drainage access chamber adjacent to Shelley's walk. It is envisaged that the point of discharge will need to be a backdrop arrangement as is the existing sink discharge (which will become redundant) but some modifications within the manhole are likely to be required to provide for effective removal of waste matter within.

7. New Electrical Services

Below is a general description of the proposed electrical services systems/equipment which it is proposed shall be provided as part of the reordering of the Church.

7.1. LV Supply and Distribution

It is proposed that this be upgraded to a suitably rated TP&N supply from the local network. We understand that the client has undertaken initial discussions with the DNO, National Grid (formerly Western Power) regarding these works and that the new supply may be brought in below ground via the path adjacent to the church as part of the council's works to the area. The new cable route would require a ducted entry with slow bends to bring the cable to the new proposed electrical cupboard location on the south wall of the new toilet facilities.

A new Three Phase main distribution board will be provided, of a size to be determined, which will feed the following items: -

- Mechanical control equipment.
- Mechanical plant
- General lighting and power final circuits.
- Lighting control system.
- Fire alarm control panel.

- New Organ sub-main distribution board
- New Boiler Room sub-main distribution board

As proposed during the Stage 2 works, the outgoing circuits from the primary and sub-main distribution boards supplying sockets will be provided with Arc Fault Detection protective devices. Currently, the only manufacturer who provide these as single module devices is Wylex, and we would propose their equipment be used at this point to reduce the space requirement for the electrical cupboard and eliminate the need for separate AFDD enclosures. We note other manufacturers may release similar products in the future and the choice of distribution board manufacturer should be reviewed on this basis during the design development.

In addition to the Arc Fault Detection, we recommend the additional provision of a Surge Protection Device on the primary incoming supply.

The board will be configured to allow separate metering of lighting and power sections in accordance with the Building Regulations Part L.

7.2. Lighting and Lighting Controls

It is proposed that a new lighting installation will be installed throughout the building.

It is anticipated that the new lighting installation will generally be wired using Pirelli LSX or equivalent, stranded multi-core soft skinned cables clipped discreetly to the structure. These cables may require painting in certain areas to blend them into the background.

Nave, Chancel and Bell Ringing Areas

The main body of the church is currently illuminated by spotlights mounted at high level just under the timber roof in the north and south Aisles and mounted along the ledges that run east and west along the Nave and where possible these will be replaced with LED fittings in similar locations.

Dedicated directional LED luminaires will also be used to highlight architectural features and other special attributes.

The LED light fittings will give a much longer life than the previous luminaires with the exact increase depending on the manufacturer. Lighting technology has developed considerably since the original church lighting installation was carried out and the proposed new LED lighting will also consume significantly less power than the existing installation.

The colour of the white light will need to be carefully selected during Stage 4 as certain colours of white light i.e., 3000K will work better with the Cotswold Stone. This is best done by actual site trials with various colour temperatures of luminaires.

North Entrance

It is proposed that the new lighting within the north entrance will be provided by wall mounted LED luminaires controlled by the central lighting control system.

Multifunction Space

It is proposed that the new lighting within the multifunction space will be provided by recessed circular LED luminaires controlled by the central lighting control system.

Vestry and Kitchen

It is proposed that the new lighting within the multifunction vestry and kitchen will be provided by recessed circular LED luminaires controlled local manual switches.

Toilets/WCs

Lighting within the toilet areas will comprise recessed LED down lighters to be arranged to suit the required illumination levels listed within the design criteria. Control of the lighting will be by recessed PIRs.

Lighting to other areas such as storage spaces and the boiler house will generally be provided by more robust LED luminaires intended for use in areas which may be dusty or damp.

7.2.1. Lighting Controls

It is understood that the existing worship area manual controls arrangement do not work well for the Church users and a new Dali control system will be provided to control the lighting as a whole. This will incorporate timeclock and photocell control and will allow the selection of scenes via an iPad or other tablet device. In other areas, the new lighting will be locally controlled with PIR control where appropriate.

A lighting control system shall be provided throughout the main areas of the building. This will include control plates. The control plates or App will control the lighting by scene setting. Each light fitting will have its own address and can be allocated to various scenes as required. Each scene will also be dimmable but will be programmed to revert to its set level once turned off.

The lighting control system will also have the capability to provide a 'Last Man Out' function to enable the person closing the building to ensure all non-timer-controlled lighting is switched off.

Areas not connected to the lighting control system will be switched via local PIRs or will be provided with local switching.

