# Supporting Documentation
## Hartford St John – Church extension heating

**Note to parish**

This bundle includes all the supporting documentation to your faculty application as required under Rule 5.5 of the Faculty Jurisdiction (Amendment) Rules 2022.

**List of documentation**



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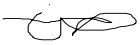
Caroline Hilton, DAC Secretary  6 September 2022

**We petition the Court for a faculty to authorise the following-**

*Please describe the works or other proposals for which a faculty is sought in the way recommended by the Diocesan Advisory Committee in its Notification of Advice.*

SCHEDULE OF WORKS OR PROPOSALS

Replacement of two heating & hot water boilers in St John's Church Extension with a single, high efficiency condensing multipoint gas boiler.

Additional details, including assessment of renewable energy alternatives, included in the attached report and specification.

*Copies of the Standard Information Form and any drawings, plans, specifications, photographs or other documents showing the proposals must be provided with this petition.*

Proposal for replacement of existing heating in church extension – St John the Baptist Hartford

V1.0 Draft for comment. 16th April 2022 AD

V2.0 Updated draft following Ops committee comments

V3.0 Final

V3.1 Final revision for submission

V3.2 Added boiler & flue details

**Introduction**

St John the Baptist in Hartford is a large church located on a prominent triangular site surrounded by busy roads in the centre of the village. The main Grade2 listed building dates from 1874 and in response to continued growth in numbers attending Sunday services, an extension was constructed at the west end of the building in 1998.

The extension is a flexible space and can be used for a variety of purposes including services on Sundays (to accommodate part of the congregation at the main morning service and pre-pandemic, the extension was used for the evening service, in part to avoid heating the main building). In addition, the extension is used for various groups and events during the week. The space is used both in conjunction with and independently of the main church building.

The main church building is heated by a circulating hot water system and radiators with heat being provided by non-condensing mains gas fired boilers. This system was replaced approximately 5 years ago. The main church building heating system is controlled by an intelligent building management system / heating controller which can be managed remotely via a secure App.

The extension was provided with an independent circulating hot water system and radiators for space heating with heat being provided by two mains gas fired boilers. In addition, a small indirect hot water cylinder provides hot water for the kitchen which forms part of the extension. This system is controlled by a local programmable timer with any changes to the programme having to be made locally. The extension is not heated when not in use although a 'frost stat' will ensure that a minimum temperature of 5 deg C is maintained during periods of very low ambient temperature.

The existing boilers are now life expired and in urgent need of replacement (one has failed and is beyond economic repair and the second boiler is expected to fail imminently and requires replacement before the coming winter). The existing boilers are non-condensing. The radiators and distribution pipework are all in good condition.

**Summary**

In reviewing all of the available options for replacing the existing life-expired gas boilers, the preferred option is replacement by one or more high efficiency condensing multi-point boilers controlled by an intelligent building management system / heating controller which can be managed via a secure App.

It is estimated that the extension accounts for between 10 and 20% of the gas consumption of the entire church building (there is no sub-metering of gas within the building and all of the gas consumed is supplied via a single fiscal meter). It is estimated that replacing the existing life expired

gas boilers with a combination of one or more modern high efficiency condensing multi-point gas boiler(s) together with an intelligent building management system will reduce direct CO2 emissions associated with heating the extension by around 10% giving an overall saving of between 1 and 2% of the total emissions for the church building (a saving of approximately 48 – 96 kg CO2/yr).

The pattern of use of the building (services on a Sunday and intermittent use by groups of varying duration during the week) requires the ability to rapidly heat the space independently of the main church heating system (the boilers for which are located in the vestry in the south east corner of the building. The extension is well insulated and there are no issues with conservation of historic fabric. A thermostat will bring on heating if the building temperature falls below 5 deg C during periods of very cold weather in order to minimise any risk of fabric damage / freezing of water pipework.

The proposed HyNet North West project will see up to 20% of the natural gas substituted by hydrogen before the end of the decade which will reduce emissions of CO2 from applications such as central heating boilers by a further 7% and this saving will apply to the entire CO2 emissions from the church and extension heating systems (estimated at around 330 kg CO2/yr).

All new (and the vast majority of existing) gas boilers are able to handle mixtures of up to 20% hydrogen without any modification and a long-term trial covering over 600 houses in the north east of England has successfully demonstrated the ability of the existing gas distribution infrastructure and domestic appliances connected to that network to handle mixtures of 20% hydrogen in natural gas.

Biogas is introduced into the local distribution system in the Manchester area although it is unclear how much biogas from these sources would be seen in Hartford. There is the possibility of one or more biogas schemes connecting to the Gas National Transmission System in the Cheshire area in the near future.

**Existing records**

Independent records for energy consumption by the extension boiler are not available as the system is fed via a common gas meter which supplies both the main church and extension gas boilers as well as the extension kitchen. Similarly, electricity consumption is not sub-metered as both church and extension are supplied via two common meters.

The extension is provided with a catering kitchen (including commercial gas hob and oven). Historically the kitchen provided a considerable demand for hot water (heated by gas via the indirect hot water circuit) as well as some demand for gas for cooking. Since the opening of the new church centre in 2010 (which has a much larger catering kitchen), use of the extension kitchen for catering purposes has dramatically reduced.

The extension was built to the relevant building standards at the time of construction (1997-8) and is well insulated and reaches temperature comparatively quickly. It is a single story and the majority of the windows are double glazed (the windows in the kitchen and toilets are single glazed to meet planning / faculty requirements).

