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LOW CARBON DESIGN ADVICE REPORT

FOR

R BLOCK - SPORTS HALL
ST MARY'S UNIVERSITY COLLEGE
Twickenham

Prepared for:	Mr Russell Whitaker Director of Facilities	Prepared by:	David Bailey BA(Hons) CEng MEI FCIBSE MIIE
	Waldegrave Road Strawberry Hill TWICKENHAM Middlesex TW1 4SX		The Green Consultancy Ltd Mead Barn, Main Street Farrington Gurney Bristol BS39 6UB
Tel: E-mail:	020 8240 4072 or 020-8240-4000 whitaker@smuc.ac.uk	Contact: Tel: E-mail:	John Treble BA MSc 01761-453900 john@greenconsultancy.com

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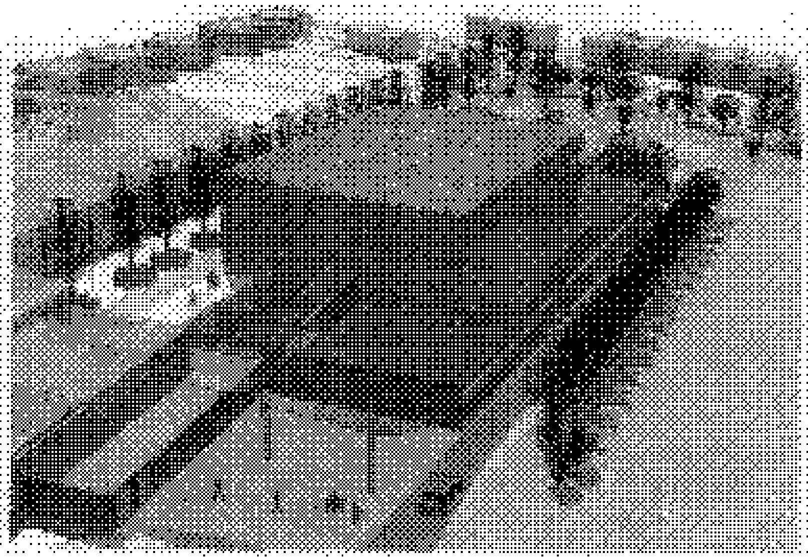
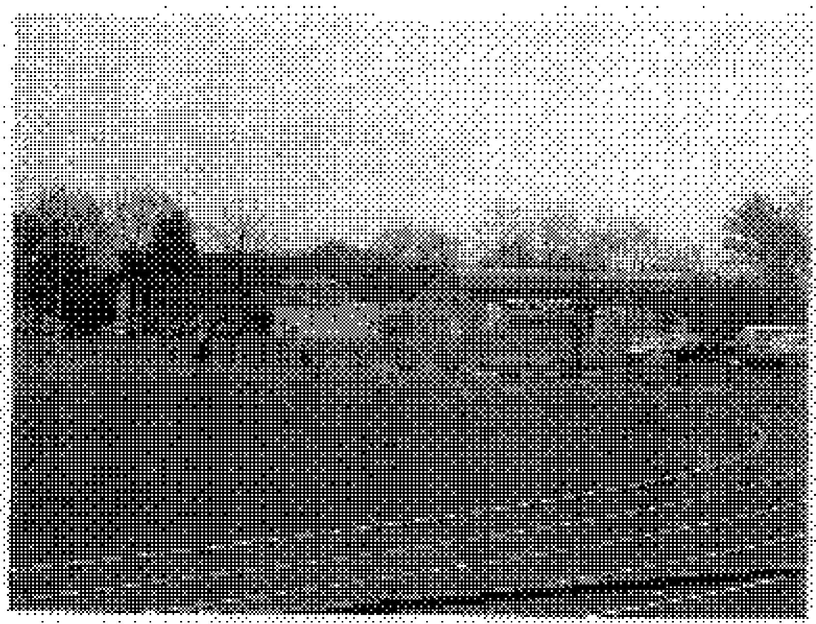


Proposed New Development



Existing Sports Facilities

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CONTENTS

Executive Summary

This report presents the results of a report of Phased advice consultation at St Mary's University College, Block R - Sports Hall. This assessment and report are provided by The Green Consultancy Ltd and have been funded by the Carbon Trust[1] programme.

The agreed scope of work was:

New Build: To advise on energy saving mechanical and electrical systems or the project and particularly for the sports hall, with particular reference to the requirement by the Planning Department for a minimum of 10% renewables and with a preference for 20%.