7.3. Emergency Lighting

Emergency lighting will be provided throughout the building in line with the current edition of BS 5266 and will comprise, self-contained, non-maintained LED luminaires and integral battery inverter units incorporated into the general lighting luminaires.

It is also proposed that wiring points be provided for emergency exit lighting in the event that Building Control require this be installed. Due to the nature of the premises, it is possible this will not be required if a suitable emergency management plan is put in place by the Church.

Emergency lighting test switches will generally be mounted in concealed positions adjacent to the distribution boards or lighting control panels.

7.4. Small Power

An upgraded small power installation will be provided throughout from the new final circuit MCB distribution boards.

General wall mounted sockets will be provided to the multipurpose rooms, vestry and servery area, with new low-level column-mounted sockets will be provided to the general worship space to allow for flexible usage. In addition, where possible within the floor trench detail floor boxes will be mounted between fan heaters to provide local power connections to the heaters, general power and data connections. Floor box dimensions have been based upon the Cableduct 700 series two compartment product with trimless finish.

It is anticipated that the small power will generally be wired using Pirelli LSX or equivalent, stranded multi-core soft skinned cables installed on cable tray, in below floor trunking or conduit. The electrical sub-contractor shall re-use existing routes and fixing holes wherever practical.

Any junction boxes will be of the maintenance free 'Wagobox' type.

It is proposed that visible socket outlets, switches, fused connection units, etc. will be antique bronze finish with black inserts and matching back boxes, if surface mounted such as those provided by 'Sockets and Switches' or an equivalent manufacturer, with all finished subject to final confirmation prior to ordering.

7.5. Disabled Persons WC Alarm

As part of the reordering works, a new alarm system will be provided to the new Disabled Person's toilet. This system will comprise a local mains power supply and power pack with a pullcord alarm switch, a combined reset and reassurance lamp unit, and an overdoor/ceiling mounted audio/visual indicator unit.

Additionally, a remote audio/visual alarm unit can be provided should it be required, to be located in an area of the church which would regularly be occupied. The repeat indicator would have a mute facility, but the indicator would remain on until the call is reset at the source. This would be configured so that a second call when the alarm is muted would re-activate the sounder. For safety purposes, the remote alarm unit would not have the ability to reset the alarm.

All plate finishes will be selected to match the adjacent accessories

7.6. IT / Data Connectivity

As part of the works, it is proposed that a new system of voice and data wiring will be installed to Cat 6 standards between the outlets shown on the drawings and the equipment rack, which will be shared with the AV equipment, located at gallery level.

Should it be required, a new incoming router can be provided during the works, which we would recommend be from the Draytec Vigour range with integral firewall and dual ADSL inputs. Alternatively, the existing equipment can be retained and re-used.

Should an email server be required, our recommendation would be for a basic PC hosting Microsoft Outlook 365.

Should a dedicated phone system be required for the church serving multiple positions within the building we would recommend a cloud hosted phone system based on HV Select from BT Wholesale with Yealink handsets at required locations.

The data points will serve the various items of AV equipment and the new proposed internal wi-fi system. It is recommended that the Wi-Fi be based upon an Ubiquiti Unifi AC Long Range indoor access points with hosted Unifi Cloud Controller. These Wi-Fi points are dual band, which would allow for public and private networks within the Church and can accommodate 200 concurrent users.

In order to allow the Wi-Fi networks to operate a managed network switch would be required and we would recommend the current model of the Netgear Smart Switch range, 16 port model.

Should new incoming phone lines be required to the building we would recommend the following be considered: -

- FTTC SIP (internet trunk) with ADSL (private)
- Standard line with ADSL (public)

7.7. Audio Visual Systems

During Stage 2, proposals for a full new Audio-Visual system were obtained by the client from Hilltop AV. We have reviewed this scheme, and in consultation with an alternative specialist known to us, have made some comments and suggested amendments to these proposals.

7.7.1. Audio System - Hilltop

Hilltop's original proposal is for the following Audio system arrangement: -

Speakers

Choir Area 2 x BiAmp Mask 4T speakers to be mounted on the pillars.

Nave & Aisles BiAmp Mask 6T speaker to be mounted in the aisle roof timbers.

Meeting room 1 x BiAmp Mask 4T speaker with local volume control.

Wireless/Wired Microphones

Altar - Existing boundary microphone to be retained

Pulpit - A new wired gooseneck microphone to be installed.

An ambience microphone will be installed for recording Wireless microphones.

Lectern – An AT Pro47T gooseneck microphone with a wireless transmitter to be provided at the lectern.