The extension has seen less use than normal in the past two years due to the Covid-19 pandemic but usage is increasing rapidly as the restrictions are lifted.

Pre-covid, the evening service was held in the extension to avoid the costs and emissions associated with heating the main church building.

**Carbon emissions**

Combined annual average gas and electricity consumption data for the main church building and extension are available period April 2015 to April 2019 and these are summarised below

| | Annual average figures April 2015 – April 2019 (inclusive) | |
|---|---|---|
| | Consumption (kWh) | CO2 (kg) |
| Natural gas | 26,029 | 4786 |
| Electricity | 11,442 | 2668 |

The very limited use made of the building during the Covid lockdowns means that energy consumption data during the period April 2019 to April 2022 is not valid for comparison.

**Choice of heating systems**

A number of options for replacement of the existing life-expired gas boilers have been considered as follows:-

Integration with existing main church building heating system to provide space heating with domestic hot water provided by an electric immersion heater

Independent condensing multipoint gas boiler(s) to provide heating and domestic hot water

Independent hydrogen boilers

Independent biomass boilers

Air and ground source heat pumps

District heating

Electric heating

**Integration with main church heating system**

The boilers for the main church heating system are located in the vestry at the southeast corner of the main church building. Given that the extension is frequently used independently of the main building, it would be necessary to install dedicated flow and return pipework between the main boilers and the extension together with the installation of new zoning valves in the existing church heating system to allow the extension to be heated independently of the main church building. The total length of the new flow and return pipework is approx. 250m with the new pipework either installed in new ducts in the existing solid concrete floor of the nave or visibly along the walls of main part of the church building. The new pipework would need to be very effectively insulated in order to minimise heat losses. As there is no provision for the main building heating system to supply domestic hot water, any enduring requirement for hot water in the extension kitchen would need to be provided by electric water heaters. The existing boilers in the main church building are non-condensing.

**Independent gas boiler(s)**

An independent multipoint condensing gas boiler or boilers connected to the existing circulation hot water heating system in the extension allows the extension to be heated independently of the main building as at present.

The installation of a high efficiency condensing gas boiler will minimise gas consumption and associated CO2 emissions whilst the partial substitution of natural gas for hydrogen later in the decade will further reduce CO2 emissions (q.v.)

The use of a multipoint boiler (rather than the current indirect hot water cylinder) to provide domestic hot water further reduces gas consumption and hence CO2 emissions by only heating water as and when required (rather than heating a full cylinder of water irrespective of the quantity of hot water required).

The existing radiators and circulating hot water pipework are in good condition and the ability to reuse these assets represents a considerable material and energy efficiency saving (as compared for example to installation of underfloor electric heating). The radiators are sized for a high temperature circulating hot water system.

In addition to the efficiency benefits to be gained from adoption of a condensing multipoint boiler or boilers, any new boilers would be controlled by a modern intelligent heating control system with secure remote access functionality. This will ensure that the system is only in use when required and by adopting an intelligent system, the system will ensure that the heating is only turned on for the minimum period in advance to achieve the required internal temperature.

**Independent hydrogen fuelled boilers**

There are currently no commercially available sources of pipeline hydrogen in the area.

There is no space to locate high pressure hydrogen storage cylinders on site (typically a 40’ trailer with multiple high pressure cylinders). Based on experience from trials in the northeast, winter demand would be likely require a 40’ trailer permanently on site and changed every 1 – 2 weeks.

The cost of supplying compressed hydrogen by road are excessive in comparison to use of pipeline natural gas even at current gas prices however, see below for details of the expected transition to use of hydrogen / natural gas mixtures.

**Transition to hydrogen**

The Hartford area is included within the scope of the proposed HyNet North West project. If sanctioned, the first phase of this project will substitute up to 20% by volume of the natural gas in the distribution system by hydrogen. The hydrogen will initially be produced by steam reforming of natural gas but with the carbon dioxide sequestered and stored as part of the production process. In the longer-term hydrogen will be produced by electrolysis of water using renewable electricity once there is a surplus of renewable electricity available on the Grid.

Gas mixtures containing up to 25% by volume hydrogen can be burnt in conventional natural gas appliances with minimal modification although a practical limit of 20% hydrogen by volume is generally being adhered to. Natural gas with higher percentages of hydrogen can be consumed by

conventional boilers but will require changes to the specification of certain items of electrical equipment to cope with the higher concentration of hydrogen. Gas mixtures containing in excess of around 80% hydrogen will require significant changes to the design of all combustion plant to cope with the increase in flame velocity and reduced emissivity associated with hydrogen flames.

The partial substitution of natural gas with hydrogen will further reduce the overall CO2 emissions to atmosphere from any gas fired boilers and thus applies to both integration of the extension heating with the existing church heating system and any replacement of the existing gas fired boilers in the extension. A 20% mixture by volume of hydrogen in natural gas will reduce overall CO2 emissions by around 7%.

The HyNet North West project is planned to be providing hydrogen into the local distribution network before 2030.

