

## Sustainable Design at the Wren Academy, Finchley

### Background

The Wren Academy, a mixed school in North Finchley in the London Borough of Barnet, opens to Year 7 students in September 2008. The Academy will cater for 810 pupils aged 11 to 16 and 150 pupils 16 to 18. The Academy's specialism is Design and the Built Environment. The Academy will be located in refurbished and brand new buildings with state-of-the-art facilities.



penoyre & prasad

### Executive Summary

It is important in the design of a modern building that the sustainability of the building should be considered in respect of its construction, operation and impact on its' surroundings. Sustainability should therefore be an important driver for most buildings, and in a building such as the Wren Academy the responsibility is extended towards the students as a means of educating them by demonstrations of sustainable design.

The sustainability initiatives being implemented at the Wren Academy have been categorised to indicate how the designers believe that they should be considered :

#### Good practice

- Use of thermal mass to facilitate natural ventilation- this is appropriate to many of the spaces to reduce the effect of peak occupancies and gains.



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- Lighting control and energy efficient lamps and ballasts applied to lighting systems.
- Condensing boilers - all new gas-fired boiler plant will be of the condensing type.
- Controlled glazing and / or shading - the target for the project will be to provide a minimum 2% average daylight factor and summertime temperatures within DCSF guidelines, coupled with effective lighting and heating controls.
- Insulation levels to comply with Building Regulations, not offset in CO2.

### Best practice

- Use of atrium spaces to reduce heat loss and drive ventilation.
- Automatic openings to maximise night cooling in summer and reduce heat loss in winter.
- Use of northlights on upper floors - a strategy has been developed to use northlights and rooflights for daylighting and to drive natural cross-ventilation.
- Avoiding use of PVC (cables, pipes etc).
- Increased insulation levels - we believe that it is appropriate to increase insulation levels above those required by Building Regulations to reduce heat gain and loss through the envelope.

### Committed

- Use of renewable energy via use of coppiced woodland as fuel source.
- Recycled rainwater for use in WCs.
- Light shafts and setbacks in building form to maximise daylighting.

### Renewable Energy Sources

The building design of Wren Academy has been optimised to use passive technologies and demand management to reduce energy consumption through numerous measures including solar shading, optimised orientation, and intelligent lighting controls. In addition to these, alternative energy technologies (AETs) are also being considered, for the following main reasons :

- To maximise educational benefits, facilitating projects, science experiments and other activities related to the schools curriculum.
- To provide a significant proportion of the buildings energy requirements from sustainable sources as a potential requirement of the Planning process.
- To raise awareness of the environment and issues concerning sustainability through demonstration of sustainable technologies.
- To achieve a green Academy with sustainability high on the agenda.

In response to the Academy's aspirations the following alternative energy technologies are being implemented at the Academy :

- Renewable space and water heating through a biomass boiler.
- Infrastructure to accommodate wind turbines and solar photovoltaic (PV) panels

To maximise the potential educational benefit and awareness arising from these technologies, it is proposed to include on-line monitoring of the energy and water



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systems, via the building management system (BMS). This will enable pupils and teachers to utilise the data produced from these systems within the school's curriculum. The monitoring system will include a live display of energy generation and water savings via a screen in the main reception areas.

### Environmental Design and Energy Consumption

#### *Sustainable materials*

- Two buildings of the original site are being retained and refurbished rather than being demolished, i.e. 1792m<sup>2</sup> gross internal area.
- The rubble from the demolished buildings will be re-used as foundations.
- Engineered timber will be used in the construction process.
- Sustainable materials will be utilised for the cladding and structure.

#### *Thermal and airflow modelling*

The building is arranged and oriented such that much of the accommodation will receive high-angle sunlight from the south. This will result in a high-degree of solar gain. A high performance glass with a low shading coefficient will be utilised on selected facades.