Existing Buildings: Overview and general comments on the refurbishment including the new roof and consequential improvements.

The new build project will be subject to Building Regulations Part L2A and planning advice received indicates that it will need to achieve an 'excellent' rating from BREEME.

The existing building is over 1,000m² and therefore any alterations will need to comply with Building Regulations Part L2B.

The Carbon Trust in association with Sport for England have carried out extensive monitoring of sports facilities with respect to energy use and have issued Energy Consumption Guide 78 Energy Use in Sports and Recreation Buildings which gives detailed benchmarks for all types of facility. This has been used as the basis for the benchmarking detailed in Appendix 1 Tables 7 and 8 and summarised in Table 2 and Graph 1.

The benchmarks were developed in 2000 and published in 2001, therefore it is reasonable to equate the 'typical' values with the 2002 Building Regulations which did not improve energy efficiency markedly over 1998 Building Regulations. These are shown in Table 2 as Level (1).

The next level (2) Compliance with the Building Regulations 2006 Part L2A is based on the requirement that new buildings must show a 23% improvement over the 2002 Regulations and figures are therefore 23% lower than Level 1.

The target values (level 3) are based on the same publication and it is reasonable to expect a larger 64% saving from 2002 for gas due to the double improvement of insulation values and equipment efficiencies and a 44% improvement on electrical consumption as light fittings and sources are considerably more efficient.

The benchmarks are developed further in Appendix 1 Table 9 to provide an individual target for each space and each service as shown below:

[1] The Carbon Trust helps businesses and public sector organisations cut their energy costs through the provision of free, professional advice and assistance. Previously known as Action Energy, the programme has helped many organisations save up to 20% of their energy bills, which equates to total UK energy savings of around £800 million a year.

The programme is funded by the Department for Environment, Food and Rural Affairs, the Scottish Executive, Invest Northern Ireland and the National Assembly for Wales.

Table 1 - Individual Targets

		Target kWh/year
Sports Hall: (Other areas are shown in Appendix 1 Table 7)	Lighting	25,000
	Ventilation Motors	4,000
	Heating Pumps	3,900
	Equipment	4,700
	Heating	72,000
	Ventilation	24,000

This type of detail is useful for monitoring and targeting the completed building but must be used with caution as variation and error will increase as the systems are broken down into their constituent parts.

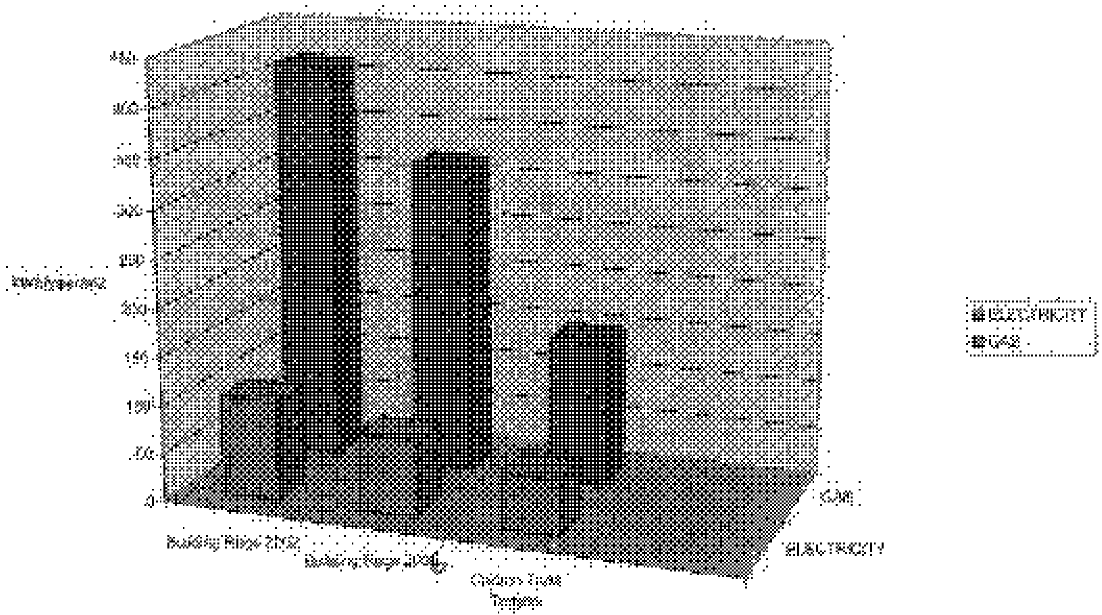
Table 2 gives overall consumption in kWh/year and benchmarks in kWh/year/m². Chart 1 shows the benchmarks graphically and the trend to lower energy use.

