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An interactive version of Brent's Sustainable Development Checklist is also available online.

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OVER THE LAST 10 YEARS, THE NEGATIVE EFFECTS THAT PEOPLE ARE HAVING ON THE ENVIRONMENT HAVE BECOME CLEARER. ATMOSPHERIC POLLUTION IN URBAN AREAS IS SERIOUSLY AFFECTING MANY PEOPLE'S HEALTH. WE ARE USING MORE ENERGY CREATED FROM FOSSIL FUELS WHICH IS NOT ONLY USING UP A LIMITED RESOURCE, BUT IS ALSO PRODUCING GASES THAT LEAD TO GLOBAL WARMING BY HARMING THE OZONE LAYER. THE CLIMATE IS ALREADY CHANGING, WITH MORE EXTREME WEATHER SUCH AS FLOODS AND TYPHOONS. NOISE POLLUTION IS ALSO HARMING OUR QUALITY OF LIFE, ESPECIALLY IN CROWDED TOWNS AND CITIES. WE SIMPLY CANNOT GO ON AS WE HAVE BEEN DOING.


THE BUILT ENVIRONMENT IS A VERY IMPORTANT FACTOR OF SUSTAINABILITY. WE NEED TO LOOK AHEAD TO MAKE SURE THAT WE CONSIDER THE NEEDS OF THE FUTURE IN WHAT WE DESIGN AND BUILD NOW, BY CONSERVING, RECOVERING AND REUSING SCARCE RESOURCES AND PREVENTING POLLUTION. AS STATUTORY REGULATORS OF THE LOCAL BUILT ENVIRONMENT, BRENT COUNCIL HAS SPECIAL RESPONSIBILITIES THROUGH THE PLANNING, ENVIRONMENTAL HEALTH AND BUILDING REGULATION PROCESSES TO DEVELOP MORE SUSTAINABLE WORKPLACES, HOMES AND RECREATION AREAS.

THIS SUPPLEMENTARY GUIDANCE COMPLEMENTS EXISTING DESIGN AND PLANNING GUIDANCE ON URBAN DESIGN, TRANSPORTATION, ECONOMIC AND COMMUNITY ISSUES. IT FOCUSES ON THE PRINCIPLES AND PRACTICE OF DESIGNS THAT SAVE ENERGY, SUSTAINABLE MATERIALS AND RECYCLING, SAVING WATER AND CONTROLLING POLLUTANTS. IT EMPHASISES ENVIRONMENTALLY SENSITIVE, FORWARD-LOOKING DESIGN, AND IS CONSISTENT WITH CURRENT GOVERNMENT POLICY AND INDUSTRY BEST PRACTICE, AIMING TO BE PRACTICABLE AND COST-EFFECTIVE.

YOU SHOULD READ THIS DOCUMENT WITH BRENT'S REPLACEMENT UNITARY DEVELOPMENT PLAN AND THE LATEST BUILDING REGULATIONS. BY FOLLOWING IT, WE CAN MAKE A REAL CONTRIBUTION AT OUR LOCAL LEVEL TOWARDS BUILDING A SUSTAINABLE FUTURE FOR THE WHOLE WORLD. WE RECOMMEND IT TO ALL OUR PARTNERS WHO WORK WITH US IN PRODUCING, DEVELOPING, USING AND PROTECTING THE URBAN ENVIRONMENT IN BRENT.
Introduction

1.1 Principles of Sustainable Design

A sustainable environment is about building with the needs of the future, as well as the present, in mind. Meeting the current Building Regulations is not enough. Sustainability has to be part of the design from the start of a development project. Good sustainable design is based on the following principles, by being:

1. **INTENTIONAL**
   Sustainable design doesn’t just happen by chance. To be environmentally and financially effective, it needs to be a stated aim of the developer and all members of the project team from the beginning of a development scheme.

2. **PLACE SENSITIVE**
   Location, location, location! The site and its context (topography, microclimate, wildlife habitat, nearby development, etc.) should be the starting point for designing and building sustainably. A design that works in one location may not work as well in another place.

3. **INTEGRATIVE**
   Realising that there are close links between development layout, energy, materials, construction and pollution. The combined effect of positive design choices can bring maximum environmental, social & financial benefits, when the whole development acts as a unified sustainable system.

4. **LONG TERM**
   Sustainability does not have to be expensive. It can often bring short-term savings, but you needs to realise that you can get a greater overall return if you invest more to begin with. ‘Spending to save’ is not a bad motto.

5. **HEALTHY**
   Sustainability is about maintaining health and survival – human, animal and plant health, and most importantly the health of our planet. According to Gaia Theory, the earth is also a type of huge ‘living’ organism on which our own survival depends.

