WIRRAL *GreenSpec* October 2010

INTRODUCTION

In September 2007, Cabinet approved a new Corporate Plan structure focusing on five key Corporate Objectives with a series of corresponding first year Improvement Priorities. The second Corporate Objective is "to create a clean, pleasant, safe and sustainable environment" with the following Improvement Priorities for 2008/9 to "**Reduce Our Carbon Footprint".** This remains a key priority below the objective for 2010-11. Wirral's 2006 Climate Change Strategy underpins and supports this priority and the overall strategic objective.

Technical Services continues to play a significant role in the Corporate Objective "to create a clean, pleasant, safe and sustainable environment".

This document is intended to be a designer's guide on incorporating best practice green technologies and sustainable products and materials into Council building projects in order to contribute to the Council's Carbon Reduction Programme, Carbon Budget and the Governments Carbon Reduction Commitment.

The Guide includes links informing designers how to access current best practice material specifications and an appendix containing examples of typical approved products which will ensure consistency across the Council's building stock, assisting with efficiency of facilities management and maintenance operations. A key principle of the Guide is that energy demand in buildings should be reduced before renewables are considered.

The Council's Climate Change Strategy is to reduce carbon emissions, the Council has now adopted the target of a 60% reduction by 2025 and will be working with residents, communities and both the public and private sectors to achieve their own reductions.

The design and specification of buildings has a key influence on the performance of buildings and the emissions produced by the Council. They determine the **operating costs** of the building, they influence the building's **impact on the environment** and they influence the comfort and well being of the building's occupants which in turn effects productivity.

Sustainability: – our objective is to significantly improve the sustainability of all new and existing buildings. More specifically we aim to:

- improve their energy efficiency/reduce their CO_2 emissions
- improve their water efficiency
- ensure that they can adapt/are resilient to a changing climate
- reduce the wider impact that they have on the environment.

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RENEWABLES

At its meeting on 18 October 2010, Council agreed to a Resolution on Renewable Energy Generation and resolved (minute 45 refers):

a) to expand its renewable energy generation;

b) to instruct officers to ensure that renewable energy projects are an integral part of the Council's office accommodation strategy

Therefore we are now required, where appropriate, to install Renewable Technologies in all new and refurbished buildings. **Renewable technologies should be considered before conventional systems are specified**.

The recently introduced Government Feed in Tariff (FiT) scheme will assist with the funding of renewable schemes by guaranteeing a set fee payable for electricity generated for self-use and an additional rate for all surplus electricity exported back to the national grid. Currently domestic rates are higher than for commercial applications. However, recent legislation now allows local authorities to participate in such schemes with a potential to accrue revenue benefits, in addition to contributing to local carbon reduction and climate change targets. Examples of small-scale, low carbon, renewable technologies include:

- Wind
- Solar Photovoltaic (PV)
- Hydro
- Anaerobic digestion
- Biomass

Similarly from April 2011 the Government intend to introduce Renewable Heat Incentive which is expected to complement FiT's. This will allow the Council to install the following types of technology:

- Air and ground-source heat Pumps
- Solar Thermal
- Biomass Boilers
- Renewable Combined Heat and Power
- Use of Biogas and Bio-liquids

The specifying of new or innovative products such as biomass boilers or rain water harvesting systems will help stimulate the market for the development of these products, which will help the UK compete in a developing market for more sustainable products.

It is crucial that renewable energy schemes are developed in conjunction with energy reduction schemes rather than to simply offset increase energy use.

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DESIGN OF BUILDINGS (SUSTAINABLE CONSTRUCTION)

- *Adaptability/Flexibility:* The use of interior space to be optimised through careful design so that the overall building size, and resource use in constructing and operating it, are kept to a practical minimum for original design use.

- *Design for future reuse and adaptability:* This can be achieved by making the structure adaptable to other uses, and choosing materials and components that can be reused or recycled.

- *Design for easy maintenance:* Whilst new buildings will usually have a design life of 30 or 60 years or greater, mechanical and electrical systems will not generally last beyond 15 years. Systems to be designed from the outset for disassembly and recycling, or designed out by use of passive design.

- *Design an energy-efficient building:* This to be delivered through the high use of insulation, high-performance windows, and tight construction. Efficiency to be obtained by using natural, or less preferably, mechanical ventilation, in preference to air conditioning.

- *Design buildings to use renewable energy.* Passive solar heating, daylighting, and natural cooling to be incorporated cost-effectively into appropriate buildings.

- *Optimise material use:* Waste to be minimised by designing for appropriate standard ceiling heights and building dimensions. Avoid waste from structural over-design (use optimum-value engineering/advanced framing).