Further detailed benchmarks as published in the Chartered Institute of Building Services Guide 'F' Energy Efficiency in Buildings and Low or Zero Carbon Energy Sources: Strategic Guide published by DCLG are provided in Appendix 2 Table 8 as guidance on detailed engineering design.

Table 2 - Benchmarks

Level	**Description**	**Gas**		**Electricity**	
		KWh/year	**KWh/year/m²**	**KWh/year**	**KWh/year/m²**
1	Building Regulations 2002	793,000	416	194,000	102
2	Building Regulations 2006 Part L2A	610,600	320	149,000	79
3	Carbon Trust Target Value	286,000	150	108,000	57

Chart 1 - Benchmarks



Estimated Carbon Savings

Table 3 - Energy Reducing Recommendations

Priority	Recommendations	Ref	Estimated Annual Savings			Estimated Cost	Action
			(£)	kWh	CO_2 (tonne)	(£)	
1	Sports Hall	2.3	2,600	80,000	18	N/A	Design Team
2	S&C Suite	2.5	1,800	60,000	13	N/A	Design Team
3	EIS	2.7	800	28,000	6	N/A	Design Team
4	Changing	2.9	3,500	139,000	28	N/A	Design Team
5	Rec. toilets, offices	2.8	2,000	58,000	14	N/A	Design Team
	OVERALL TOTALS		21,700	365,000	79	N/A	

Systems with a high cost and/or payback have been excluded in the analysis therefore estimated payback and costs are not relevant, as the objectives are to provide a building that will achieve an excellent BREEME rating and high renewable content.

Further Reports

This is a multi-stage intervention and will offer support at each phase of the design process and will also possibly offer 'light touch' support at the commissioning and handover stage. The Carbon Trust has allocated time for a further report/assistance which can be defined after issue of this report.

Strategy Matrix

The matrix is shown in Appendix 4 and should be used as a guide to the project status as it moves through the design stages.

Renewables

Table 10, Appendix 1, shows the breakdown of savings attributable to Renewables, that is the heat pump, monodraft light pipes and ventilation stacks, solar panels and PV panels.

The savings shown are:-

36% of Building Regulations requirement for 23% savings on CO_2 consumption for 2002, 29% of Carbon Trust CO_2 targets.

Both values are within the Building Regulations or Planners target values.

1.0 INTRODUCTION & BACKGROUND

1.1 General

This site consultation was carried out via a design team meeting on 24 February 2007 by D A Bailey of The Green Consultancy. The main site contact was Russell Whitaker, Director of Facilities.

This is a multi-stage intervention and will offer support at each phase of the design process and will also possibly offer 'light touch' support at the commissioning and handover stage. The Carbon Trust has allocated time for a further report/assistance which can be defined after issue of this report.

1.2 Organisation Background

St Mary's was founded in 1850 by the Catholic Poor Schools Committee to meet the need for teachers to provide an education for the growing numbers of poor Catholic children. It started in Brook Green in Hammersmith in the charge of the Brothers of Christian Instruction. Succeeding years saw an ever-increasing demand for Catholic teachers and by the 1920s the College at Brook Green was inadequate for its tasks. The College purchased Strawberry Hill to build living accommodation and classrooms for about 250 students. The Strawberry Hill premises were officially opened in 1925, since then the College buildings have been enlarged to meet the needs of 2,000 students.

St Mary's is a high performance centre for sport and the major centre in London for the English Institute of Sport. Sport is central to St Mary's corporate strategy and the College works had to sustain its elite position in sport, to meet the needs of its courses and students and to provide high quality services and programmes to the local community, especially young people and schools. In order to maintain this sporting success and deliver future plans the College urgently needs to upgrade and extend its sports facilities.

It is proposed to locate the new building adjacent to the existing R Block facilities at the south end of the site on Metropolitan open land. If funds area available then some refurbishment of the existing facilities will be included as a separate project and there may be consequential improvements required under the Building Regulations Part L2B.

The project proposes to deliver to the University a major national standard badminton/multiuse sports hall, a strength and conditioning suite (S&C), shower and changing facilities for 2 rugby teams and the six court hall, EIS, Dance Studio and Reception for the complex all on the ground floor.

The existing building contains gym, EIS, Dance Studio, Treatment and S&C Suite.