6. **EFFICIENT**
   Using less energy in the first place is more economical than producing more and reclaiming used energy. Energy efficiency is at the centre of sustainable design and good practice has shown that it can bring big savings, not only in the amount of energy used, but also in the investment in mechanical equipment.

7. **PARTICIPATORY**
   Design that involves users of a development (where they are known) and provides opportunities for future occupiers to take responsibility for their own energy use, and waste management, is more sustainable.

8. **CREATIVE**
   Creative and simple solutions are often the most sustainable in many instances. Advanced technology can play an important role in challenging situations, but over-designed and complicated technical ‘fixes’ use more resources and are often not available to, or affordable by, most people.

9. **FLEXIBLE**
   What we build now will often be in use in a century or more, so we must design what we build now in ways which, as far as possible, anticipate changing needs. Although we cannot predict future developments, we must build in ways which will make it easier to respond to changing needs throughout the life of the building.

10. **LOCALLY RESPONSIBLE**
    Sustainability is an incremental process and simple design features can have many benefits – the more local developments that are sustainably designed and constructed, the more sustainable will be the quality of life in London, the UK and the world.

11. **COOPERATIVE**
    Sustainable design works with nature – using the opportunities offered by place and time cycles – such as, day and night, the changing seasons, sun, wind, vegetation. It does not use unnecessary resources in trying to control nature (for example, by building homes on high-risk flood-plains and then putting up defences).

The following sections of this document cover the main aspects of sustainable design, as defined by the principles outlined here. We have also included some case studies of different kinds of development where these principles have been imaginatively and successfully applied. We hope you find it useful.
I.2 Legislation and Policy

The origins of sustainable development as an environmental approach arose from global meetings and agendas. An agreement on sustainability was signed by 180 countries at the 1992 Rio de Janeiro summit to protect the earth and prevent environmental, social and economic breakdown. The 1997 Kyoto Protocol set challenging targets for developed countries to reduce pollution and the amount of limited resources used.

The 2002 World Summit in Johannesburg agreed more priorities. European Union Directives are implemented through national legislation, and there are various legal, policy, financial and voluntary measures to tackle the UK Government’s sustainable development strategy. At strategic level, the Greater London Authority must make sure that London contributes to UK sustainable development.

In Brent, the Adopted Unitary Development Plan (UDP) included some sustainability policies but the Replacement UDP (Policy BE12) specifically includes more sustainable design, construction and pollution control issues. This SPG document develops the principles and requirements further.

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Brent Council is committed to working with developers, property owners, architects, surveyors and engineers – in fact, all our partners, to make Brent a place where the design of development is environmentally friendly and will provide a high quality of life. We have produced this guidance to:

- Provide guidance to developers, on ways of meeting Policies BE12 and other policies in the Adopted UDP, aimed at securing more sustainable development in Brent;
- Encourage developers and building professionals to consider sustainability from the earliest stages of the design process, and to go beyond minimum standards;
- Raise awareness among local residents, businesses and other Council units, by highlighting the expectations and features of current best practice in sustainable design, construction and pollution control.

How should you treat this Guidance?

Supplementary Planning Guidance is a material consideration in deciding the outcome of planning applications, so you need to show that regard has been given in your proposal, to the contents of this guidance.

This guide does not tell designers how to design or what a sustainable building should look like. It emphasises the main design principles and options of sustainability. If you are a building professional, you could use this guidance as a project tool to support you in exercising your professional judgement, and help you check that you are doing as much as possible to design and construct your projects more sustainably.

This guidance explains how you can achieve more sustainable design, construction and pollution control through the planning process; provides information on the main issues and factors to consider, and points you towards other more specific resources. You may have to compromise between different needs, limits and options. Both you, and we, may have to be flexible in designing and considering schemes.

### How to Use this Guidance

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I.4 The Application & Assessment Process

Pre-Application Enquiries

1 PRE-INCEPTION

- **Site** - Is your site ‘Brownfield’ or ‘Greenfield’?
  - Brownfield sites (which have been developed before) often offer benefits such as higher permissible density levels, being close to existing infrastructure, shops and services, as well as regenerating run down areas.

- **Location** - Is it Public Transport or Car oriented?
  - Sites in areas that have good public transport also have higher permissible density levels and a reduced need for parking spaces.

- **Buildings** – Should you Build New, Refurbish or Adapt?
  - Refurbished buildings conserve and recycle resources; can save time and money and can help regenerate derelict sites/areas while protecting urban character.

2 INCEPTION/FEASIBILITY

- A ‘Sustainability Strategy’ should aim to tackle the following three aims:
  - Environmental sustainability - efficient use of finite resources (land, water, energy, raw materials), reducing pollution (air, water, land, noise), minimising waste and enhancing/creating new habitats;
  - Economic sustainability - offsetting development costs with savings over the lifecycle of the building and marketing opportunities (unique selling point);
  - Social sustainability - reducing ‘fuel poverty’ (where people cannot afford to heat their homes properly) and removing ‘sick building syndrome,’ providing equal access and ‘designing-out crime’ (See SPGs 10 and 17).