Any new boiler will be compatible with gas containing up to 20% hydrogen by volume. Although boilers that are compatible with 100% hydrogen have been developed they are not yet commercially available (the author of this paper has seen two of the prototype boilers in operation on 100% hydrogen), this is an emerging technology and at this stage, it is assumed that government funding would be made available to cover all or part of the costs of upgrading / replacing equipment as part of any conversion of the gas network to 100% hydrogen as happened during the conversion from towns gas to natural gas in the 1970's. Conversion of the gas distribution network to 100% hydrogen is regarded as being a minimum of 10 years off by which time a significant proportion of the economic life of any new boiler installed now would be consumed (the lifetime of condensing boilers is generally regarded as being less than that of traditional non-condensing boilers).

**Independent biomass boilers**

There is no space for handling and storage of biomass or the associated ash or accommodating a biomass boiler in the vicinity of the extension and given the location of the church building in a triangle surrounded by busy roads, delivery of biomass and removal of ash would be difficult. This option is regarded as impractical for the heating pattern proposed and as with any system reliant on solids handling (and especially of materials that are very sensitive to moisture) is likely to require significant manual intervention to ensure effective and reliable operation.

**Heat pump technology**

**Air source heat pump**

The church building is Grade 2 listed and is located within a conservation area and as such there are no practical locations where an air source heat pump could be located.

There are no suitable locations at ground level. Two elevated locations have been considered, within the bell chamber or on the roof of the church tower. The bell chamber is heavily congested by the ring of 6 bells and there is no available floor space within the bell chamber to accommodate any additional equipment. Despite considerable prevention efforts, this area is prone to ingress by nesting birds, especially pigeons and the mess associated with their presence. Given the location, noise propagation from the heat pump when in operation is expected to be an issue.

Locating an air source heat pump on the roof of the tower would be likely to create an adverse visual impact in addition to issues with noise propagation.

In both cases, installation of the heat pumps would be extremely difficult due to the only internal access being via a narrow spiral staircase. Crane access to the roof of the tower would be extremely

difficult due to the distance from the nearest road and the large mature trees lining the roadside edges of the site.

The option of locating the heat pump within the existing boiler room is considered impractical due to the lack of space and the need to significantly alter the external aspect of the building to provide sufficient flow of air.

**Ground source heat pump**

The church building and extension are surrounded by the now closed graveyard. Only a very small (and sensitive area) at the west end of the churchyard in the vicinity of the war memorial would potentially be available for installation of bore holes to supply heat to a ground source heat pump.

As per the air source heat pump, there is no obvious location for the heat pump. Locating it within the existing boiler room is considered impractical due to the limited space available and the need for significant works to bring in the flow and return pipework to the boreholes.

Either air or ground source heat pumps would be likely to require upgrades to the existing power supply into the church building. General reliability figures for air and ground source heat pumps are not as high as for conventional gas-fired boiler plant and supply and installation costs are significantly higher than for conventional boiler plant where the gas supply infrastructure is already in place.

Air source heat pumps are most effective in systems with a low temperature rise which is inconsistent with a space that is used intermittently and that requires rapid heating.

**District heating**

There are no known district heating schemes being considered within the village (although the author of this paper did once develop a scheme to heat a cathedral with waste heat from a proposed combined heat and power system being developed for a brewery!)

**Electric heating**

Given the multi-purpose use of the extension space (church services, meetings, toddler groups etc.) the preferred option for any electric heating scheme would be the installation of underfloor electric heating. Installation would require removal of the existing carpet floor-coverings and significant work to modify the existing solid concrete floor. Such systems tend to be quite slow to respond to changes in demand and are thus not ideal for spaces such as this where demand for heating is intermittent.

Air or ground source heat pumps providing heat to air handling units have already been discounted. In addition, such units are often noisy which is not idea for a space used for worship services.

Night storage heaters are considered to be impractical given the varying usage profile and requirement for rapid heating of the building on an intermittent schedule.

Conventional convection heaters would provide a suitable speed of response but tend to be noisy.

Any switch to electric heating would be likely to trigger a requirement to upgrade the power supply to the building.

**Heating controls**

The existing extension heating system is controlled by a manually programmed timer with a manual over-ride facility.

The existing timer is awkward to programme and any changes have to be made locally.

The new system will be controlled using the same technology as is used for controlling heating in the main church building. This can be programmed and any short term adjustments made remotely via a secure App. The proposed heating controller is an intelligent system that will optimise the start time for any heating cycle based on external ambient temperature, internal temperature and rate of heating.

**Fabric Improvements**

The extension was built in 1997-8 and was compliant with relevant building codes. With the exception the comparatively small windows in the toilet block and the kitchen area, all windows are double glazed. The non-double glazed leaded windows were required as part of the planning approval for the extension to blend with the existing church building.

The extension building is generally well insulated.

Consideration will be given to installing specialist panels to the walls behind the radiators to minimise heat losses and ensure that as much of the heat as possible is directed into the building.

The existing radiators and pipework will be power flushed prior to installation of any new boiler(s) and a magnetic cleaner installed to remove any corrosion products to maintain the efficiency of the new heating system.

Other improvements to reduce overall energy consumption

A programme is in place to replace all remaining light bulbs with high efficiency LED bulbs as the existing bulbs fail. Approximately 90% of the lightbulbs in the main church building and the extension are now LED bulbs.

Option for converting the fluorescent light fittings in the church centre to LED tubes are under consideration to further reduce electricity consumption.

An energy audit of the church centre has commenced and work is ongoing to optimise the energy consumption.

Schemes for installing solar panels on the roof of the church centre are being considered although the capital outlay is considerable (c. £50k) and the viability of the scheme is critically dependent on the feed-in tariff.