- *Design water-efficient, low-maintenance landscaping:* Conventional lawns have a high impact because of water use, pesticide use, and pollution generated from mowing. Consider landscaping with drought-resistant native plants and perennial groundcovers.

- *Make it easy for occupants to recycle waste:* Make provisions for storage and processing of recyclables and kitchen waste.

- *Recycle greywater if feasible:* Water from sinks, showers, or clothes washers to be recycled for WC flushing or irrigation. Design the plumbing for easy future adaptation and access.

- *Design for durability.* Spread the environmental impacts of building over as long a period as possible. The structure must be durable as a building with a durable style will be more likely to realise a long life.

- *Design for recovery.* To be done by ensuring that buildings are designed to facilitate the maximum recovery of materials when the time comes to demolish them.

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LOCATION & PLANNING SITE

- *In-fill and mixed-use development: Identifying an in-fill site which increases density is inherently more sustainable than building on undeveloped greenfield sites. Mixed-use development, in which residential and commercial uses are intermingled, can reduce vehicle use and help to create healthy communities.*

- *Minimise car dependence: This can be done through locating buildings to provide access to public transportation, bicycle paths, and walking access to basic services.*

- *Value site resources: Early in the siting process, carry out a careful site evaluation covering issues such as: solar access, soils, vegetation, water resources, important natural areas, and let this information guide the design.*

- *Promote biodiversity: By clustering buildings or building attached units to preserve open space and wildlife habitats. Avoid especially sensitive areas including wetlands, and keep roads and service lines short.*

- *Provide responsible on-site water management: By designing landscapes to absorb rainwater runoff (stormwater) rather than having to carry it off-site in storm sewers. Consider collecting rainwater for irrigation (SUDS recommendations to be followed).*

- *Situate buildings to benefit from existing vegetation:* Hedge rows and shrubbery can block cold winter winds or help channel cool summer breezes into buildings. Trees on the east and west sides of a building can dramatically reduce cooling loads.

MATERIALS

- *Avoid ozone-depleting chemicals and those with a high global warming potential: The new Framework rules out the use of CFCs and HCFCs and promotes the use of alternatives to MFCs (which add to global warming). Reclaim CFC, HCFCs, and HFCs when servicing or disposing of equipment.*

- *Use durable products and materials: Because manufacturing is very energy-intensive, a product that lasts longer or requires less maintenance usually saves energy. Durable products also produce less waste in the long run and are a more efficient use of resources.*

- *Choose low-maintenance building materials: Where possible, select building materials that will require little maintenance (painting, re-treatment, waterproofing, etc.), or whose maintenance will have minimal environmental impact.*

- *Choose building materials with low embodied energy: Heavily processed or manufactured products and materials are usually more energy intensive. As long as durability and performance will not be sacrificed, choose low energy embodied materials.*

- *Use building products made from recycled materials: Building products made from recycled materials reduce solid waste problems, cut energy consumption in manufacturing, and save on natural resource use.*

- *Use salvaged building materials when possible:* The pressure on landfill can be reduced and natural resources saved by using salvaged materials: lumber, millwork, certain plumbing fixtures, and hardware, for example. Make sure these materials are safe (for example, by testing for lead paint and asbestos), and don't sacrifice energy efficiency or water efficiency by reusing old windows or plumbing fitments.

- *Use good wood:* There is a Government commitment that all central government departments and agencies actively seek to procure timber and timber products from legal and sustainably managed sources.

- *Avoid materials that will give off gas pollutants:* Solvent-based finishes, adhesives, carpeting, particleboard, and many other building products release formaldehyde and volatile organic compounds (VOCs) into the air. These chemicals can affect workers' and occupants' health as well as contribute to smog and ground-level ozone pollution outside.

- *Minimise packaging waste*: Avoid excessive packaging, such as plastic-wrapped plumbing fixtures or fasteners that aren't available in bulk. Inform suppliers why over-packaged products are being avoided. Keep in mind, however, that some products must be carefully packaged to prevent damage, and resulting waste.

EQUIPMENT

- *Install high-efficiency heating and avoid air conditioning:* Well-designed high-efficiency boilers, not only save the building occupants money, but also produce less pollution during operation. Design incorporating natural ventilation or, less preferably, mechanical ventilation, can make air conditioning unnecessary for most applications.

- *Install energy efficient lights and appliances:* Fluorescent lighting has improved dramatically in recent years and is now suitable for homes. High-efficiency appliances offer both economic and environmental advantages over their conventional counterparts.

- *Install water-efficient equipment:* Low flush WCs, waterless urinals and low flow showers not only reduce water use, but save money through lower water and sewerage charges. Reducing hot water use also saves energy and reduced emissions of carbon dioxide - the main greenhouse gas.