3 STATUTORY CONSTRAINTS AND OPPORTUNITIES

- **Planning and Transportation**
  - What does the planning policy say of your proposed development (what is acceptable on your site)? Will you need to carry out Environmental or Transport Impact Assessments (EIA/TIA)?
  - Some brownfield sites have a nature conservation interest. You may need to make an early assessment.

- **Environmental Health**
  - Is the site contaminated? - What is required to deal with it?
  - Are noise levels acceptable? – What can be done to minimise problems?
  - Is the site in an AQMA? – What measures can be taken to enhance air quality?

- **Building Control**
  - What are the options for meeting the Building Regulations and achieving an even higher standard, where feasible?

4 SUPPLEMENTARY GUIDANCE

- **Sustainable Design, Construction & Pollution control:**
  - Consider sustainability from the start of your project, so that it influences the design, construction and operation of the development. This also ensures that it will have a minimal impact on overall costs and that it brings returns in terms of the attractiveness, quality and saleability of the end product.

- **Learning from Case Studies:**
  - Consider case studies to see if there are specific sustainability features that can be designed into your type of development (e.g. residential, commercial, employment, mixed)

- **Sustainable Design Checklist:**
  - Fill this in and submit with your planning application, to indicate the level of sustainability of your scheme and help us monitor progress.

5 INDEPENDENT SUSTAINABILITY ASSESSMENT (ISA)

This should be carried out for schemes meeting the above thresholds, if they score poorly on Brent’s sustainability checklist, and on Schemes requiring an EIA (as part of the EIA). Currently only the BRE has an independent, nationally tested methodology:

- BRE or licensed firms (BREEAM™ – Sustainability rating for offices, industrial, warehouse, BREEM Retail, and EcoHomes™ – Sustainability rating for homes).

Sustainability Assessments include the following (or other reputable methodologies):

- Arup’s ‘SPeAR’™ Sustainable Project Assessment Routine:
- Buro Happold’s PSPA – ‘Project Sustainability Performance Assessment’;
- NHS (bespoke NEAT Assessment) for health schemes;
- Institute of Civil Engineers, CEEQUAL – Environmental quality assessment scheme.

6 NEGOTIATIONS

The aim is to secure as many sustainability measures as feasible, within developments, by negotiation. For S.106 Planning Obligations & Conditions:

- An appropriate level of sustainability is expected to be ‘designed-into’ schemes on-site. Where the Council accepts this is not possible, ‘payments-in-lieu’ to offset its deficiency in sustainability terms, may be accepted, for; Renewable Energy/ CHP, SUDS, Clean Vehicle fuelling Stations, decontamination, etc. within the Borough. Operational conditions may be used in some consents to ensure developments function more sustainably.
The Unitary Development Plan contains policies which address the spatial implications, as well as the economic and social aspects of sustainable development. These are already well understood and integrated into the land use planning system. They are the subject of comprehensive UDP policies and detailed Supplementary Planning Guidance (SPG) and will not be replicated here. The following list is for reference:

A LOCATIONAL & SPATIAL ISSUES

• Public Transport Accessibility: Major trip-generating activities should be located in areas of very good or good public transport access, to ensure sustainable patterns of development, and reduce the need to travel by car (Policy SH3).

• Intensive (High Density) Design: A compact city is more sustainable than a sprawling, low density city. The increasing rate of urbanisation worldwide and the huge ecological footprints of cities mean that their outward growth should be constrained, to protect surrounding greenfield sites and rural areas. Good quality Intensive or high density design in accessible locations can help urban areas to accommodate needed growth, by making the best use of limited brownfield sites. (See UDP Policies BE11, H14, TRN6 and SPG 17).

• Mixed-Uses: A compact city is even more sustainable, if it is not too rigidly zoned i.e. if different activities are not totally separated (while still protecting vulnerable land uses and minimising the juxtaposition of conflicting uses). The close proximity of shops, services, and some residential development help to further reduce the need to travel by car, and create more activity, particularly in town centres and around transport interchanges. (See Policies BE11 & TRN6 and SPG17)

B ECONOMIC ISSUES

• Local Economy: This involves ensuring adequate employment land for the creation of new jobs in a wide range of sectors (industry, business, creative, leisure as well as retail). In order to maintain this diversity of employment opportunity, land for uses such as industry and warehousing is protected from higher value uses e.g. retail. (See Policy EMP8)

C SOCIAL ISSUES

• Community Safety: Crime and the perception of insecurity has a negative affect on people’s quality of life and the willingness of developers to invest in an area. Design can play a key role in making the public realm a safer place for everyone. (See Policies BE5 and SPG10).