The new sports hall will be constructed with reinforced concrete retaining walls on the four corners which whilst providing structural stability for the 9.1m high hall, will provide very good thermal mass to assist in regularizing the internal temperatures in both summer and winter.

The building will be clad with profiled steel with a high degree of insulation. The roof will be constructed from steel trusses to form a flat roof with a high insulation layer under a roofing membrane.

The other areas will be constructed of portal frames with infill brick/block or a proprietary panel system again highly insulated. The roof is to be curved to form a feature of the building and will be highly insulated.

The existing building structure is very poor and in fact the existing Sports Hall roof consists of corrugated asbestos with translucent rooflights.

The total floor areas are 1907 m^2 for the new building and 1300m^2 for the existing and the budget costs is £5,500,000.

1.3 Objectives

The agreed scope of work was:

New Build: To advise on energy saving mechanical and electrical systems for the project, particularly for the sports hall, with particular reference to the requirement by the Planning Department for a minimum of 10% renewables and with a preference for 20%.

Existing Buildings: Overview and general comments on the refurbishment including the new roof.

1.4 Design Team Meeting

D A Bailey attended the Design Team meeting of 24 January 2007 with the design team consisting of:

Architect	-	David Tucker, Rivington Street Studios
M&E Consultant	-	Dale Price, Michael Jones Associates
Quantity Surveyor	-	Philip Boulcott, Dobson White & Boulcott

An outline of the scheme was provided by David Tucker and Dale Price.

The philosophy of the scheme was discussed in detail, in particular, the sports hall lighting, ventilation and heating and the gym comfort conditioning.

2.0 Report

2.1 Standards

The new build project will be subject to Building Regulations Part L2A and planning advice received indicates that it will need to achieve an 'excellent' rating from BREEME.

The existing building is over 1,000m² and therefore any alterations will need to comply with Building Regulations Part L2B.

2.2 Benchmarks and Estimated Energy Use

The Carbon Trust in association with Sport for England have carried out extensive monitoring of sports facilities with respect to energy use and have issued Energy Consumption Guide 78 Energy Use in Sports and Recreation Buildings which gives detailed benchmarks for all types of facility. This has been used as the basis for the benchmarking detailed in Appendix 1 Tables 7 and 8 and summarised in Table 5 and Chart 1.

The benchmarks were developed in 2000 and published in 2001, therefore it is reasonable to equate the 'typical' values with the 2002 Building Regulations which did not improve energy efficiency markedly over 1998 Building Regulations. These are shown in Table 5 as Level (1).

The next level (2) Compliance with the Building Regulations 2006 Part L2A that new buildings must show a 23% improvement over the 2002 Regulations and are therefore 23% lower than Level 1.

The target values (level 3) are based on the same publication and it is reasonable to expect a larger 64% saving from 2002 for gas due to the double improvement of insulation values and equipment efficiencies and a 44% improvement on electrical consumption as light fittings and sources are considerably more efficient.

The benchmarks are developed further in Appendix 1 Table 9 to provide an individual target for each space and each service as shown below:

Table 4 - Individual Targets

		Target kWh/year
Sports Hall: (Other areas are shown in Appendix 1 Table 7)	Lighting	25,000
	Ventilation Motors	4,000
	Heating Pumps	3,900
	Equipment	4,700
	Heating	72,000
	Ventilation	24,000

This type of detail is useful for monitoring and targeting the completed building but must be used with caution as variation and error will increase as the systems are broken down into their constituent parts.

Table 5 gives overall consumption in kWh/year and benchmarks in kWh/year/m². Chart 1 shows the benchmarks graphically and the trend to lower energy use.

Further detailed benchmarks as published in the Chartered Institute of Building Services Guide 'F' Energy Efficiency in Buildings and Low or Zero Carbon Energy Sources: Strategic Guide published by DCLG are provided in Appendix 2 Table 11 as guidance on detailed engineering design.