3 x belt pack wireless systems – can be used with either headset or lapel mic

2 x Handheld wireless system microphones

Line inputs

Line inputs for the connection of a wired device, such as CD, laptop etc to be available at the AV desk in the gallery, and at east end and south side of the nave.

Bluetooth – Audio by wireless Bluetooth to also be available

System control

Hilltop's recommendation is that the system be controlled by the Allen & Heath QU-Pac rack mounted digital audio mixer with 16 inputs, with iPad control throughout via app.

7.7.2. Audio System - EEP

Generally, we believe that the Hilltop Audio proposals are suitable, however, we have the following comments and suggestions: -

Speakers

We are cautious about the proposed speaker installation method in the Aisle areas as while this is good for the aesthetics of the space, speakers pointing at the floor in a reverberant space is not recommended.

We would recommend consideration be given to the installation of engineered column speakers on the side aisle walls to cover the whole area.

We note that no proposal has been made for the installation of overflow speakers in the multi-function space or at gallery level, to allow these areas to also be used during large events. This would require the addition of an extra amplifier to power these speakers; the mixer size as detailed by Hilltop would be enough to accommodate the extra outputs.

We would also recommend that high density multi-channel power amplifiers be used to minimize the amount of rack space required.

Wireless/Wired Microphones

We have checked with Audio Technica about the use of a Pro47T gooseneck mic with a wireless pack, as the specification sheet for the product calls for the equipment to be powered by 9-52v phantom power via a hard-wired connection. Standard wireless belt packs cannot provide this level of power output, only being suitable for 3V lapel microphones. Audio Technica have confirmed that this is indeed the case, meaning that the wireless lectern arrangement with the equipment proposed would not be viable.

Alternative products from Sennheiser would however work when installed in this manner.

We would recommend that two microphones be installed in the Chancel choir stalls to allow the choir to be reinforced into the main area of the Church and allow the congregation to hear them more clearly.

No mention was made within the Hilltop proposal for the location of the RF distribution equipment and microphone antennae. We have assumed that the microphone equipment would be incorporated into the Gallery AV rack. We believe that two antennas would be needed to provide a suitable signal to all receivers.

Line Inputs

We would recommend that a single play CD / MP3 media player be installed to allow both MP3 files and CD discs to be played via the system.

System control

While we agree that the Allen & Heath Qu-Pac is a very nice product, we have found that the iPad user interface is not customizable and can look quite daunting to a novice user. In our opinion, this is a product aimed more at a gigging musician or band rather than as an installation product.

We would propose the Yamaha MTX range as an alternative, as the iPad interface is fully bespoke, and can be as complex or as easy to use as is desired. However, we note that the MTX is roughly twice the cost of the Qu-Pac for the same 16 channel count. That aside, the MTX product has all the desired functions of a digital mixer and given the extent of the full AV package we would argue that the cost increase is worthwhile in this instance.

7.7.3. Video System – Hilltop

Hilltop's original proposal is for the following Video system arrangement: -

Projection

Screen: - A 3048x1905mm Sapphire Smartmove projection screen will be mounted above the east side of the chancel arch. When in use the screen case will lower on

wire rope, and then the screen fabric lowers from the screen case. Please see this video for how the screen works.

Projector: - The Epson EB-PU1007W projector has a brightness of 7000 ANSI lumens with WUXGA resolution. This will be mounted under the galley, close to a pillar to avoid bouncing of the image from gallery movement, and to avoiding a show from the chandelier.

Video Screens

Chancel - A pair of 32" LED displays are to be mounted on the pillars of the chancel to enable the choir and priest at the altar to view the image.

Aisle displays - A pair of 55" LED displays are to be mounted on wheelable trolleys. These can be connected to sockets installed at the front of each aisle, or on the south wall, to provide flexibility of seating formats. These displays can also be used independently for smaller meetings in the building.

Meeting room - A 43" display is to be installed in the ground floor meeting room. This will display the image displayed in the church or can be used independently with a local HDMI input.

North Porch - In the north porch a welcome display will be provided which is to be a 43" display with a press to start button, will start a slideshow stored on USB.

Connectivity

HDMI inputs are to be installed for the connection of a laptop at the front of the nave and on the south wall, as well as on the gallery where the AV desk will be situated. All inputs will be cabled to the AV desk in the gallery, where the signals will be switched and distributed to the displays.

Wireless screen casting from a laptop, tablet or phone will also be available.