• Social Inclusion: The 1980s out-of-centre shopping and leisure trend resulted in the closure or lack of upgrading of town centre facilities, which meant that people without cars, could not use these facilities. Convenient and sustainable access (i.e. public transport, cycling, walking) to fresh food, services and facilities, is needed for all members of the community to benefit. (See Policies CF1, CF2 & 13, TEA1, TEA2 & OS20).

• Adaptability: ‘Adaptable’ buildings can be modified or extended at a low cost to suit the changing needs of the occupants. This extends the life of the property and increases its value. Adaptable or lifetime housing is designed to enable future modifications to be made, catering for changing family size and lifestyles, ageing or disability, and home-working/telecommuting. Designers should:
  • Allow flexible roof space
  • Include a ground floor toilet/bath or lift options
  • Layout flexible external space
  • Use more open plan layouts and/or moveable partitions where suitable.

D ENVIRONMENTAL ISSUES

• Sustainable Design: This is the main focus of this supplementary guidance document. It is covered by Policy BE12 in the Replacement UDP:

BE12 Sustainable Design Principles

Proposals should embody sustainable design principles, commensurate with the scale and type of development, including taking account of:

Sustainable Design

• a incorporating built forms, technologies, orientation and layout that will contribute to reduced energy consumption (e.g. ventilation, heating/cooling, lighting) and associated emissions;
• b avoiding negative micro-climatic effects (e.g. wind turbulence, noise reflection);
• c taking into account where feasible, the potential for the re-use of existing buildings and materials and environmental effect of building materials used;
• d making adequate, integrally-designed provision for the storage and recycling of waste;
• e the potential for the management or recycling of water;

Sustainable Construction

• f methods to protect important flora, fauna and/or topographical features during construction and to minimise disturbance to local amenity;
• g methods to maximise recycling and re-use, as well as minimising waste during demolition and construction;

Pollution Control

• h sustainable remediation of brownfield sites redeveloped for sensitive uses, will be sought, and where contamination remains in-situ, a monitoring regime will need to be agreed;
• i measures to minimise the impact of poor air quality on sensitive users in Air Quality Management Areas (See Policy EP3); and
• j noise levels from traffic, trains (near railway lines) or other significant noise-generators.

In assessing the sustainability of schemes under these headings, regard will be had to the supplementary planning guidance.
Urban Climate & Site Layout Strategies

Urban areas create their own microclimate. Site layout planning can have a significant effect on environmental conditions, both within and around buildings, and will be influenced by the following factors:

Temperature
Air temperatures in a densely built urban area will always be higher than in a nearby rural area – a phenomenon known as ‘heat island’. In hot climates this can be a negative, but in cooler northern climates, such as the UK, it can be an advantage, reducing heating demand, and in very cold climates the phenomenon is often intensified by roofing over streets.

A resulting layout strategy for London would include:
- Maximising passive solar gain for winter heating by orientation and avoidance of overshadowing
- Using sunlight as an amenity both indoors and outdoors
- Providing wind shelter
- Maximising daylighting

Wind speeds
Although not as important as temperature, wind speed has a considerable effect on site layout strategy. For much of the year reducing wind speeds and providing shelter will contribute to lower heating demand, but in the summer air movement can play an important part in cooling strategies, particularly for commercial and public buildings.

Building Type and Heating & Cooling Needs
For residential developments, the heating load over the whole year always exceeds the cooling load. Much of this heating load will occur in the early morning however and cannot be provided by direct solar gain; shelter, insulation and particularly thermal mass will therefore be important for conserving passive solar gains.

For non-residential developments the cooling load predominates and key strategies will include:
- Using natural ventilation as part of a cooling strategy;
- Managing pollution levels to aid ventilation;
- Enabling the maximum penetration of natural light;
- Using passive cooling including seasonally effective shading;
- Exploiting heat sinks such as vegetation and water features; and
- Laying out efficient floor plans - deep plans need less heating and more cooling.

Summary
Environmentally sensitive urban design needs to consider the relationship between buildings and the spaces surrounding them. The emphasis should be on forms that avoid:
- Overbearing visual impact
- Wind effects on the ground, especially around tall buildings
- Areas in permanent shade
- Glare or dazzle from reflective building faces

Sustainable Energy Use in Buildings

Energy used in buildings accounts for nearly 50 per cent of Carbon Dioxide emissions in the UK. Energy is used to provide building services such as heating, cooling, hot water, lighting and for other appliances. The amount of energy and thus carbon dioxide produced is dependent on the building’s energy efficiency, which is largely determined by its design.