Measures are being taken to improve the management of the churchyard and glebe land to improve bio-diversity including establishing areas where wild flowers can flourish, providing sites for nesting birds and habitats for small mammals.

**Conclusion**

Based on the above analysis, the preferred option for replacement of the existing gas boilers used to heat the extension is one or more high efficiency condensing multipoint gas boiler or boilers to provide both space heating and domestic hot water and linked to an intelligent building management system accessible via a secure internet connection to ensure that the building is only heated as and when required.

It is proposed to re-use the existing balanced flue connections through the outer wall of the boiler room on the north side of the building thereby avoiding any change to visual impact. If a larger balanced flue is required for a single boiler installation, the remaining flue will be modified cosmetically to match.

The building is relatively new and conforms to the building regulations in force at the time of construction in 1997-8. It is well insulated and there are minimal improvements to the fabric that are cost effective other than the installation of reflective panels behind the radiators.

The early involvement of the Hartford area in the HyNet North West project will see up to 20% of the natural gas supplied to properties in the area substituted for hydrogen before the end of the century which will further reduce CO2 emissions at point of use (the hydrogen will be produced initially by steam reforming of natural gas with the carbon captured and sequestrated).

**Recommendation**

That the existing life expired boilers are replaced as quickly as possible ahead of winter 2022-23 with a new condensing multipoint boiler(s) and associated intelligent control system.

**Boiler and other equipment**

Boiler:

Worcester Bosch Greenstar 8000 Cdi Life (35kW)

- Boiler to be fitted with ‘Easyfill’ system and Magnaclean filter unit.
- Boiler will be fitted in same position as one of the existing boilers

Control system:

- Option 1: Worcester Bosch Easy Control smart thermostat.
- Option 2: Heatmiser Neo smart heating controls.

Flue:

Standard Worcester Bosch flue, with second fitted as dummy in hole used by existing second boiler. External colour is black.

See below for photos showing existing external flues:

# St John the Baptist Church, Hartford

## Statement of Significance

### *Introduction*

St John the Baptist Church, Hartford is in the village of Hartford, Cheshire, England, in the ecclesiastical parish of St John Hartford. The church is designated by English Heritage as a Grade II listed building.

The first church on the site was consecrated in 1824. Following this the population grew and the church became too small. In 1873 it was decided that a new and larger church was needed. The new church was designed by John Douglas. The foundation stone was laid on 29 October 1873. The new church was consecrated by William Jacobson, Bishop of Chester, on 24 June 1875.

At this time, the church consisted of the chancel and nave with its porches and the foundations of the tower. The tower, also designed by John Douglas, was then added and this was dedicated by William Stubbs, Bishop of Chester, on 14 April 1887. On 20 June 1897 a ring of six bells was dedicated.

In the 1920s a choir vestry was added to the east wall. In 1990 the church pipe organ was replaced by an electronic organ. In 1993 the roof was refurbished and during the following year the pews were replaced by chairs. In 1997–98 an extension was added to the west end of the church to provide extra seating, toilets and a kitchen.

### *Architecture*

The church is built in early gothic style, from Kerridge sandstone with red Eddisbury sandstone dressings and a red tile roof.

Its plan consists of a five-bay nave with a clerestory, north and south aisles, a two-bay chancel with a vestry to the south and a chapel to the north, north and south porches and a west tower. The tower is in four stages with a stair turret at the southwest corner which rises higher than the tower. The parapet is embattled. The tower is around 70 feet (21 m) high, built in the form of a square with a circular staircase on the southern side.

The interior walls are are lined with Kerridge stone, although the arches are of Kelsall stone and the pillars are of red sandstone.

The windows are glazed with cathedral glass except those which have been replaced with stained glass.

### *Interior Description*

Since the building of the extension in 1998, the main entrance to the church is through the west-end of the building, through the extension and under the tower.

The south aisle has a number of stained glass windows (working from west to east):

- The first four represent St. Edmund (a Saxon king 840 to 870 martyred by the Danes), St. Oswald (604 to 642 another early martyr), St. Alban (died 304 – the first English martyr) and St. George (circ 300). They were donated by the Marshall Family in memory of George Marshall, a soldier who died in Africa, and Charles Marshall who was the vicar of a church in Leeds;
- The next pair represent St. John the Baptist and St. James (a disciple of Jesus) and are in memory of Sir Thomas Marshall;
- The last pair represent St. Anne (by legend, the mother of the Virgin Mary) and St. Lucy (another early martyr) and are in memory of Lucy Marshall.

Further information is provided by inscriptions adjacent to these windows.

Further along the south side of the church, there is a screen which was placed across the chancel in 1906 and was not part of the original building. This was first moved to the entrance to the baptistry (under the tower) in 1967, and moved a second time to its present position in 1994 when the flooring was renewed. The brass plaque recording the erection of the screen in memory of George Hatt-Cooke remains under the tower.

The chancel contains a brass plaque in memory of Edmund Eddowes, vicar from 1864-1908, who was incumbent during the construction of the present church.

The stained glass windows of the chancel represent on the north side St. Matthew and St. Mark and on the south side St. Luke and St. John, an inscription records that they were the gift of William Hatton. The large East window shows scenes from the life of Jesus with the crucifixion placed centrally, with His baptism above, and the last supper below; to the left are shown His entrance to Jerusalem on Palm Sunday (top) and His nativity (bottom); to the right - His ascension to Heaven (top) and the empty tomb (bottom).