7.7.4. Video System – EEP

Generally, we believe that the Hilltop Video proposals are suitable, however we have the following comments and suggestions: -

Projection

The original mounting position of the projector 'under the galley, close to a pillar' we believe would not now be achievable due to the construction of the folding doors to the multipurpose space. There are several alternative mounting solutions we have initially investigated: -

- The projector could be mounted to the face of the gallery structure adjacent to a column rather than below, or on one of the columns themselves (subject to approvals). We are concerned that the visibility of this solution would not result in an acceptable installation.

- The projector could be mounted at the rear of the West end of the gallery on the Nave wall at high level. This increases the projector throw and would require a replacement lens in order to meet the approximate 5.67:1 ratio for a 3m screen which would add an approximate £2000 to the projector cost.

Further review of this item would be needed in the Stage 4 design phase.

7.8. Induction Loop

During Stage 2, it was reported by Hilltop AV that the existing induction loop is working well, and they recommendation was that this be retained. We are concerned that the positioning of the induction loop wiring around the perimeter of the space will result in this being damaged during the works and believe that the installation of a replacement system should be included.

This would take the form of a new low loss phased array installed under the floor finish utilising flat loop tape.

7.9. Fire Alarm System

We propose that the church is provided with a new, Category L1 fire alarm system as part of the works. The system will be analogue addressable with the facility to the existing auto-dialler.

It is proposed that fire alarm system will comprise smoke and heat detectors, high level aspiration and beam detectors, break glass units and interface units. Sounders will generally be integrated with detectors or discreetly located standalone devices as indicated.

We recommend that this be an open protocol system, using Hochiki devices (or similar) that are available in a black finish in addition to the standard white including for sounder-bases/device bases.

Within areas of the nave and aisles of the church where the floor to ceiling height is less than 4.5m we recommend individual point detectors be used; this would include the multifunction spaces, area below the gallery and the aisle sections of the gallery. These devices would be provided with integral sounders bases and can be obtained in a black finish to better match the ceiling colour.

Within areas of the nave and aisles of the church where the ceiling height is greater than 4.5m, we would recommend a microbore aspiration system be used. This system uses a 4mm diameter pipe to connect the individual sampling points back to a central control panel. We recommend this system as the sampling points do not require access for maintenance and the pipework can be discreetly positioned at the apex of the ceiling. All routine maintenance is carried out at the control panel itself.

Within the Chancel and Sanctuary, we recommend that a beam detector be used with the emitter mounted above the stained-glass window, with the reflector located at high level in the space above the proposed projector screen installation.

This arrangement has not been proposed for the nave and aisles as any interruption of the beam by an object, such as a person with a ladder, will send the system into alarm and we believe is a risk at gallery level. The beam would need to be positioned off-centre to the space due to the limited wall space available for mounting the emitter/reflector above the east window.

The system will be wired using Pirelli FP200 Gold or equivalent fire-rated soft skinned cable with LSF sheath clipped to the structure. Supports and fixings for the fire alarm wiring will be strictly in accordance with the manufacturer's requirements.

This installation would need to be carried out in red cable in order to comply with the requirement of BS5839 for the fire alarm cabling to be identifiable as separate from the other wiring within the building. The cable can be painted to match the surrounding environment post installation however this would need to be undertaken in intumescent water-based paint and undertaken in line with the cable manufacturers advice.

The fire alarm system will be provided with interface units to isolate the following items of equipment in the event of an alarm activation: -

- Mechanical services control panel shut off
- AV system mute
- Gas solenoid valve shut off
- Any installed Photovoltaics

The fire alarm panel will be provided with facilities to isolate the interface units when routine testing is being carried out.

A dedicated electrical feed will be provided to the to the fire alarm main panel, taken directly from a separate way on the main distribution board and connected to the fire alarm panel via an un-switched fused connection unit. The switch panel and connection unit shall be labelled "Fire Alarm – Do Not Switch Off" in red.

The system proposed the capability of connecting to an auto dialler, which can either be provided as a standalone GSM unit, of could be shared with the intruder alarm installation.

7.10. Intruder Alarm System

We recommend that church be provided with a new Intruder Alarm level, which unless advised otherwise by the Church's insurers will be based upon NACOSS (National Approval Council for Security Systems) grade III equipment.

We recommend that the system be provided with a central controller with an RF portal, such as the Honeywell Galaxy range and that the field devices comprise wireless door and window contacts, breaking glass detectors and presence detectors as indicated on the drawings

We have indicated the head end panel position be within the vestry and have also indicated the set/unset keypad at the door to this area from outside as the most likely 'staff' entrance to the church.

The system proposed has the capability of connecting to an auto dialler, which can either be provided as a standalone GSM unit, of could be shared with the fire alarm installation.

