

KIRKBY GOLF CLUB

ENERGY STATEMENT REPORT

Parker Wilson Consulting
Burnham House
373 Bury New Road
Manchester
M25 1AW

T: 0161 773 1177
F: 0161 773 9977
E: manchester@parker-wilson.co.uk

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Parker Wilson Consulting
2nd Floor
72 Cannon Street
London
EC4N 6AE

T: 0207 251 4500
E: london@parker-wilson.co.uk

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Revisionn	Date	Section	Description
A	01/04/2021	All	First issue.

KIRKBY GOLF CLUB ENVIRONMENTAL STANDARDS STATEMENT

1.0 INTRODUCTION

1.1 Brief

This report has been produced to provide an Energy Statement in accordance with the requirements of Knowsley Council. The following key areas are addressed:

1. Energy Efficiency
2. Renewable Energy

1.2 Proposed Development

The proposed development will comprise:

- New build golf club house
- Golf training academy
- Driving range and building
- Maintenance compound
- Car park and landscaping
- Golf course
- Five-a-side football pitches
- Tennis courts
- Bowling green
- Adventure golf

The proposed works are a continuation of the new management's approach to upgrading the existing golfing experience on the site.

Full details of the proposals for the site are provided within the design and access statement. The build accommodation on the site will comprise the following:

Accommodation		GIA (m ²)	Total GIA (m ²)
Golf Club House and Function Room	Ground Floor	1093	1908.8
	First Floor	815.8	
Driving Range	Ground Floor	1740	2728
	First Floor	988	
Bowling Green Pavilion	Ground Floor	53.61	53.61
Golf Academy	Ground Floor (existing)	652.2	1633.34
	Ground Floor (proposed total)	981.14	

Table 1.2 Proposed Built Accommodation

2.0 ENERGY EFFICIENCY & CARBON REDUCTION

2.1 Policy Requirements

The scheme will be designed to meet national planning policy with regard to limiting energy use and carbon emissions.

Government guidance for carbon performance suggests a hierarchy of good practice in low carbon design. *Figure 2.1* illustrates this hierarchy.

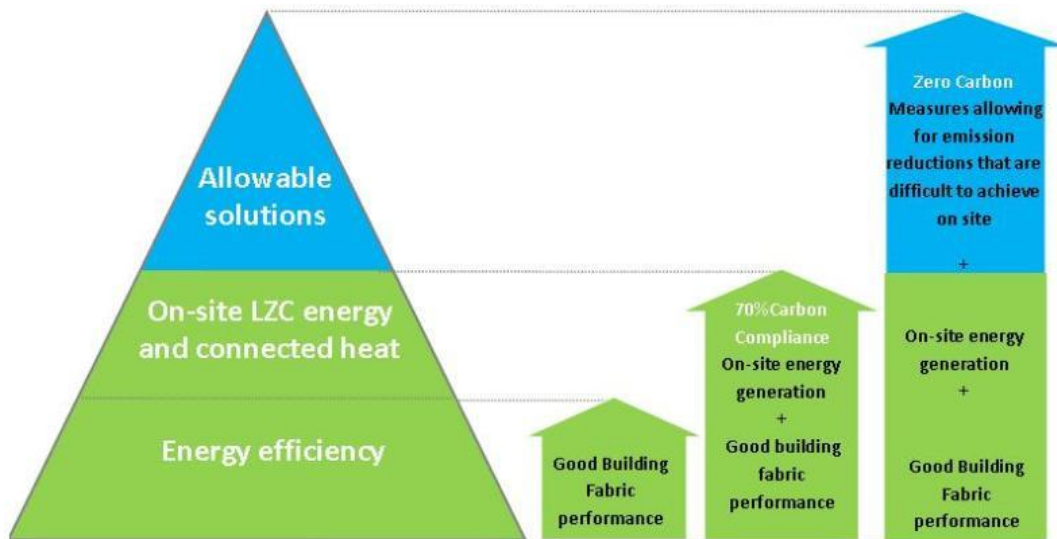


Figure 2.1: Low Carbon Design Hierarchy

Energy efficiency is achieved through the use of high performance building materials to ensure thermal efficiency of the building envelope. This, along with the implementation of efficient fixed services design and low and zero carbon technologies, should allow designers to meet most carbon compliance requirements.

The last element of the hierarchy is the use of renewable energy solutions to generate the energy used on site. Ideally, these renewable energy sources should be installed locally. However, if this is not possible then 'Allowable Solutions' can be used to provide off-site renewable energy sources to offset carbon emissions from the site.

The development will be designed in line with the hierarchy illustrated above. Passive design measures and envelope efficiency will be maximised with on site low and zero carbon technologies utilised to further offset carbon emissions where necessary.