The north transept (which for some years served as a side chapel), contains a window showing St. Peter walking on the sea (given in memory of Captain Edward Knowles who went down with his ship) and a brass plaque in memory of William Hatton erected by his sister. The north window, which depicts St. Peter flanked by Sarah and Elizabeth, was given in memory of Peter and Bessy Hatton.

The north aisle has a brass tablet in memory of Herbert Hatt-Cooke and there is only one stained glass window on this side of the church. It illustrates the parable of “The Good Samaritan” and was given in memory of Egerton Wright.

At the west end of the church, there are stained glass windows either side of the tower arch. The window on the north side shows St. Barnabas and St. Lucy, that on the south side shows St. Luke and St. Dorcas. A large window dominates the west end; this contains three figures, representing Solomon flanked by Zerubbabel and Hezekiah which was given in memory of John Littledale by his friends.

Under the tower there are two marble tablets in memory of Thomas Marshall junior and Thomas Marshall senior and his wife Elizabeth. Another plaque by the door in to the extension records the dedication of the bells in the tower above.

**Historic fabric or church interior affected by proposed changes**

No historic fabric or internal features are affected by the proposed changes. The new boiler will be installed in the same cupboard as the existing (two) boilers. Only one external flue is needed but a dummy flue will be used in the position of the previous second boiler, so the external appearance will be unchanged too.

Existing radiators will be re-used.

**References**

Further descriptions of St John's Church are available on the following websites:

1. History of St John's Church: https://www.stjohnshartford.org/who/history
    - includes a booklet published to mark the centenary of the current building in 1975
2. English Heritage List Entry: https://historicengland.org.uk/listing/the-list/list-entry/1228363
3. Wikipedia entry for St John's: https://en.wikipedia.org/wiki/St_John%27s_Church,_Hartford
4. Hartford Civic Society: http://www.hartfordcivicsociety.org.uk/p/st-johns-church.html

Initial specification for replacement heating system for church extension

Background

A single storey extension was added to the main church building in 1997/8. The new build extends westwards from the tower at the West end of the building and is a steel portal framed building (see photos 1 & 2) built in compliance with the building standards applicable at the time. The extension comprises a main meeting space, small catering kitchen, entrance porch, vestibule areas and three WC cubicles.

Photo 1 Internal view of extension looking east. (Boilers located in vestibule area behind door in far left corner)

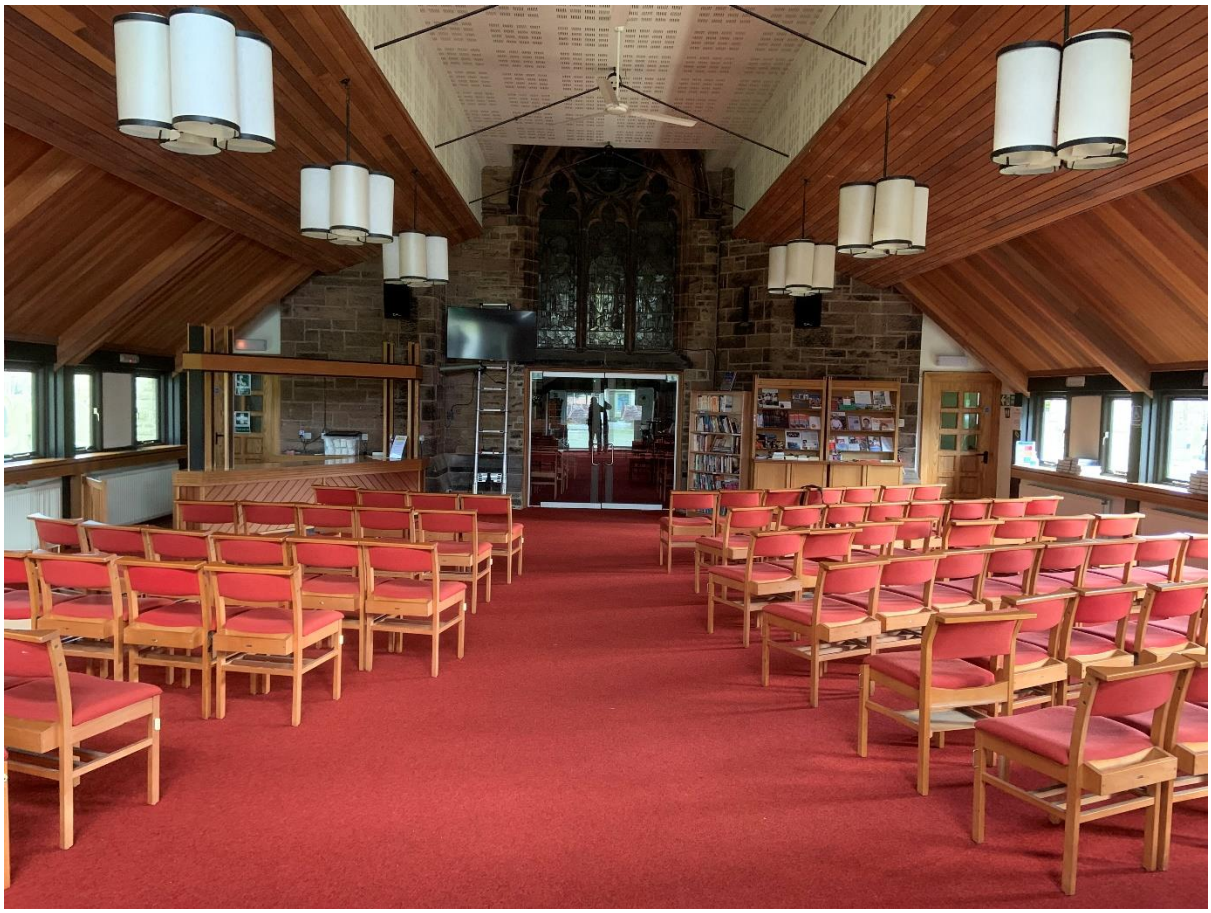


Photo 2 Internal view of extension looking east. Circulating pipework runs in void above entrance doors

