



The Abbey

The independent school for girls aged 3-18.

**THE ABBEY
JUNIOR SCHOOL EXTENSION**

MECHANICAL & ELECTRICAL SERVICES ENERGY REVIEW



Ref: HGA/6313/EAR/MS/ES/MF/PW
Date: January 2012
Rev: P2

P2	29/01/2021	Correct gas data incorporated	MF/PW	MF/PW
P1	28/01/2021	First Issue	MF/PW	MF/PW
Rev	Date	Description	By	Reviewed
Document Control				



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1. **Introduction**

This report has been produced to record the as installed decarbonisation and sustainability measures installed during the refurbishment and extension of The Abbey, Junior School Extension, Christchurch Road, Reading.

The report includes a summary of the pre-construction design philosophy for each service and a summary of the installed services.

The report also includes an assessment of the pre-construction consumption and post construction consumption summary for the gas and LV electrical services based on data provide by the client.

2. **Pre-Construction**

The following listed low carbon technologies were identified for use within the extension.

2.1 **Building Fabric**

The permanent building will be constructed in materials to achieve or exceed current Building Regulations compliance for thermal conductivity of fabric components.

2.2 **Heating System**

In preparation for this project and as part of a rolling 'planned maintenance programme', the school are undertaking a replacement boiler plant in 2018. The new plant has been designed using gas fired high efficiency condensing boilers (95% efficiency & low NOx), with compensation and optimisation control. This replaces existing plant with an estimated <70% efficiency.

New space heating will be extended from the new boiler plant. Heat emitters will be LPHW heated ceiling panels with individual controls for each room.

2.3 **Domestic Hot Water Services**

Due to intermittent and very peaky load profile, domestic hot water will need to be via gas fired high efficiency fan flued condensing water heaters. Equipment will comply with The Energy Related Products Directive (ErP): September 2015.

The efficiency of hot water generation may be improved by use of solar heating for pre-heating.

2.4 **Domestic Cold Water Services**

All outlets will be direct mains cold water. Flow restrictors to 9 l/m will be fitted to each shower, time flow control to taps and dual volume flush for WC cisterns.

2.5 **Lighting**

Space lighting will be provided by high efficiency LED luminaires with local absence detection control to ensure economy of operation.

2.6 **Power**

Power requirements will be provided via a 400-volt metered supply, with consideration of supplementation by photo-voltaic panels contributing to supply via an inverter control.

3. **Post Construction Assessment**

This section of the report identifies the as installed technologies.

3.1 **Building Fabric**

Kendall Kingscott Limited should provide commentary on the as installed building fabric.

3.2 **Heating System**

New high efficiency natural gas condensing primary heating plant was provided in replacement of the existing tired equipment.

New under floor heating systems have been employed for space heating.

A new building management system has been provided which includes optimised and compensated controls and remote access allowing improved time scheduling further improving energy savings.

3.3 **Domestic Hot Water Services**

The existing LPHW HWS system was retained and utilises the new high efficiency condensing boilers for indirect heating purposes.

3.4 Domestic Cold Water Services

Flow restrictors were provided to outlets.

3.5 Lighting

New high efficiency LED was employed in the building.

Automatic controls are provided to all offices and corridors. Controls have been set to automatically hold off luminaires if daylight is available and switch off luminaires if there is no occupancy.

Manual switching was provided to the reception.

3.6 Power

New power services were provided using the existing supply.

New electricity metering has been provided in accordance with building regulations.

4. Primary Fuel Consumption Review

A review of the energy consumption readings utilising pre-construction and post-construction consumption data identified the following.

4.1 Project Timeline

- September 2018: Preparation Works with New Boiler Plant Commissioning
- December 2018 to September 2019: Site Works. Extension of school by circa 20%
- September 2019 to March 2020: School Occupation
- 23 March 2020 to June 2020: School closed due to pandemic.
- July 2020 to current: Limited use in well ventilated spaces.

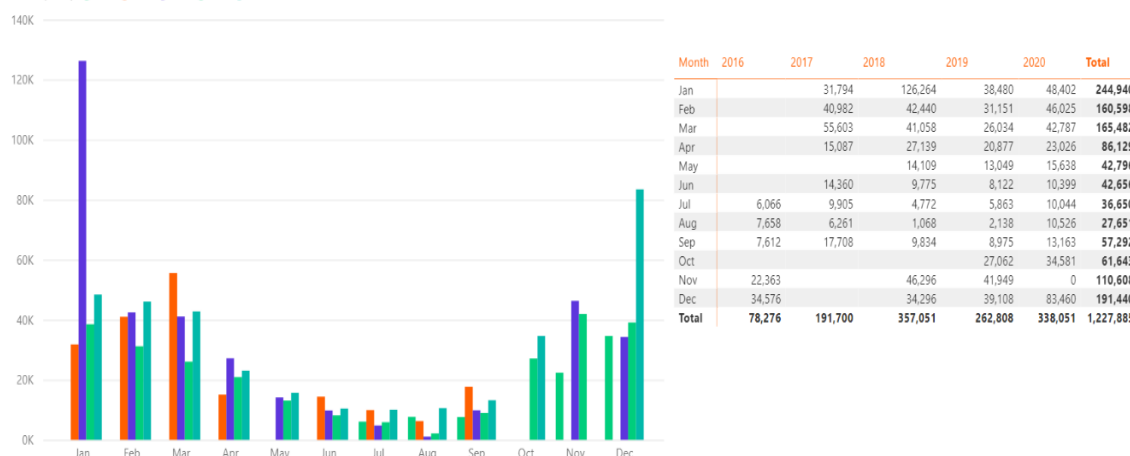
4.2 Gas Consumption

4.2.1 Consumption Information Source

Information obtained from main school supplier information below.