SITE DEVELOPMENT

- *Protect trees and topsoil during site work:* Trees can be protected from damage during construction by fencing off the "drip line" around them and avoiding major changes to surface grade.

- *Avoid use of pesticides and other chemicals that may leach into the groundwater:* Look at alternatives or less toxic treatments.

- *Minimise site waste:* This can be done by setting up clearly marked bins for different type of usable waste (wood scraps for kindling, sawdust for compost). Find out where different materials can be taken for recycling, and raise awareness about recycling procedures. Salvaged materials can be donated to community groups.

- *Make education a daily practice:* Use the design and construction process to educate clients, employees, subcontractors, and the general public about environmental impacts of buildings and how these impacts can be minimised.

- *Sustainable demolition practices:* Specify safe demolition for site users with all works complying with health and safety requirements; avoidance of damage and operational problems to the plant in other buildings; reuse of materials and a statement showing where reclaimed materials will go. Waste must be disposed of legally.

BUILDING SERVICES (ENERGY EFFICIENCY) GENERAL

The definition of an energy efficient building is 'One that provides the specified internal environmental conditions for minimum energy cost'. To achieve this it is essential to adopt an integrated approach to building design, employ good practice techniques and influence the specification of building services at the earliest possible stage. This will directly influence the environmental impact of a building and result in reduced operating costs over its lifetime.

A straightforward approach, taking account of location, orientation, natural ventilation and daylighting, will not only minimise capital costs, but also facilitate plant operation and reduce maintenance costs. Improving the quality of the indoor environment will ultimately improve the health and wellbeing of the building occupants.

Heating

- ***Reduce the use of fossil fuels:*** Choose the least polluting source of energy for space and water heating after all renewable schemes have been considered.

- ***Select high efficiency boilers:*** Condensing boilers are more efficient and therefore cheaper to run than conventional boilers and must be considered for at least the lead boiler in a multi-boiler installation.

- Use separate, localised systems to meet small loads and for water heating.

- ***Use the natural characteristics of a site:*** Optimise solar heat gain to enable internal conditions to be achieved with minimum reliance on services.

- ***Use appropriate controls:*** Incorporate zoning, weather compensation and optimisation to heating systems.

Cooling

- ***Consider the solar, dynamic and thermal characteristics of the building:*** External shading, internal blinds and self-shading will minimise the impact of the weather on the internal conditions, delaying peak internal temperatures.

- ***Natural or mixed mode ventilation:*** This must be considered for use in preference to full air conditioning.

- Where air conditioning is required, specify systems that will use free cooling in summer and heat recovery in winter.

- If air conditioning is required to supplement natural ventilation or for special needs, the system should be designed to operate on a zoned basis.

Ventilation

- Natural ventilation should be the first choice: Where additional ventilation is required, fans and pumps should be sized accurately. Variable speed drives will be used to minimise losses at periods of low load.

- Provide controllable, natural ventilation removing dependence on air-conditioning systems.

Lighting

- Design windows to ensure their size and layout take full advantage of daylight.

- Choosing light colours for internal finishes will reduce the requirement for artificial lighting.

- Design buildings to maximise natural day lighting by the use of shallow floor plates and use sun pipes where deeper floor plans are necessary.

- Consider daylight linking: Artificial lighting should be used to meet lighting levels not provided by natural light.

- Maximise energy efficiency by controlling the level and timing of lighting systems.

- Use High frequency and Slimline Fluorescent tubes: These are no more expensive than ordinary lamps, and are up to 10% more efficient.

- Do not over light non-sensitive areas. Areas of special needs can be provided for locally.

- Maximise use of daylight through good use of blinds, while eliminating glare and minimising heat gain.

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Performance

- Set performance targets based on recognised guides such as Best Practice Guides or BREEAM measures requiring thermal modelling studies to be undertaken.

    - Design temperatures for air-conditioned offices of:
        - 24°C in summer
        - 20°C in winter

      Careful consideration should be given to external ambient design conditions as this could lead to plant / systems being oversized and a reduction in operating efficiency.

    - Winter design heating temperatures for other areas should be less than or equal to the lower end of the temperatures stated in CIBSE guides[5].

    - A minimum temperature dead band of 4°C should be considered.

- Design to achieve air tightness and specify insulation to optimum levels that balance capital costs against energy savings.

- Specify equipment that is energy star compliant or a similarly recognised certification scheme.

Controls

- Install controls that are simple to understand and that will allow control to local occupants. Building Energy Management systems should be provided by Trend and installed by Trend approved installers

- Controls must be accessible to those responsible for energy management and maintenance of the building.