Table 5 - Benchmarks

Level	Description	Gas		Electricity	
		KWh/year	KWh/year/m²	KWh/year	KWh/year/m²
1	Building Regulations 2002	793,000	416	194,000	102
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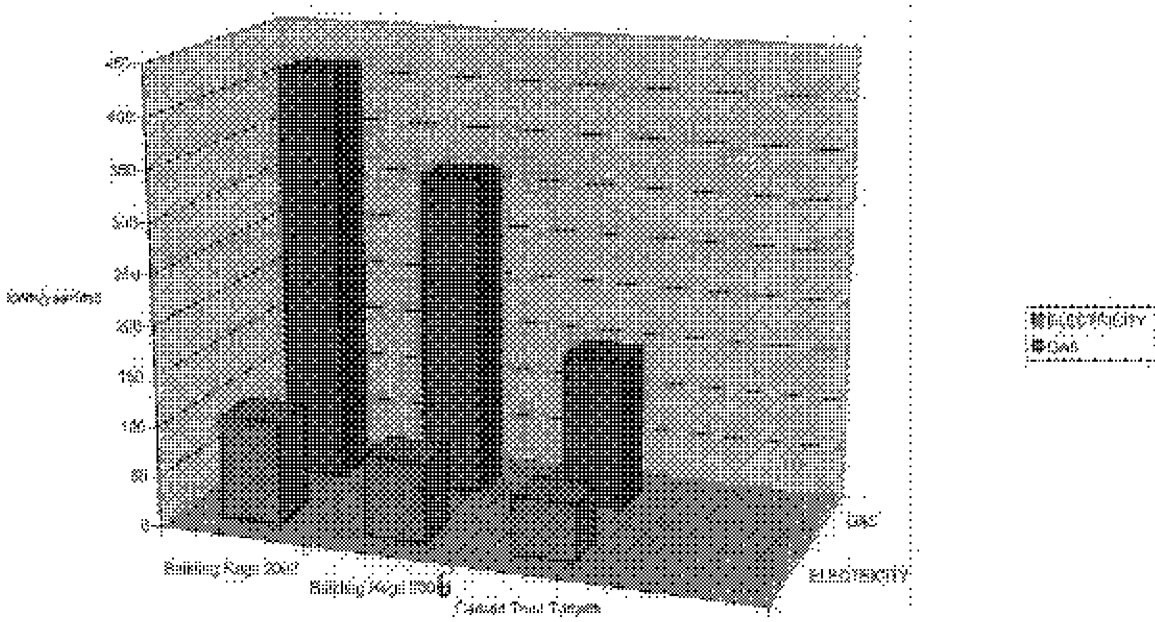
Chart 1 - Benchmarks



2.3 General Enhancements

The report uses the base line for energy used by the building when designed to the basic 2006 Part L2A of the Building Regulations as shown in Table 5 Level 2. The effect of design decisions can then be realistically assessed. The design team have already included in the design a high level of expertise and these are incorporated in the sections below.

2.4 Sports Hall

The Sports Hall is going to be used essentially for national standard badminton and therefore heating, lighting, ventilation and natural daylight need to be considered in the specific requirements of the sport.

- Lighting/natural light
  It is essential to keep a low energy profile of the building and therefore natural day-lighting must be optimised. However, this needs to be a diffused light source so that badminton players are not influenced by glare. The proposal is to use mono-draught light pipes which provide the most effective use of the daylight rather than have open roof lights which would need some type of blind or diffuser. The artificial light should be high efficiency, be zoned to the different courts and provided with variable daylight controls.

- Ventilation
  Ventilation is also another high energy using system, therefore natural ventilation is essential. The ideal proposal appears to be the mono-draught fan-powered stack ventilators, with PV (photo-voltaic) panels, so that there is no external electrical supply required. This will provide a zero carbon option for the ventilation.

- Heating
  Heating needs to be non-intrusive into the space and also flexible and capable of being zoned so that small sections of the hall can be used independently. The ideal system for this will be an underfloor system which allows air stratification so that only the lower part of the hall is heated. It also reduces air currents so that the flight of shuttlecocks is not affected.

  Ideally this system would be linked to a ground source heat pump to obtain the optimum efficiency as it can be compensated to external temperatures and will also provide a large proportion of the renewable requirements. If there is a need for a quicker response than normal from the underfloor heating, it can be located between the concrete base and the timber floor.

2.5 Gym

It is probable that the gym will have periods of very intense use, mixed with periods when only one or two people are in occupation, therefore the heating/ventilation needs to be very flexible to accommodate these different purposes.

The traditional method of using split-unit air-conditioning with this type of space is very energy inefficient, therefore a different approach needs to be considered. This would be to use a fresh-air system, probably with three or four individual roof-mounted units which would provide filtered and heated air, but not cooling, with sufficiently good air distribution system and air-change rates to ensure occupant comfort. The advantage of this is that the fresh air system can be controlled from CO_2 detectors reducing the fan volume via inverters and they can also provide overnight pre-cooling and possibly recirculation on start-up.

Because the fan motors will be operating for considerable periods of time, it would be a great advantage to run two or more of the units from PV (photo-voltaic) panels mounted on the roof. This again would contribute to the percentage of renewables required.