Billed Consumption (kWh) by Month and Period (Years)

Period (Years) 2016 2017 2018 2019 2020



4.2.2 Gas Load Per Annum

2018: 357,051 kWh/a

2019: 262,808 kWh/a

2020: 338,051 kWh/a

Please note the following:

- Consumption figures relate to the main gas meter only and not the Kitchen / Estates gas meter.
- Figures for 2016 and 2017 are incomplete so can't be included in considerations.
- Cold winter 2018 increased heating requirement.
- Unfortunately, the gas readings per month are inconsistent but show useful seasonal characteristics.

- A general reduction in gas load can be seen when considering a 20% increase in building volume since September 2019. This is attributed to replacement boilers and new building fabric thermal performance. With full school 'normal' occupation during 2018 at 357,057 kWh/a, it could be expected that a post works gas load of (357,057 kWh/a + 20%) 428,486 kWh/a would be expected. Given the 2020 consumption of 338,051 kWh/a this is 21% below anticipated. This 21% reduction in 2020 expectation will have been assisted by good fabric performance but there are other factors. These factors are partly due to actual reduced school use due to pandemic but are off set partly by having to operate the building with opened windows and doors during the heating season.
- Due to 'not normal' circumstances since extension completion, accurate evaluation of figures in respect to building thermal performance and gas consumption is not possible.
- A fuller evaluation of figures in three years' time after 'normal use' will enable a more informed evaluation.
- The initial indicators appear to indicate the extension increase has not attracted an increase in gas load.

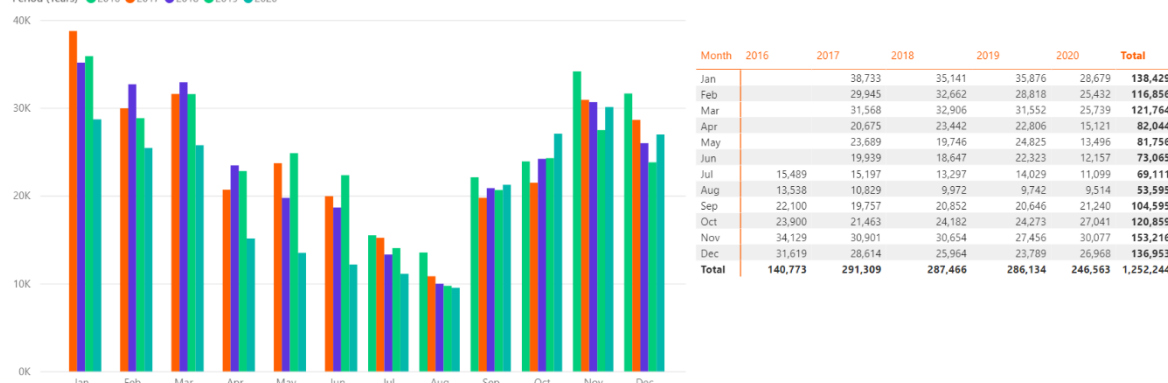
4.3 Electricity Consumption

4.3.1 Consumption Information Source

Information obtained from main school supplier information below.

Billed Consumption (kWh) by Month and Period (Years)

Period (Years) 2016 2017 2018 2019 2020



4.4 Electrical Load Per Annum

2017: 291,309 kWh/a

2018: 287,466 kWh/a

2019: 286,134 kWh/a

2020: 246,563 kWh/a

Please note the following:

- The figures for 2019 include the electrical supply for construction consumption, which appears to have had little impact.
- The pre works 2017 consumption of 291,309 kWh/a in comparison with the 2020 post works consumption at 246,563 kWh/a would appear to indicate a 25% reduction but included the 3 month pandemic school shut down. The shutdown was not in months of higher demand, so still represent over a 18% reduction.
- Due to 'not normal' circumstances since extension completion, accurate evaluation of figures in respect to electricity consumption is not possible.
- A fuller evaluation of figures in three years' time after 'normal use' will enable a more informed evaluation.
- The initial indicators appear to show the extension increase has not increased the buildings electrical consumption.

5. Summary

It is clear that the overall impact of the project has been to reduce carbon emissions, principally caused by the improvements in efficiency to the LPHW heat sources using high efficiency natural gas condensing boilers and controls improvements.

Use of high efficiency LED lighting and automatic lighting controls has reduced the impact of the additional floor area on the overall consumption of the building.

Covid-19 has impacted the normal operations of the school, so a true comparison is difficult to achieve although it is clear from the information that there has been a carbon reduction as a result of the project.