The aim of designing an energy efficient building is to produce a building that uses the minimum amount of energy to provide the intended function, such as comfortable living or working space with sufficient lighting and ventila-
tion (See UDP policy BE12(a)). This is achieved by balancing two aims:

1. Reducing the energy required by the building services by minimising heat loss in winter and heat gain in summer and using natural light and ventilation as much as possible.

2. Maximising the efficiency of the necessary building services to reduce the amount of fuel needed to provide those services.

This process needs to be integrated as using a smaller heating system can offset additional costs, such as higher levels of insulation. It is often the case that higher capital costs are usually more than offset by reduced running costs over the building’s lifetime. Integrating sustainable energy use in the design of a building has these benefits:

- Promotes energy efficiency and resource conservation
- Raises demand for/viability of renewable technologies
- Reduces operational and maintenance costs
- Reduces environmental impacts of energy generation
- Creates a healthy and comfortable environment
- Combats climate change

How do we measure Energy Efficiency?
The Energy Efficiency of a building can be calculated using computer models, which use information readily available at the design stage. There are 3 methods recognised by the Building Regulations for calculating compliance with Part L:

- The Government’s Standard Assessment Procedure (SAP) energy cost rating (from 1 to 120) is used for housing.
- The Carbon Index (CI) is based on the SAP rating. It measures CO2 emissions and ranges from 0 to 10. An index of 8 or more must be achieved to satisfy Part L.
- The ‘U-Value’ measured in W/m2K. Target values for the whole building or elemental values; for dwellings – ground floor insulation (0.2-0.25) (walls (0.35), doors & windows (average of 2.2 wood/pvc or 2.2 metal) and pitched roofs (0.16).

London’s Energy Strategy
The Mayor’s London Plan also requires proposals referred to the GLA, to include an Energy Use Assessment and to demonstrate their application of the Energy Hierarchy set out in the Mayor’s draft Energy Strategy. This requires 3 steps (see diagram):

- Apply Energy Efficiency measures (to minimise demand)
- Apply renewable energy (first install on-site – if not feasible purchase from grid)
- Optimise the efficiency of energy supplied (e.g. use CHP for remainder)

Energy use affects all aspects of sustainable development. Energy is used for transportation, for heating, lighting and ventilation, for the provision of water, for the procurement of materials, and for landscaping, construction and demolition, and waste disposal. It is considered a theme that runs through all the sections of this document.

Ecological Footprinting
The other consequence of energy use in all its forms is the bio-productive (land & sea) area required to supply it and absorb its wastes. This has been developed into the concept of an ‘Ecological Footprint’.

Best Foot Forward (with funding from the GLA) have analysed the ecological footprint of London and found it to be 49 million global hectares (gha). This is 6.63 gha per Londoner (UK average is 6.3 gha, but actual earth-share should be 2.18 gha per person). There needs to be a 35% reduction by 2020 for Londoners to be sustainable. This is a useful measure of sustainability per person in a scheme.
1.0 Passive Solar Design

Passive Solar Design is the concept of designing a building to reduce the need for additional building energy services by minimizing heat loss in winter and heat gain in summer and using natural light and ventilation as much as possible. This would include:

1. Solar gain for heating through proper orientation
2. Maximising the insulation value of the building fabric
3. Natural lighting and ventilation where possible
4. Solar overshadowing and reduction of summer heat gain

The converse is that coming to a satisfactory solution means avoiding the following problems:

- Over-heating due to excess solar gain in the summer
- Poor internal air quality in polluted urban areas
- Excessive heat losses through large glazed areas

1.1 Solar Gain for Heating

Solar gain can make a significant contribution to the heating of a building although care has to be taken, particularly for buildings with large glazed areas, to create a design that avoids overheating in the summer. This could potentially lead to a large air conditioning bill and very uncomfortable working conditions.

The relationship between glazed areas and orientation is critical. Orientation of the house within 30° of due south is a basic principle to maximise solar gains. It is important that glazed areas are made to a high specification to ensure that annual heat gains exceed heat losses. It should also be noted that in reality many people obscure windows with net curtains and blinds that also negate some of the heat gain effect. For further guidance on passive solar design, see the excellent DTI/DETR guide (Appendix III, Ref. 17)

It is generally acknowledged that conservatories and atria may be appropriate elements of passive solar design. However, unless carefully designed they can be counterproductive due to overheating in the summer (unless due consideration is given to shading and adequate ventilation is provided). Since even very good quality glazed units still lose heat at 5 times the rate of a well-insulated wall any heating installed in the conservatory will greatly add to the heat loss of a building.

1.2 Solar Shading & Avoiding Overheating

Overheating is one of the biggest problems in modern office buildings with large glazed areas and increasing amounts of electronic equipment emitting waste heat. In many modern buildings the answer has been to fit air conditioning, leading to large electricity bills and increased CO2 emissions.