#### *Building Envelope / Shading requirements*

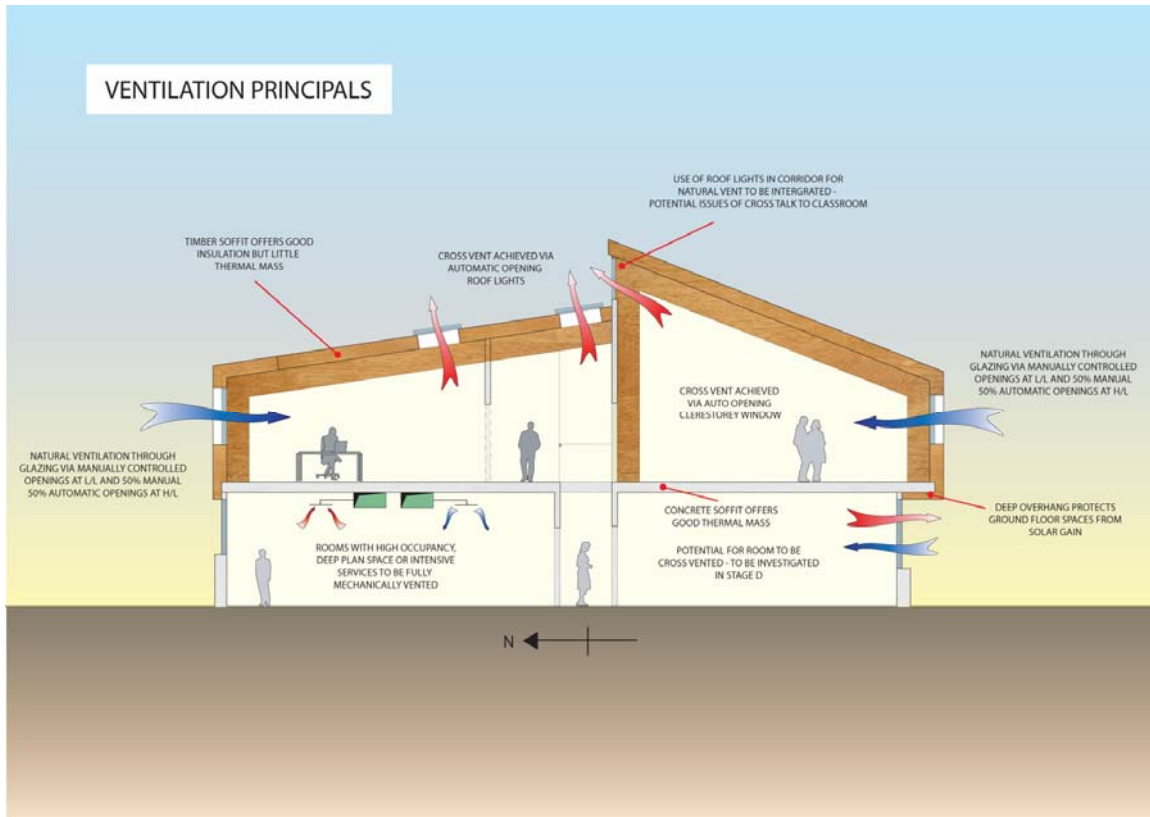
The design of the building will take into account the following objectives :

- Eliminate summertime high-angle noon and lower-angle late-morning sunshine on SE facing facades.
- Eliminate summertime high and low-angle noon to evening sunshine on SW facing facades.
- NE facing facades are only affected by morning sunshine and internal roller blinds will suffice.
- NW facing facades are only affected by late afternoon sunshine incident at an acute angle to the façade.
- Maintain good daylight penetration into the building
- Maintain visual 'transparency' of glazed elements.
- Maintain views through glazed elements.

#### *Ventilation*

The general principles of the ventilation fall into the following categories :

- Naturally ventilated spaces
- Single sided natural ventilation. Very few spaces have been treated like this as it can be difficult to achieve without additional expense to the façade,.
- Natural cross ventilation- many of the classroom spaces have been vented in this manner.