The extension is currently heated by a low pressure circulating hot water heating system heated by mains gas fired boilers. The extension heating system is independent of the main church heating system.

Heating is controlled via a programmable timer with manual over-ride as required. Rapid heat-up of the space is a pre-requisite. The boiler also provides domestic hot water for the kitchen sinks via an indirectly heated hot water cylinder.

The existing gas boilers installed in 1997/8 are now life expired and in need of replacement with one boiler having failed and been taken out of service.

**Extension details**

The main single story meeting space is approximately 11m x 14m and is equipped with 10 off 6’ x 2’ double panel radiators.

On the north side of the building there is a small catering kitchen equipped with twin catering sinks with a common domestic hot water supply. The domestic hot water is supplied from a small, indirectly heated hot water cylinder co-located with the boilers in a cupboard adjacent to the kitchen. These sinks represent the only requirement for domestic hot water on the system (hot water for hand washing in the WCs is provided via local electric water heaters). Space heating for the kitchen area is provided via a small convector radiator fed from the circulating low pressure hot water system used to heat the rest of the building. The kitchen area used to see extensive use for

the large scale preparation of cooked meals but use is now restricted to tea / coffee making for meetings and after services (Covid permitting).

The extension has single leaf personnel access doors at the east end of the north and south elevations and each has a small vestibule area. These are each equipped with single panel radiators (600mm x 600mm in the north side vestibule and 900 x 600mm in the south side vestibule. Each of the WC cubicles (located in the south east corner of the building) has a single panel radiator (600 x 600mm in the disabled cubicle, 400 x 600mm in the middle cubicle and 500 x 600mm in the end cubicle).

Flow and return pipework for the radiators is located in shallow, loose covered, ducts along the edges of the cast concrete floor slab. The flow and return pipes run along the north and south sides of the building and at the west end of the building either side of the entrance doors. Due to problems with leakage, the pipework where it crossed the main entrance doors was re-routed at high level across the entrance porch with automatic air vents provided at the high points.

The flow and return pipework from the boilers across the north side vestibule and into the main part of the extension as well as that supplying the radiators in the south side vestibule and WC cubicles is buried in the floor and is not accessible without removing the floor finish.

The system is all located within the new construction for the extension and given the date of construction (1997/8) there is no asbestos or asbestos containing materials present within the building or associated structures and equipment. The building is insulated according to the building regulations that were applicable at the time of construction (1997)

**Existing heating and hot water system**

Space heating and heating for the indirectly heated hot water cylinder is provided by a circulating low-pressure hot water system heated by twin Potterton Suprima 80 gas boilers (Max heat output 23.4 kW) fed from a 28mm mains gas supply that is common with the main church heating boiler supply and fed via a common meter located in the cellar below the Vestry in the south east corner of the main church building. The boilers are sequenced in operation and normally operate singly with the second boiler supplementing the first boiler as required. A single Grundfos centrifugal pump circulates the water through the distribution system. A single motorised valve directs part of the circulating water flow to the heating coil in the domestic hot water cylinder as required. A stand-alone pressurising vessel maintains pressure in the system and a connection to the domestic cold water is available to allow the system to be topped up as required.

The existing boilers, circulating pump, pressurising vessel and domestic hot water tank are located in a cupboard on the north side of the building with balanced flues to the outside of the building (see photograph 2).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Circulating pipework is copper with soldered / compression connections and the main circulating pipework is 22mm dia. The buried circulating pipework into the south east vestibule area and WCs is 15mm dia. The pipework above the main entrance doorway at the west end of the extension is installed in plastic pipe with push-fit connectors.

The system is kept pressurised by an independent pressurising vessel.

A 28mm domestic gas supply is provided in the boiler cupboard.

The radiators are fitted with thermostatically controlled valves although a number of these are non-operational.

A frost-stat provides protection against low temperature damage.

**Known issues with the existing heating system**

The original sliding expansion joints in the south side of the LPHW distribution system were leaking leading to a loss of water from the system and were replaced some years ago. The pressurising vessel suffered a failure of the diaphragm leading to over-pressurisation of the system by thermal expansion and has been replaced by an identical vessel. These actions have largely resolved the water / pressure loss issues.

Both boilers are now life-expired and obsolete, with one having failed with repairs not being cost effective.

**Relationship of extension heating system to main church heating system**

The main church building is equipped with a circulating hot water heating system to provide space heating. There is no requirement for domestic hot water in the main church building and there is no provision made for this within the system. The main church heating system was upgraded and the boilers replaced with new gas fired condensing boilers approximately three years' ago.