2.6 Changing/Showers

If a ground source heat pump is to be used, then ideally an under-floor heating system would be used for showers, changing grooms, entrance etc served from the heat pump. Ventilation to toilets and internal areas could again use the mono-draught solar powered stack ventilator.

Hot Water - there is potentially a large usage of water as the showers are needed for players for up to two rugby teams and the players for six badminton courts, so there is considerable potential for use of solar panels mounted on the adjacent roof to provide a good proportion of the hot water. Heating to the gym fresh air supply units and the hot water could be via a small 'A' rated condensing boiler.

2.7 Existing Building

The existing building is shown on the front piece and is an amalgam of different styles of construction. Generally it is built of double skimmed brickwork and the Green Gym, EIS and Dance Studio have flat roofs constructed with lattice beams and stramit board covered with asphalt with little insulation.

The Sports Hall roof is a pitched steel framed roof with 50% single glazed roof lighting and 50% corrugated asbestos roofing.

The existing heating is generally by radiators and fan heaters supplied from local gas fired boilers. The system is at least 15 years old and the controls are minimal and require a serious upgrade.

The building is over 1000m² and the extension for the EIS is over 100m² and less than 25% of the total floor area, therefore it is likely that consequential improvements will apply and improvements that in most circumstances are practical and economically feasible are given in Building Regulations Part L2B Page 18 as follows:

Improvements that in ordinary circumstances are practical and economically feasible

Items 1 to 7 will usually meet the economic feasibility criterion set out in paragraph 19. A shorter payback period is given in item 8 because such measures are likely to be more capital intensive or more risky that the others.

1 Upgrading heating systems more than 15 years old by the provision of new plant or improved controls.

2 Upgrading cooling systems more than 15 years old by the provision of new plant or improved controls.

3 Upgrading air-handling systems more than 15 years old by the provision of new plant or improved controls.

4 Upgrading general lighting systems that have an average lamp efficacy of less than 40 lamp-lumens per circuit-watt and that serve areas greater than 100m² by the provision of new luminaries or improved controls.

5 Installing energy metering following the guidance given in CIBSE TM39(13).

6 Upgrading thermal elements which have u-values worse than those set out in column (a) of Table 7 following the guidance in paragraphs 87 and 88 of Building Regulations.

7 Replacing existing windows, roof windows or roof lights (but excluding display windows) or doors (but excluding high usage entrance doors) which have a u-value worse than 3.3W/m²K following the guidance in paragraphs 75 to 78 of Building Regulations.

8 Increasing the on-site low and zero carbon (LZC) energy generating systems if the existing on site energy demand, provided the increase would achieve a simple payback of seven years or less.

Therefore the practical improvements would be to provide a new thermally efficient roof for the Sports Hall with a 'u' value of better than 0.12 w/m² °K and to replace the heating boilers with high efficiency boilers and the following controls in accordance with the 'Non Domestic Heating, Cooling & Ventilation Compliance Guide Section 2'.

	Building Regulations
Minimal boiler seasonal efficiency (%GCV)	80%
Minimum Effective Heat Generation Seasonal Efficiency (% GCV)	84%

Minimum controls suggested by the Carbon Trust:

1 Zone controls - Zone control is required only for buildings where the floor area is greater than 150m². As a minimum, on/off control (e.g. through an isolation valve for unoccupied zones) should be provided.

2 Demand controls - Room thermostat which controls through a diverter valve with constant boiler flow water temperature. This method of control is not suitable for condensing boilers.

3 Time controls - Time clock controls.

Additional controls suggested by the Carbon Trust:

4 Sequential control of the boilers.

5 Weather compensation on zones which do not include fan heaters.

6 Optimum start.

7 Thermostatic radiator valves.

2.8 Renewables

General:

Renewables are an essential part of the project, in particular the Building Regulations requirement for 10% renewables and the Planning Requirement for 10-20% renewables.

The following assessment is based on information at Stage D and the 2nd Tier document 'Low or Zero Carbon Energy Sources: Strategic Guide'.

These assumptions will need to be expanded in accordance with government approved calculation methods such as iSBEM before submission for British Regulations or to the relevant Planning Department.

The renewables considered by Building regulations and Planning Departments are as follows.

The estimated content of renewables is developed in Appendix 1 Table 10.

a) Absorption Cooling
Only applicable where waste heat is available or regeneration can be used as a by-product of CHP.

b) Biomass

Biomass boilers use woodchips, logs or pellets instead of gas or oil which therefore gives a near zero carbon burden providing that the fuel can be sources within a radius of 25 miles.