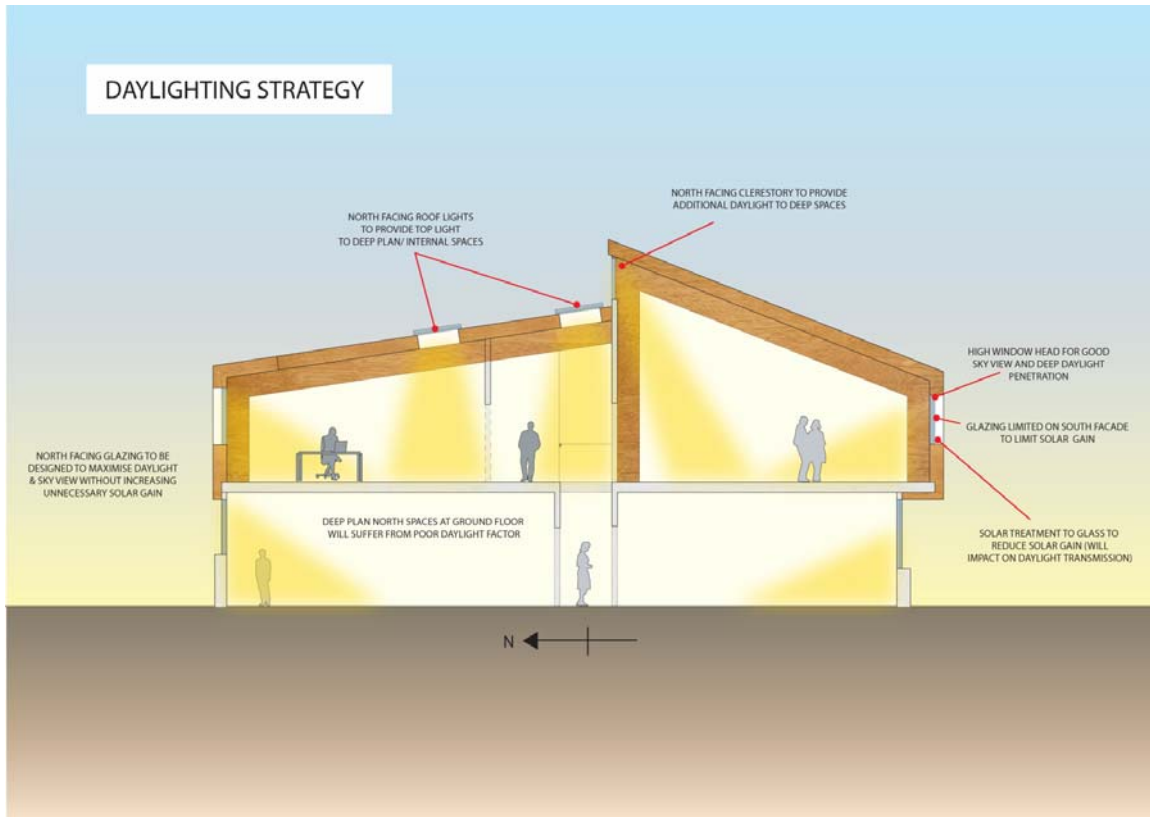


### Lighting

Lighting uses around one third of a typical school's annual energy consumption with carbon intensive electricity and hence priority has been given to intelligent and efficient lighting design. The lighting scheme focuses on two main elements of the lighting design:

- Reducing lighting energy at source, i.e. specify high efficiency fittings (e.g. high frequency fluorescent lamps and ballasts) with efficient light distribution.
- Reducing the time and intensity for which this energy is used.

The classrooms will comprise of linear suspended fittings to allow light to spill up to the ceiling to give good uniformity and a pleasant lighting environment. To maximise efficiency and avoid complicated conduit runs at ceiling level, classroom lighting shall consist of lighting "booms" cabled from one side of a run of classrooms via the partition wall. As the fittings will provide a degree of uplight, It is important that any soffit or panels which might act as reflectors are as reflective as possible (for instance by painting soffits white). Only high-quality construction fittings will be used, from manufacturers that can demonstrate good-value. Light-output ratios from linear fittings shall be greater than 80%.



Generally, all lighting shall be from fluorescent sources, equipped with high-frequency control gear. These shall be dimmable where appropriate, to maximise the benefit of daylight in reducing energy use.

A passive infra-red (PIR) light sensor will provide absence detection which will switch the lights off when not in use and will signal the ventilation system to prevent unwanted rooms from being ventilated when not in use. A central timeclock will ensure lighting is switched off at night during unoccupied periods

### *Water usage*

- Leak detection systems will be installed in all plantrooms.
- There will be flush sensors on all urinals.
- PIR washroom control systems will be installed, i.e. when the PIR switch detects that the room is unoccupied, it will automatically turn the water supply (+ lights) off.

### *Landscape strategy*

We believe the environment is of high importance to the school community and its future development. The site contains valuable existing habitats including hedgerows, trees and unimproved damp grassland. These provide habitats for mammals, invertebrates, bird and bat life. These existing habitats will be retained and more habitat created

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to increase the biodiversity of the site and links to the wider environment. Habitat creation increases the richness of the site and becomes a learning resource for pupils, staff, visitors and community alike.

The drainage systems to be installed at the Wren Academy have been designed to manage the rainfall runoff at source. This is a key feature of sustainable systems; the ability to store water where it falls so it can be released back into watercourses, or public sewers, at a controlled rate to mimic natural drainage patterns and avoid increasing the risk of flooding downstream. Particular features provided on site include a permeable paving system for the car park, and a swale to convey rainfall along the northern boundary of the site. Both of these features slow the flow of water and provide a degree of filtering to cleanse the runoff. Attenuation has been provided to ensure all discharge to public sewers is reduced back to Greenfield runoff rates.