The extension is used independently of the main church building and thus any heating system needs to be able to function independently of the main church heating system (see below).

The boilers for the main church heating system are located in the vestry at the east end of the building and either independent flow and return pipes or multiple motorised valves to isolate the radiators in the main church building would be required if using these boilers to heat the extension independently of the main church building. This option is not considered to be cost-effective with the preferred option being to retain independent boilers and associated low pressure hot water circulating system to provide spaced heating for the extension. There remains a limited requirement for domestic hot water in the extension kitchen.

**Building usage**

The extension is used for morning and evening services on a Sunday as well as for a variety of events and meetings during the week and as such it needs to be able to be heated independently of the main church building.

The catering kitchen is no longer used for mass catering and the requirement for domestic hot water is currently limited to washing up coffee cups etc. after services / meetings.

The space needs to be able to be heated quickly and efficiently (including the WCs).

**Proposed works**

It is proposed to replace the two existing non-condensing boilers (one of which is now non-operational) with a single condensing multi-point boiler to provide both heating and domestic hot water.

The new boiler should be fully supported at the time of installation and supportable for at least the design lifetime of the boiler. The boiler should be suitable for operation on a mixture of natural gas and up to 25% hydrogen with no or minimal conversion. In order to fully future-proof the installation, any options for boilers with the potential for conversion to operate on 100% hydrogen fuel would be welcomed.

The existing system shall be power-flushed prior to commissioning of the new boiler and a suitably sized and accessible magnetic cleaning system to be installed together with suitable isolation valves to allow the element to be removed and cleaned without having to drain the system. Ideally the replacement system shall incorporate a separate circulating pump and pressurisation vessel.

Suitable drain and vent points shall be provided if the existing points cannot be reused. Isolations shall be provided to allow removal and replacement of any automatic air vents without the need to drain the system.

Provision shall be made for the addition of corrosion inhibitor to the circulating hot water system (either via a dedicated injection point or via the magnetic cleaning unit).

All thermostatic valves on the individual radiators to shall replaced.

The extension heating system shall be linked into the existing 'Heatmiser' control system used to control the heating in the main church building.

There is a continued requirement for a frost stat to prevent damage in periods of extended cold weather when the building is not in use.

**Available utility supplies**

(All located within the boiler cupboard)

Natural gas

28mm diameter (reducing to 25mm downstream of the manual isolation valve) low pressure gas supply.

Potable Water

15mm mains water supply direct from the street main

Electricity

240V ac (single phase)

Drain

Drain to the domestic sewer system

**Safety requirements**

The installer shall be able to demonstrate that they have the relevant Gas Safe registrations for the work to be undertaken and all necessary safety documentation shall be provided post installation.

Appropriate risk assessments and method statements shall be provided prior to starting work.

**Guarantee**

A minimum 12 months parts and labour guarantee shall be provided in addition to any manufacturer's warranty on the equipment.

**Further information**

For further information and to request a site visit, please contact the Operations Administrator at St John's Church on 01606 872255

Hartford St John - Correspondence with parish and others

Attachments are listed according to the numbering on the supporting documents list

- Attachments in blue are included within the proposals section

| Date | Message |
|---|---|
| **13/02/2022**<br><br>To: Katy Purvis<br>From: Ian Barton<br><br>**With attachment** | Thanks for the letter regarding the quinquennial. There's another urgent task that I need your advice on. The heating system in the extension to St John's is desperately in need of repair and upgrade – one of the boilers no longer works and the other fails to start regularly.<br><br>We are proposing to simply replace the two boilers with a single high-efficiency multi-point boiler, plus modernised controls (new thermostatic valves and a wireless programmer compatible with the rest of the church). The changes will be in the boiler cupboard, nothing visible will change.<br><br>My reading of the rules is that the work could be List A (repairs to the existing system) or maybe List B (adaptation of the existing system). Can you please advise?<br><br>I've attached a specification for the work for your information. We'd like to move very quickly on this if possible.<br><br>*Superseded specification* |
| **16/02/2022**<br><br>To: Ian Barton<br>From: Katy Purvis | Please find attached heating guidance from the Church Buildings Council. I realise this is a lot of information, but it covers everything you need to consider in your options report, which you will need to include in your List B application, if it is determined that the new boiler can't be installed under List A.<br><br>I've also attached the guidance from the DAC heating advisor, he will be looking for the information he lists here when reviewing your application for the new boiler, so these factors also need to be included in your options report, to illustrate that the parish have paid due regard to the commitment to net zero by 2030.<br><br>The energy footprint tool is found at https://parishreturns.churchofengland.org/. I don't think this is live for data entry at the moment, I believe it will reopen in May, but you can't be expected to fill it in if it isn't available at the moment |
| **29/05/2022**<br><br>To: Katy Purvis<br>From: Ian Barton<br><br>**With attachment** | It's taken a while, but attached is a report discussing the options we have considered for the new boiler for St John's Church Extension heating. The report discusses alternatives to natural gas that have been considered. There is also some commentary on other environmental and energy efficiency activities that we are undertaking at St John's. |