2.3 Sustainable Technologies

2.3.1 General

There are various sustainable technologies, such as photovoltaic panels, wind turbines and CHP etc available on the market. However, not all are feasible due to capital expenditure, pay-back periods, availability, logistics and respective CO₂ emission reduction. It's often not feasible to outlay significant capital expenditure which has high payback periods and will save limited CO₂ emissions.

Condensing Boilers

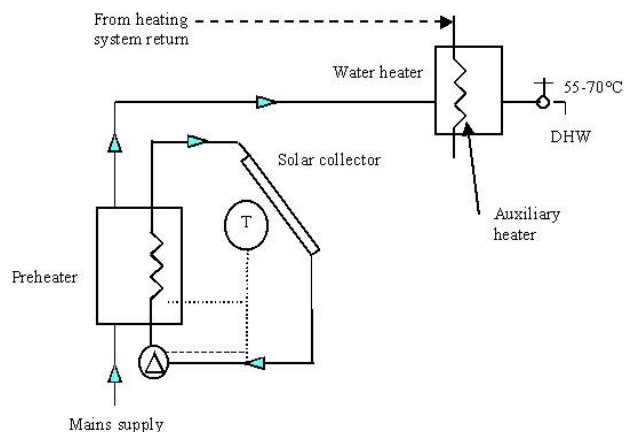
A high efficiency condensing boiler works on the principle of recovering as much as possible of the waste heat which is normally rejected to the atmosphere from the flue of a conventional (non-condensing) boiler.

This is accomplished by using two heat exchangers within the boiler which maximises heat transfer from the burner as well as recovering useful heat which would normally be lost with the flue gases. When in condensing mode (condensing boilers do not condense all the time) the flue gases give up their 'latent heat' which is then recovered by the heat exchanger within the boiler. As a result the temperature of the gases exiting the flue of a condensing boiler is typically 50-60°C compared with 120-180°C in a non-condensing boiler. At the same time an amount of water or 'condensate' is produced.

The result of using the exhaust flue gas means less primary gas demand. This subsequently reduces CO₂ emission

Solar Collectors

Solar collectors, collect both direct and diffuse solar radiation. Heat is transferred to the circulating liquid via heat exchange pipes that run through the solar collector. The circulating fluid in the solar collector is a mixture of water and antifreeze. This is to enable operation in winter and maximises efficiency similar to run around coils in a ventilation system which use the same water and antifreeze mix. The water and antifreeze mixture is used to cool the panels, so increasing the temperature of the water/circulating fluid. The water is then used to pre-heat the building domestic hot water as shown in the diagram above. The preheated water is then heated through a condensing boiler prior to delivery to the building.



The domestic hot water can be provided for the building via a central plant room. The primary heat source for this hot water can be provided via a solar collector system. Hot water requirements could be served via evacuated-tube solar collectors on the roof of the building. The evacuated tube solar collector consists of a series of metal rods contained inside glass tubes, which are heated by the sun, and conduct their heat to water passing through a header at the ends of the rods. The hot water is then circulated into the building and utilised.

Heat Pumps

There are a multitude of air and ground source heat pumps available in the construction industry, each installed differently and subsequently perform differently, however the principle of operation is fundamentally the same.

Air source heat pumps remove residual, low grade heat from ambient air and, via the vapour compression cycle, transfer this to high grade heat for use within the building. Air source heat pumps typically output heat at 45°C, but can output up to 65°C.

A GSHP removes heat from the earth or ground water in cold weather and transfers it to the building through an underground piping system. The process reverses in warm weather as heat is transferred to the ground. GSHP's work by circulating water or a water/antifreeze solution, generally through a closed loop of pipe that is buried in the ground or set beneath water. The refrigerant cycle within a GSHP system can comprises a two phase process, operating in the vapour and liquid phases. A GSHP can be categorised as having closed or open loops and these loops can be installed in three ways:

- horizontally,
- vertically,
- in a river / pond or lake.

The selection process for a GSHP depends on the area of the site / land, soil and rock type at the project. These factors will help determine the most economical choice for installation of the ground loop.

Wind Catchers



The windcatcher principle, of encapsulating any prevailing wind, originated some 2,000 years ago in the Middle East, where " Wind Towers " were often a common sight. The modern windcatcher is an extension of this principle but is also a development of the Vertical Balanced-flue system.

A windcatcher system is an effective method of providing natural ventilation to a building, by encapsulating the prevailing wind from any direction. Clean, fresh air, relatively free from contamination or traffic pollution, is entrained at roof level and is carried down to the rooms below through a controlled damper arrangement.