This can be avoided if the building is designed with features such as large thermal capacity, night cooling, overshadowing and reflective glazing. The design of modern office buildings is complicated by the need to avoid glare on computer screens. If care is taken at the design stage it is possible to design glazed areas to maximise use of natural light whilst minimising heat gain in the summer. Generally this leads to a more pleasant working environment and will greatly reduce the size of the air conditioning plant needed, if not eliminate it completely.

1.3 Minimising Heat Loss Through insulation

In a new building insulation can be generally integrated into walls, roofs, floors, and glazing may have high thermal performance. Generally, insulation is very cheap and current practice shows that highly insulated buildings, of which there are many examples, can be used throughout the year with very little additional heating other than natural heat gains from body heat, lighting and appliances.

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Figs. 3c,d: Above, Passive solar design allows buildings to be spaced for winter overshadowing. Below, winter and summer sun paths, Source: Terence O’Rourke, ‘Planning for Passive Solar Design’, DTI.

Figs. 4a,b: Winter night (left) and day (right) – effect of sunspace. Source: Sydney & Joan Baggs ‘The Healthy House’
1.4 Natural Daylighting

Daylighting is the controlled entry of natural light into a building through windows, skylights, atria, clerestory and other building envelope components. A properly designed daylighting system should admit only as much light as necessary, distribute it evenly and avoid glare and overheating. It is therefore important to engage or consult with an architect or lighting designer who is experienced in designing for daylight.

Daylighting offers building occupants a pleasant and highly valued connection to the outdoors—natural light and views evoke positive physiological and psychological responses that promote wellbeing and morale.

These can translate into tangible economic benefits, as many studies show that daylighting can boost the performance and productivity of occupants by 15-20 per cent, and when considered at the design stage, can lead to significant reduction in the use of electricity for light and thus reduce overall energy consumption by 10-30 per cent.

When daylighting components are well integrated into the building design, the cooling load is reduced and less, or no mechanical ventilation is required. The BRE has published a number of documents, including ‘Site layout Planning for Daylight & Sunlight’, 1991, which give guidance on maximum and minimum percentages of wall areas to maximise natural lighting. Window sizes have a bearing on heat loss as well as fire risk to adjoining properties. Generally north facing glazed areas should be minimised with larger areas facing between SW and SE. Where possible this principle should be followed unless for reasons of security and privacy.

In internal situations, uncontrolled direct sunlight is to be avoided as it can lead to visual and thermal discomfort. Diffuse light, is an efficient and effective source of light. It is also possible to use ‘sunpipes’ (See Fig. 5) to bring natural light into windowless spaces such as corridors and stairwells.

1.5 Natural Ventilation

Ventilation has become a much more important issue with the advent of modern construction methods, which reduce air leakage and reduced use of open fires.

Air conditioning systems also require an airtight structure for effective operation. But, these can reduce internal air quality by allowing the build up of chemical pollutants. The key to a good ventilation strategy is to ensure adequate ventilation for good internal air quality, but not too much so as to waste heat.

Natural ventilation uses the passive stack effect and pressure differentials to bring in cool fresh air from the outside through the building without the use of mechanical systems. This process cools the occupants and provides comfort.

Naturally ventilated buildings will incorporate openable windows or other means of outdoor air intakes including roof- mounted ‘windcatchers’ to induce vertical and horizontal airflow. Energy demand for air conditioning and mechanical ventilation will thereby be reduced or eliminated (See Fig. 6).
2.0 Energy Efficient Building Services

The main aim of sustainable building design should always be to reduce the need for building energy services through passive solar design. This not only reduces annual energy bills, but can also reduce initial capital costs and general maintenance costs.

Energy efficient building services technologies are systems that use energy efficiently to provide services, such as heating, cooling, lighting, ventilation etc. [See UDP Policy BE12 (a)]. It is also important to realise that the total cost of providing a service such as heating includes not only the initial capital cost but also the ongoing fuel and maintenance costs. It is often the case that spending more on energy efficient systems at the construction stage saves much more money during the building’s lifetime.

2.1 EFFICIENT HEATING & HOT WATER SYSTEMS

2.1.1 Heating & Cooling

The purpose of any heating and/or cooling system in a building is to provide a comfortable temperature for the occupants according to the building use. Following the first principle of passive solar design, to minimise the need for energy services, it is important to ensure that the necessary building services are sized correctly to take advantage of reduced capital and running costs. Oversized systems can also be less efficient if running well below maximum load.

There is a tendency to oversize since many systems are designed to ‘rule of thumb’ principles that no longer apply to modern levels of insulation and other recent influences. A well-insulated house needs a much smaller heating system, with smaller radiators and boilers than would have been used a few years ago. In office buildings overheating is a major problem which can be greatly reduced through passive solar design and features such as overshading and specialised glazing.