Item	Requirements	Conclusion
Supply Chain	Is there a supply chain source within 25 miles.	Not known
Delivery	Is there space for delivery vehicles.	Space could be designed into the scheme
Storage	Can space be allowed for storage.	This would have a considerable cost and space penalty
Boiler Plant	Can space be allowed for boiler and ancillary equipment.	This would have a considerable cost and space penalty
Exhaust Flue	Is there a location for the flue.	Flue could rise to above Sports Hall
Maintenance	The plant is more complex than gas fired boilers and will need both on site and expert maintenance.	The project needs to be low maintenance to reduce the maintenance costs for the College.

Conclusion

This is a very good robust technology but it is dependant on supplies, which are unlikely in Twickenham, and space for storage and plant which would considerably increase the plant space in the development and therefore cost, together with the premium cost for the plant itself and on-going maintenance and therefore is not considered.

c) CHP

CHP relies on static winter and summer heat load usually from a swimming pool or residential block. The hot water load would not be sufficient to provide a cost effective electrical output.

d) Ground Cooling

Ground cooling is of two types:

(i) Ground linked air cooling where air is drawn through pipes of ducts to ventilation plant. This would require 5m deep excavation which would impinge on Metropolitan open ground and would be a high cost option.

(ii) Ground water cooling where an underground water source is used for cooling. However there is no underground source on this site.

e) Ground Source Heat Pumps

These are ideal for this application as they can feed directly into the under floor heating in the Sports Hall, showers, entrance, C&S suite and EIC. If required some cooling could also be used for the C&S Suite in summer via cooling from the underfloor heating.

Item	Requirement	Conclusion
Ground conditions	To be suitable for ground array.	Ground condition from 2-4m appear to be gravel therefore acceptable for ground array
Type of ground array	Horizontal array or vertical bore holes.	The adjacent sports field provides the ideal pipe array location.
Plant room	Plant room must be sized for the equipment.	Plant space is available local to the ground array
Available heat load	Good low grade heating system must be available such as underfloor heating.	The major part of the building will be using underfloor heating.

Conclusion

Again, a very robust well tried system that has the advantage of providing cooling in summer if necessary.

The estimated renewable savings is shown in Table 10, Appendix 1.

f) Photo voltaics (PV)

Photo voltaics can be mounted either on the roof or façade of buildings or as ground arrays. Obviously ground arrays take up useful space and therefore, roof mounted or integrated into facades are a more practical option. The photo voltaics (PV) panel absorbs direct sun light and converts it directly into Direct Current (DC) electricity which is then converted to Alternating Current (AC) to match the normal building electrical supply.

At present the single or multi crystal silicon flat plate technology is the most popular and currently costs between £4,500 and £10,000 per kW installed (from DCLG Publication) which can be offset by the reduction in cladding cost if integrated into the building.

Item	Requirement	Conclusion
Roof Orientation	The PV panels need to be orientated from SE to SW or mounted flat.	Flat roof is available on the sports hall roof and changing room roof.
Roof Space	Panels should not be shaded at any time.	Panels can be mounted so they are not shaded.

Conclusion:

This is a very good option for renewables on this site especially to serve individual extract towers on the main Sports Hall roof and also the motors for the C&S Suite ventilation and toilet ventilation.

The estimated renewable saving is shown in Appendix 1 Table 10.

g) Solar Panels

Solar systems use hot water panels mounted externally to absorb heat from the sun and provide low grade hot water which can be used to provide preheated hot water for domestic use with top up from a gas fired condensing boiler.

It is well established for domestic, residential and high demand applications and is a robust technology. Collectors should be mounted on an incline to a southerly orientation although SE and SW can be used and can generally provide 50-60% of the hot water demand.

In addition, the solar system pump can be operated from PV panels to reduce the carbon burden.

Item	Requirement	Conclusion
Location	Roof SE to SW preferred.	South available on sports hall roof.
Roof space	Space required for mounting of panels.	Sports hall roof has adequate space.
Hot water requirement	Is there sufficient regular demand to be cost effective.	Shower and changing area has a high hot water demand throughout the year to serve the multipurpose hall and adjacent rugby and athletic facilities.
Plant room	Space available for large cylinder.	Space is available.

Conclusion

This is a very good option for renewable as the shower area is compact but likely to be heavily used and therefore hot water demand will be high, see Appendix 1 for consumption calculations.