Heat Recovery In Ventilation System

There are various methods of recovering heat from a mechanical ventilation installation. This varies from thermal wheels, heat recuperators and run around coils etc. The recovered heat is then utilised back into the installation and thus reduces the primary energy demand for the building and subsequent CO₂ emissions. On a smaller scale fresh air/extract ventilator units with heat recovery coils will pre-heat or pre-cool the fresh air.

Demand Controlled Ventilation

This type of system is best suited to a central ventilation system serving a number of rooms or apartments. Demand controlled ventilation basically operates through a series of passive infra red detectors which control the ventilation installation in the building. If the space is unoccupied then the ventilation would not operate. However, once the space is occupied the ventilation operates. This reduces the primary energy demand and subsequently reduces the building CO₂ emission rate

Biomass Boilers

Biomass is all non-fossil organic materials that have intrinsic chemical energy content. This includes all water and land-based vegetation and trees or virgin biomass, such as log wood or thinning from local forests, prunings from roadsides or parks, grasses and energy crops and in some countries residues from agriculture or food processing e.g. nutshells or olive pits, wood chips, recycled untreated wood or palletising residues from wood processing. Also all waste biomass such as municipal solid waste, municipal bio solids (sewage) and animal wastes (manures), forestry and agricultural residues, and certain types of industrial wastes. Through using these resources a possible disposal problem can be turned into a high quality fuel and local suppliers of wood fuels will gain extra income and enhance local economic turnover.

Biomass can be used on a domestic or industrial scale. For a biomass power plant, the chipped, shredded and dried fuel is fed into a boiler or gasifier, from where the gas is collected and used.

The boilers could operate via biofuel. Biofuel is any fuel that derives from biomass - recently living organisms or their metabolic byproducts, such as manure from cows. It is a renewable energy, unlike other natural resources such as petroleum, coal and nuclear fuels. The carbon in biofuels was recently extracted from atmospheric carbon dioxide by growing plants, so burning it does not result in a net increase of carbon dioxide in the Earth's atmosphere.

The use of biofuel would mean the requirement for a biofuel storage tank and regular deliveries. A hard standing is therefore required for the delivery truck.

In urban environments careful consideration must be given to local restrictions on the use of biomass such as smoke control zones, clean air requirements and interaction with surrounding buildings.

Biomass flues are normally required to terminate above the roof line of the property being served, as well as any nearby buildings which could be affected by exhaust fumes. This can be a particular concern for tall, multi-storey buildings.

Lighting Control

Presence Detection

A presence detector is a switching device which detects persons within an area, thus switching electrical loads as a result, i.e. switching lighting and extract fans etc.

Presence detection utilises a motion detector, typically a passive infra red or microwave technology to detect the presence of persons in a given area.

Upon detection of persons the presence detector acts as a switch enabling the lighting to switch “on” for a pre determined duration i.e. 15 minutes. After this predetermined duration the lighting will be switched “off”.

Absence Detection

Absence detection utilises the same principles of operation as presence detection, however rather than the detector switching lighting circuits on automatically a manual switch has to be engaged. For example upon walking to a room with a presence detector installed a person has to physically switch on a switch to enable the lighting to switch “on”. As with presence detection, after a pre-determined duration of no presence in an area the lighting will switch off.

Performance

A typical Passive Infra Red detector when mounted at 2.7m above finished floor level will give coverage of circular diameter 6.5m. Microwave detectors generally provide greater coverage than Passive Infra Red Detectors. However, they are sensitive and may cause nuisance switching if installed in areas of heavy traffic.

2.3.2 Sustainable Element Feasibility

The following section of this report aims to identify potential technologies for more detailed analysis and justify and technologies being excluded at this stage. A traffic light system has been adopted to represent the anticipated feasibility of these measures prior to undertaking modelling of the site.

The traffic light system should be interpreted as follows:

Red Technology not suitable.

Amber Technology may be suitable depending on building energy demands.

Green Technology may be suitable subject to payback and operational constraints.

No.	SUSTAINABLE ELEMENT	FEASIBILITY COMMENT	FEASIBLE Yes/No/
1	Wind Turbines	Wind Turbines generate electrical power for the earth's natural wind resource. The location of any wind turbines would need to be carefully considered as there are a number of buildings within the vicinity of this building which could prevent/block wind potential. Planning could also be a consideration. It is generally considered that wind turbines do not operate well in urban and semi-urban environments unless they are tall enough to be unaffected by the deflection of wind by surrounding buildings. This is not likely to be possible in an urban area.	No