Water

- For general use, install low flush volume cisterns and consider greywater schemes. This will reduce surface water drainage and sewerage sizes.

- Install water saving devices at an early stage. Use spray taps, urinal controls and water efficient shower heads.

ADVANCED MODELLING TECHNIQUES

By using specialist advice and advanced modelling techniques, it is possible to design in such a way that waste from oversizing of plant and equipment is eliminated. Changes in legislation, tighter building standards regulations and an integrated and innovative approach to building design, will ensure a sustainable and energy efficient built environment that will meet the needs and aspirations of Wirral Council.

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USEFUL INFORMATION

Each of the organisations listed below have excellent web based links to data that has been analysed, categorised and labelled for ease of use:

a) **National Green Specification** Environmental assessment of products and materials on the basis of Life Cycle Analysis (LCA)
http://www.greenspec.co.uk/

b) **Building Research Establishment (BRE) "thegreenguide**" through its use of the Environmental Profiles Methodology 2008,
http://www.thegreenguide.org.uk/

c) **NBS Green Building** use of their "Construction Information Service".
http://www.thenbs.com/products/tcis/index.asp

d) **WRAP** (Waste & Resources Action)
http://www.wrap.org.uk/local_authorities/research_guidance/

e) **Carbon Trust** (Carbon Trust Energy Technology List)
http://www.eca.gov.uk/etl

Sustainable Energy Sources

- **Grey Water Recycling/Rainwater Harvesting**
http://www.greenspec.co.uk/rainwater-harvesting-costs.php

- **Solar Thermal (hot water systems)**
http://www.greenspec.co.uk/html/energy/solarcollectors.html

- **Wind Turbine http://www.feed-in.co.uk/**
http://www.greenspec.co.uk/small-wind-turbines.php

- **Photovoltaics**
http://www.greenspec.co.uk/html/product-pages/electrictiles.php

- **Biomass Heating**
http://www.greenspec.co.uk/html/energy/biomass.html
http://www.greenspec.co.uk/html/products/list752.html

- **Biomass Combined Heat and Power (CHP)**
http://www.greenspec.co.uk/html/energy/micro_chp.html

- **Ground Sourced Heating & Cooling**
http://www.greenspec.co.uk/html/energy/GSHP.html

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Examples of Green Materials and Technologies incorporated into recent Council Projects

Laird Foundation 2006

- high thermal properties and U-values
- intelligent lighting system (Thorlux Lighting)
- solar thermal for hot water (SolarTwin, http://www.solartwin.com/aboutcontact-us/contact-us , Solar Twin Ltd, 50 Watergate Street, Chester, CH1 2LA, UK)
- wind turbine (Proven Energy, http://www.provenenergy.co.uk/ Wardhead Park, Stewarton, Ayrshire, KA3 5LH, Scotland)
- radiant heating to maximise efficiency
- eco-warrior monitoring system (BMS) (Sotaew, http://www.sotaew.co.uk/ State Of The Art
The Poplars, Barnston Road, Thingwall, Wirral, CH61 7XW)

Town Lane School 2006

- high thermal properties and U-values
- recycled aggregates used
- intelligent lighting system
- solar thermal for hot water
- consequential improvements made (105 of building contract sum)

Dale Farm 2007

- high thermal properties and U-values
- wood burning stove (carbon neutral) for heating installed
- intelligent lighting system
- solar thermal for hot water

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Stanton Road School 2009

- high thermal properties and U-values
- intelligent lighting system
- solar thermal for hot water
- recycled aggregates used
- passive ventilation system to reduce mechanical
- sun glass used to reduce solar gain and diminish cooling requirement (Pilkington 'Suncool' glazing http://www.pilkington.com/europe/uk+and+ireland/english/products/bp/bybenefit/solarcontrol/suncool/default.htm Alexandra Business Park Prescot Road St Helens Merseyside WA10 3TT
- heat recovery system installed (Vectaire, http://vectaire.co.uk/ Vectaire Ltd, Lincoln Road, Cressex Business Park, High Wycombe, Bucks, HP12 3RH)
- consequential improvements made (105 of building contract sum)

Pensby New Primary 2011

- high thermal properties and U-values
- biomass boiler
- sun glass used to reduce solar gain and diminish cooling requirement
- rainwater harvesting (Wavin Rainwater 'Aqua' Attenuation http://intesio-uk.wavin.com/master/master.jsp?FOLDER%3C%3Efolder_id=2534374305510741&middleTemplateName=oc_middle_left_content Hazlehead, Crow Edge, Sheffield S36 4HG)
- intelligent lighting system
- passive ventilation system to reduce mechanical
- recycled aggregates used
- BMS system