The estimated renewable savings is shown in Table 10, Appendix 1 and summarized below.

h) Wind Energy Technology

Wind power is one of the most successful and fastest spreading renewable energy technologies in the UK and the use of single or multiple sites in urban areas is increasing particularly with the encouragement of local planning officers.

For a practical installation and a good the relative output, per £ of installation, wind turbines are likely to be between 0.5kW and 1.0kW output. However it is difficult to make precise calculations because of the variability of wind speed. However the DCLG document Low or Zero Carbon Energy Sources: Strategic Guide suggests that with a wind speed of 6 m/s the expected output from a 1kW turbines is about 2,500 kWh year and a turbine has a 20 year life.

There are specific requirements that need to be met if a wind turbine is to be considered and these are listed below together with conclusions.

Item	Requirements	Conclusion
Wind speed	Free standing: wind speed to be above 6m/s Building mounted: wind speed to be above 4.5m/s	Unlikely to be achieved in this area, see NOABL database
Obstructions	Free area around the turbine required to avoid turbulence	Acceptable
Land available	Free standing turbines must have sufficient space around the installation	Not available without taking up sports facility area
Effect on adjacent properties	Adjacent properties may be affected by noise and vibration and the wind turbine could cause an objection under visual amenity	Housing on south and west which is likely to be affected
Structural considerations	Additional structure for a building mounted wind turbine may be required	Additional structure would be a cost penalty on the building

Conclusion

Wind turbines are not suitable for this site mainly due to the adjacent housing, low wind speed and lack of space for a free standing wind turbine (see Appendix 1, Table 10).

2.9 Metering, Targeting and Monitoring

It is essential to be able to monitor individual gas and electric consumptions to check that conservation is being maintained and have early notice of faults. It can then be used to inform the occupants of the buildings on the overall performance and to establish if further energy saving would be cost effective. It would also be very useful with respect to lettings of the different areas so that energy use can be reclaimed.

Building Regulations requires metering of loads above 10kW which is basically every main distribution board and each boiler.

Also display meters could be installed in prominent positions in the reception/entrances to display the current energy consumption and indicate to staff and students energy consumption, this should also be collated in to the BMS system to enable the maintenance staff to pinpoint any anomalies, incorrect readings, trends of increasing usage and therefore investigate and resolve the problem.

Only by being informed where the energy is used is it possible to make management decisions on where it is more economical to spend further funds on energy saving.

The existing building is poorly metered with gas meters being shared with the adjacent residential block and electric meters being non-existent. Therefore it is important with the new development, and possibly s part of the 'consequential improvements' that additional metering is provided in the existing building.

2.10 Commissioning and Maintenance

Many buildings do not realise their full potential for energy efficiency. This is often due to over complex design, which makes the buildings and plant difficult to manage and maintain.
Ease of maintenance will influence future energy efficiency and should be addressed at the design stage. The requirements of space, position, access, repair and replacement of services should be considered so that equipment can be commissioned, monitored and maintained. Therefore,

designers should include adequate access and monitoring facilities based on the existing Trend BMS System. For example, it should be easy to check or change features such as set points, control authority and boiler efficiencies, and also for alarms and faults to be registered quickly and easily.

Energy efficiency will only be achieved in practice if the building is operated as the designer intended. The specification should also make clear the need for, and extent of, properly planned operating and maintenance procedures so that the design objectives for the minimum use of energy are achieved.

The College should think carefully about how the building will be used and operated. Suitable operating staff should be designated at an early stage. They should be involved in commenting on the proposals, witnessing commissioning, and preparing for handover and occupancy. The Client should ensure that there is seasonal commissioning, i.e. if a project is completed and commissioned in the winter then a repeat visit should be made in the summer months to prove and carry out checks on the control strategy.

The design team should address the issue of 'commissionability' of building services early on, and the Client should be encouraged to participate in this exercise. Adequate time should be allowed and a suitable budget provided for commissioning by competent personnel. If this completion stage is shortened, poor operation and high energy consumption are likely throughout the life of the building. Therefore, commissioning should not be overlooked.

The commissioning period in any project should be planned so that it remains a phased part of the contract period. It should not be regarded as a 'buffer period' during which earlier delays can be absorbed.

Log books should be provided in accordance with the Building Regulations and be based on CIBSE recommendations and the design team should provide the basic information on energy use and targets prior to tender and issue the draft log books as part of the tender documentation.

With respect to training the Client's maintenance engineer must receive adequate training in the various systems otherwise the systems will fail and then complaints will increase with respect to unfavourable room conditions.