The system proposed would be sufficient to provide 'double knock' coverage as required for a police response.

7.11. CCTV System

Is has been requested that existing CCTV installation be retained and extended with additional devices to suit the refurbishment works.

Investigation of the installation indicates that this comprises: -

- 1No Bracket mounted camera on the corner of Church Cottage
- 1No Unknown camera type – Church cottage hall
- 1No Unknown camera type – Church cottage rear
- 2No internal 'turret' cameras mounted at the west end of the North and South aisles.
- 1No internal West entrance – turret type
- 1No dome type mounted on the Vestry Roof
- 1No dome type mounted on the South Aisle Roof
- 1No dome type mounted on the North Aisle Roof
- 1No Chancel – turret type
- 2No external bracket mounted cameras positioned at the East and West end walls of the South Aisle.
- 1No external bracket mounted on the south wall of the south aisle overlooking the boiler room entrance.

The cameras installed are of the IP type by Hikvision, connected to a Hikvision 16 channel NVR located in the Parish Office on the first floor of Church Cottage.

We understand that it is the preference that the NVR be repositioned to the Vestry during the reordering which we agree would be a suitable position and would aid in the future sale of Church Cottage. In order to enable this relocation, the majority of the existing cameras would require full rewiring as the existing cabling will not be long enough to be diverted to the new NVR position.

We believe it is likely that, subject to testing of the existing cable, the wiring the to the following cameras only could be retained and modified: -

- Vestry Roof
- Chancel
- South aisle, east end

To supplement the existing system, we recommend that additional cameras be installed to the following locations: -

- North entrance
- Vestry – this camera would be positioned to overlook the safe only and could be programmed to record 'out of hours' only.

The new and re-wired cameras would be wired in Cat 6 data cable back to the new NVR position within the Vestry.

7.12. Lightning Protection

It is proposed that the existing church lighting protection system will be retained and modified where required to accommodate new in-ground services. On completion of the works, the system will be re-commissioned and certified in accordance with the current edition of BSEN 62305-3.

8. Estimated Annual Fuel Costs for New Space Heating

The total energy consumed by the proposed new heating installation will be made up of the following elements: -

a) Electricity to power the ASHP serving the underfloor heating
b) Electricity to power the associated circulation pump
c) Gas to run the existing gas boiler installation
d) Electricity to power the fans in the trench heaters and boiler circulation pump
e) Electricity to power the radiant and convection electric heaters

Calculation for Item A

Using degree days for the Thames Valley adjusted for an internal base temperature or 9°C and an external design temperature of minus 4.6°C.

(901 hours x 22kW) / (2.5 Average COP) = 7,928 kWh (Electricity)

Note: - COP refers to Coefficient of Performance

Calculation for Item B

(901 hours x 0.7kW) = 631 kWh (Electricity)

Calculation for Item C

(270 hours/year x 35kW x 0.6 Load Factor) / 0.9 Boiler Efficiency = 6,300kWh (Gas)

Calculation for Item D

(270 hours/year x 2kW) = 540 kWh (Electricity)

Calculation for Item E

(270 hours/year x 3kW x 0.8 Load Factor) = 648 kWh (Electricity)

Total of Above

Electricity A + B + D + E = 9,747 kWh / Annum

Gas C = 6,300 kWh / Annum

Estimated yearly fuel cost

Assumed current Electricity Tariff: - 34p / kWh

Assumed current Gas Tariff: - 7.6p / kWh

Calculation: - (9,747 x £0.34) + (6,300 x £0.076) = **£3,793 / annum**

Note: - The above excludes all standing charges

Schedule of Stage 3 Drawings

Electrical

4184/E/01	P4	1:50	Ground Floor Lighting and Fire Alarm Layout
4184/E/02	P3	1:50	High Level Lighting and Fire Alarm Layout
4184/E/03	P3	1:50	Lighting and Fire Alarm Sections
4184/E/04-1	P3	1:50	Ground Floor Power, Data and AV Layout
4184/E/04-2	P3	1:50	Gallery Level Power, Data and AV Layout
4184/E/05	P3	1:50	Proposed Photovoltaic Layout
4184/E/06	P3	1:50	Indicative Containment Layout
4184/E/07	P3	1:50	Security Systems Layout

Mechanical

4184/M/01	P4	1:50	Domestic Water Services Layout Ground Floor
4184/M/02	P3	1:50	Heating & Ventilation Services Layout Ground Floor
4184/M/03	P3	1:50	Heating Services Layout Basement Plantroom & Gallery
4184/PH/01	P3	1:50	Public Health Services Layout