2.1.2 Heating

A good quality heating system provides heat at the right temperature when and where it is needed. Maximising the efficiency of a system requires that the conversion of fuel to heat is very efficient, and that the distribution of heat is controlled and not prone to heat loss. In London gas is freely available and is cheaper and more environmentally sound than electricity as a fuel for heat. For gas, a condensing boiler is the most efficient heat source.

Heating controls are probably even more important in determining the efficiency of a heating system. They are also important in ensuring maximum comfort for the occupants. The basic principle is to control the heating system so that heat is provided when and where it is needed. As this is determined by the occupants it is also important that the controls are easily understood and therefore more likely to be used properly. In a small building a single thermostat and timer may be all that is required.

However in larger buildings, different areas may need different temperatures at different times and some parts of the building may cool or heat up more than others. In this situation the heating can be zoned so that the different needs within the building can be met. Local control over temperatures also provides additional comfort.

Larger heating systems can be very complex and this document is not a heating design manual. However the building developer can influence the design of the system by insisting that the building meets certain standards that are set as part of Environmental Assessment Methods or Government Best Practice targets for energy use.

Many larger buildings are occupied by several businesses and whereas in the past energy bills may have been included with the rent, separate metering provides an incentive for individual users to be more energy aware and allows greater control of energy use.

It is also possible to use waste heat either from a heat intensive process in the building or from ventilation to heat incoming air using a heat exchanger.

2.1.3 Community Heating & CHP (Combined Heat & Power)

Where there is still a large heat demand, usually resulting from the building(s) being in continuous use, or through specific heating requirements such as a swimming pool, Community Heating or Combined Heat and Power (CHP) may be a good option [UDP policy EP14].

Community (or district) heating involves using a central boiler plant (or other heat sources) to heat a number of buildings through a network of well-insulated underground
pipes. They can benefit from competitive fuel prices and can use alternative sources (combined heat and power or renewable energy, including geothermal.)

CHP makes use of the fact that when fossil fuels are used to generate electricity, most of the energy contained in the fuel is given off as waste heat. This heat can be used to provide heating and hot water. Mixed-use developments where there are various energy demands throughout the day tend to be the most cost-effective users of CHP. By the end of 2004 ‘micro’ CHP systems (essentially domestic boiler replacements) are expected to be commercially available.

2.2 VENTILATION & AIR CONDITIONING

Even with good thermal design, it is possible that some buildings will still need extra mechanical cooling. The limit for natural ventilation is 40 watts per m², and an office with high densities of people and electrical equipment could well exceed this. The 3 main methods of mechanical cooling are fans, evaporative cooling and air-conditioning.

Fans: These are the first choice, and are cheapest to buy and run. They circulate air but do not reduce temperature or humidity. Portable table and floor fans or fixed ceiling and wall models are available. They are useful if combined with an air-cooling system as the extra air movement provides comfort at higher thermostat settings.

Evaporative Coolers: The second choice for mechanical cooling should be evaporative coolers. They work best in low humidity conditions as the air has greater potential to absorb water vapour. They are less effective in high humidity conditions. Windows and doors should be open for evaporative cooling.

2.2.1 Air-Conditioning (Refrigerated Coolers)

Air-conditioning and mechanical ventilation systems are more expensive to run and produce more greenhouse gas. Good design of these can:

• Significantly reduce running costs
• Reduce carbon emissions
• Improve system reliability
• Reduce life-cycle costs

Energy-efficient mechanical ventilation (MV) can sometimes be the best solution to ensure minimum fresh air requirements and effective pollutant removal. MV systems consume energy through the operation of fan motors. The amount of energy used depends on the pressure in the system as air is distributed through the building as well as the volume of air transported. These typically contribute 40-50% of fan electricity costs. Energy is saved if:

• The pressure drop can be reduced
• An efficient fan is selected
• Excess supply of air is avoided

A large building with a continuous cooling load would be best served by a centrally located ‘packaged’ chiller that distributes the cooling via ducted air or chilled water. Factory produced packaged units avoid long refrigerant filled pipe runs, minimising refrigerant use and the possibilities for leakage.

A small building with a variable cooling load would be best served by a small number of individual units. At the design stage it is important to:

• Avoid over sizing units. This avoids units running inefficiently at part load – motors and fans are most economical at constant near full load. Proper predictive calculations and low building air leakage rates will help to reduce the size of the unit(s) needed.
• Set up controls to prevent heating and cooling systems running simultaneously.

Fig. 8a: Schematic of mechanical warm air ventilation system with heat recovery. Source: ‘British Gas, Watson House Bulletin Vol. 49’

• Use cooling system only when temperature exceeds 21º-24ºC
• Automatically switch units off at evenings and weekends unless there are special circumstances.