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| | I will call you this week to discuss what we need to do next. We are very keen to replace the very unreliable boilers over the summer.<br><br>*Superseded specification* |
| **30/05/2022**<br><br>To: Ian Barton<br>From: Katy Purvis | Thanks for sending this report, it is very good. We will need some photos of the extension, flues and boiler locations etc, and a spec for the boiler(s). I will ring you later to discuss, but I think you've done a good job in documenting "due regard" to the net zero advice. I'll send this to the heating advisor for his comments today, while we are waiting for the other info. |
| **30/05/2022**<br><br>To: Ian Barton<br>From: Katy Purvis | Hi again Ian, I've found the initial proposal document, so we already have some of the things I was asking for, apologies, I'd forgotten. We will still need a spec for the boiler and details of the external flue |
| **30/05/2022**<br><br>To: Katy Purvis<br>From: Ian Barton | Thanks for the quick feedback. I'll get the information about boiler & flues (I don't think we've selected a boiler yet). |
| **07/06/2022**<br><br>To: Katy Purvis<br>From: Ian Barton<br><br>**With attachment** | Updated document attached with details of the boiler included, plus photos of the existing flues (these will be replaced with two standard black flues).<br><br>Please let me know if you need anything else & let me know what the next steps are.<br><br>2) Report: Proposal for replacement of existing heating system in church extension |
| **07/06/2022**<br><br>To: Ian Barton<br>From: Katy Purvis | I've had the initial comments from the heating advisor (on the previous documents)<br><br>*I have reviewed the information that you have sent through and I have the following comments:*<br><br>*The parish should be congratulated on the documents they have submitted that are carefully thought through.*<br><br>*The current gas energy consumption as advised is approximately 26,000 kWH for the church and the hall. This is relatively low and again is probably related to the careful management of the heating system.*<br><br>*I am supportive of the proposal to provide a multipoint type gas boiler to the church hall. This is due to the low overall consumption, also the new boiler will be more energy efficient than the existing and energy will be saved due to not having stored hot water.*<br><br>*One recommendation / suggestion would be to install a separate (sub) gas meter to monitor the gas consumption to the church hall separately from the church.* |

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| | I have just forwarded the updated info, and will let you know when I hear back |
| **08/06/2022**<br><br>To: Katy Purvis<br>From: Ian Barton | Great news, thanks for the feedback, I look forward to hearing from you.<br><br>For the sake of accuracy and to avoid any confusion, the heating advisor refers to the 'church hall'. The boiler is of course intended for the church extension on the main St John's church building, not our church hall (which we call the 'Church Centre'). |
| **07/07/2022**<br><br>To: Ian Barton<br>From: Katy Purvis | With many apologies for the delay, we had a DAC meeting, I've been to Glastonbury, and been off sick since we last spoke.<br><br>We heard back from the heating advisor on your revised document, he had no further comments. The DAC architect commented as follows<br><br>"*I can appreciate that the church has a relatively urgent need for the boiler replacement and therefore, almost inevitably, the replacement (more efficient) gas boiler will be installed. It is vital, though the church understands the net zero advice and is asked to consider ways of moving forward in the near future. For instance could solar panels be put on the modern roof and therefore the heating becomes a hybrid system (being able to complement a gas boiler with alternative technologies should at least be addressed)? Could they commission a report in tandem with the boiler replacement and have a 5 year plan for introducing more sustainable heating?*"<br><br>Please could you respond to these points? I'm sorry we have missed the deadline for getting this through under List B as the faculty jurisdiction rules changed on 1st July, so this will now need a faculty application, but as a grade 2 church building this can be discussed at standing committee on 22nd July |
| **07/07/2022**<br><br>To: Katy Purvis<br>From: Ian Barton | This is rather frustrating. I will respond with regards to solar panels this evening, but we already have an extensive sustainable heating project running, as you know, for the Church Centre.<br><br>Most frustrating is the 1st July date, which I was completely unaware of. Indeed I reported to our PCC on Monday that we were nearly good to go under List B. Do you need the full faculty application before 22nd July? I work full time and am away at Keswick the week after next.<br><br>More details later. We are running out of time to install a simple boiler to keep our congregation warm this coming winter – if we do, we are failing to do our day job! |
| **07/07/2022**<br><br>To: Ian Barton<br>From: Katy Purvis | I'm sorry Ian, I didn't anticipate that this would still be being discussed after 1st July. I do understand that is very disappointing, I apologise. It is very bad timing |
| **07/07/2022** | Just to be clear… it is now a full faculty? We will attempt to knock something up ASAP (next week) using the document we have already |

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| To: Katy Purvis<br>From: Ian Barton | prepared and submitted (exactly a month ago) but solar panels are bananas, the roof faces the wrong way and we would never get planning permission.<br><br>Apologies if I sound grumpy! |
| **26/07/2022**<br><br>To: Ian Barton<br>From: Katy Purvis | I am writing to let you that at its meeting of 22 July 2022 the DAC standing committee considered the proposals for the replacement heating in the church extension.<br><br>The standing committee resolved to recommend the scheme, subject to the following proviso<br>a. Any electrical works should be carried out by an electrical contractor accredited with the NICEIC or ECA, to the standards recommended in the Churchcare "Guidance Note: Electrical Wiring Installations in Churches" available via https://www.churchofengland.org/sites/default/files/2018-11/CCB_Electrical-wiring-installations-in-churches_Apr-2013.pdf<br><br>The standing committee also wished to offer the following feedback:<br>a. It expected that it would be helpful to the parish if they could organise the separate meter to the boiler as this would help them understand their energy consumption.<br><br>This means that Caroline will shortly be able to raise the notification of advice, and you will be able to post the public notice.<br><br>If you have any queries please do let me know |
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