2	Photovoltaic Panels	Photovoltaic (PV) panels could be installed however capital expenditure is high for relatively low outputs and therefore the equipment has long pay-back periods. The utilisation of PV would need to consider potential for glare and nuisance to adjacent residential properties.	Possible
3	High Efficiency/ Condensing Boilers	Any new boiler installed could be of high efficiency condensing type. As there is no existing gas infrastructure to the site, this could be a limiting factor.	Yes
4	Solar Collectors	Solar collectors provide a mechanism to collect heat energy from the sun and transfer this to the water supply to the building, thus reducing the primary domestic hot water demand and subsequent energy consumption. The solar collectors could be mounted on the roof of the building. The system output would be dependent on the orientation of the solar array. The hot water usage profile for the buildings and availability of space for a hot water system mean that solar collectors are unlikely to be viable.	No
5	CHP	Combined Heat and Power (CHP) installations require careful sizing against the base loads of the building they are to serve. In order to operate efficiently it is preferable to have a steady base load. As the buildings' energy demands are unlikely to be steady, CHP will not be viable.	No
6	ASHP	Air source heat pump (ASHP) systems offer a more practical alternative to GSHP's in that, generally, they offer much greater flexibility with regards to their installation and do not require the prior geological work needed by GSHP's. With a seasonal efficiency of 300% or more, they are not quite as efficient as GSHP's. They do, however, offer a renewable energy source to provide low grade hot water for suitable for domestic hot water or heating installations. Air source heating could be implemented to provide heating and hot water to individual buildings.	Yes
7	GSHP	The installation of a ground source heat pump (GSHP) needs to be carefully considered. Heating and hot water to some of the buildings on the site could be delivered by a ground source heat pump. The ground conditions would need to be investigated for suitability. Much of the surrounding site will provide car parking, roadways or form the landscaping of the sports facilities. These would reduce the available ground area for a heating loop.	Possible

8	Wind Catchers	These are unlikely to be applicable for this project. The height of the buildings would render wind catchers ineffective on lower floors.	No
9	Biomass Boilers	The use of a central boiler plant utilizing biofuel would mean the requirement for a biofuel storage tank and regular deliveries. Biomass boilers could be installed to provide the necessary energy for heating and domestic hot water. However, transportation and storage of fuel make the suitability of biomass highly dependent on available space. Further investigation of local planning, clean air and smoke control requirements would also be required to fully assess feasibility. Given the proximity of the site to residential buildings, there are likely to be planning restrictions on the use of large biomass systems. The requirements to dissipate exhaust gases is likely to require an extensive flue dilution system or large flue. Biomass flues must exhaust above the ridge-line of a building. The current plans do not provide any storage space for biomass fuel. Storage requirements would be difficult to accommodate given the close proximity of surrounding buildings and public areas. In this case the use of biomass is non-viable.	No
10	Heat Recovery Ventilation Units	Heat recovery systems allow energy from extracted air to be transferred to incoming air before it is supplied to the occupied space. For a heat recovery system to be effective, the building in question should have a good level of air tightness, as will be the case for this scheme. Consideration should be given to the inclusion of heat recovery within local ventilation systems as required in the design of the scheme.	Yes
11	High Efficiency Lighting & Lighting Control	Modern low energy light fittings such as LEDs or compact fluorescents should be considered. These are many time more efficient and can significantly reduce building energy consumption in comparison to tungsten type fittings commonly installed in residential and retail spaces in recent years. There are various lighting control systems available. Consideration should be given to their installation in common and circulation areas and the commercial space.	Yes

2.4 Energy Export & District Energy Distribution

No existing district energy systems are known to exist nearby, eliminating the possibilities for extension of existing infrastructure. As the building's energy demand profile is unlikely to be continuous, CHP is unlikely to be cost effective.

2.5 Design Intent

2.5.1 Passive Measures

To minimise building energy demand buildings will include thermally efficient envelope design, surpassing the minimum requirements of building regulations where possible.

The use of glazing will be optimised to provide natural light without inducing excessive solar gains.

Natural ventilation will be utilised where appropriate to limit the need for mechanical ventilation.

2.5.2 Low & Zero Carbon Technologies

Based on the feasibility study for low and zero carbon and renewable technologies and the potential for energy and carbon savings the following have been selected as suitable for implementation into the design:

1. VRF heating and cooling to comfort cooled areas in the Club House.
2. Heat recovery ventilation to mechanically ventilated areas.
3. LED internal and external lighting with lighting control throughout the site.
4. Consideration of air or ground source heating to serve the heating and hot water demand. Likely to be applicable only to the Club House.
5. Consideration of photovoltaic panels to provide further carbon savings where required to meet Part L compliance.

3.0 CONCLUSIONS

The developer is committed to utilising low and zero carbon technologies where these are practically and financially viable. Appropriate design solutions will be selected for each building on the site based on its usage and energy demands.