Heat recovery should be employed to pre-heat or pre-cool the supply air. The system should be controlled to either run at pre-determined periods or in direct response to the comfort/occupancy requirements of the building

2.3 Lighting

Artificial lighting will be required in all buildings. To minimise energy use, the following aspects should be specified:

• Design lighting to provide the correct levels; excess lighting levels can produce harmful glare as well as wasting energy.
• Ensure controls e.g. switches are easily understood and accessible, otherwise the temptation may be to leave lights on unnecessarily.
• Design wiring to allow smaller areas to be switched on or off instead of the whole room at the same time. This is useful where only part of an office is being used at night or tends to be darker than another part during the day.
2.4 RENEWABLE ENERGY SOURCES

Renewable energy is energy which is supplied, particularly as heat and electricity, from sources which are constantly renewed, and which do produce any extra carbon dioxide (CO2) emissions. Traditional fossil fuels are finite resources and always emit stored CO2 when burned. A wide range of renewable energy resources are technically possible in the UK, including solar, wind, biomass, hydro, wave, tidal and geothermal, but only solar, geothermal, emerging fuel cell systems and, to a lesser extent, biomass, tend to be suitable for the urban environment.

Biomass is the technical term for organic material, both above and below ground, living and dead, such as trees, crops, grasses, tree litter and roots. The types of biomass used in producing energy include ‘short rotation’ energy crops like willows and aspen poplars, wood and wood wastes, food and agricultural wastes and sewage sludge. This diversity and ready availability make biomass a strong alternative to fossil fuels for future energy requirements around the world. Today, fast growing trees like willow and poplar can be used as commercial energy crops to meet local heating needs, or used in power stations to generate electricity.

These energy crops offer a means of developing a renewable source in many agricultural areas of the country, supplying power and creating employment. Wastes from agricultural and forestry operations can also be used in this way. In urban environments sewage sludge and food wastes are the most readily available biomass sources, together with tree and hedge prunings from parks and streets.

Solar Energy comes in two main forms, solar water heating, which can provide about 50-60% of annual hot water demand for a building, and photovoltaics (PV), which converts sunlight directly into electricity.

Government grants are currently available to homeowners, developers and the public sector to install both technologies and their payback period can be significantly reduced by integration into the fabric of a building during construction or refurbishment using building components such as PV roof tiles/cladding.

Photovoltaic technology converts sunlight directly into electricity. The interaction of sunlight with semiconductor materials in the PV cells free electrons that generate electric current. PVs can provide extra power for customers who are already connected to the grid. Costs have fallen by 90% since the early 1970s, but more and more individuals, companies and communities choose PV for reasons other than cost, because:

- It is a clean sustainable energy source
- It is a clean back-up power source
- It generates power right at the source, with no fuel, noise or moving parts; and
- The power technology can be built into roofs, facades, canopies & windows.

Solar water heating uses the sun’s energy to heat water, reducing the use of gas or electricity. When installed properly, solar water heaters are more economical over the life of the system than heating water using electricity, heat pumps or heat recovery units. Solar water heating for buildings have two main parts: a solar collector and a storage tank. Typically a flat-plate collector is mounted on the roof, facing the sun. The sun heats an absorber plate in the collector, which, in turn heats the fluid running thorough tubes within the collector.

Many large commercial buildings can use solar collectors to provide more than just hot water. Solar process heating systems can be used to heat these buildings. A solar ventilation system can be used in cold climates to preheat air as it enters the building; and the heat from a solar collector can even be used to provide energy for cooling a building. Freeze protection for solar water heating systems is a must to protect the collector in very cold weather.

Ground Source Heat Pumps: These make use of the earth’s ability to absorb and store solar energy, resulting in almost constant temperatures of 10-12°C a couple of metres below the surface. This ‘low-grade’ heat source can be tapped by water circulating through pipes buried in the ground and then boosted to higher temperatures using a heat pump. Heat pumps produce 3-4 kW of heat energy for every kW needed to power the compressor, so are as efficient as a condensing gas boiler. They are most effective if linked to an underfloor heating system due to the lower temperatures involved. Reverse-cycle heat pumps are available which can provide both heating and cooling to commercial buildings.

Hydrogen Fuel Cells: There is a growing agreement that hydrogen will be an important source of sustainable energy. It is a clean fuel producing no CO2 when burned, can be electrolysed from water using any renewable electricity source and is easily transported by pipeline. It can then be used as a transport fuel or to supply the range of building energy needs. A community CHP system powered by hydrogen fuel cells is already operational in Woking and there are many other similar installations worldwide. There are no immediate implications for building design, but designers need to be aware of its future potential.
3.0 Water Conservation

3.1 Water Supply and Demand

Drinking water supply, managed by London’s water utilities (principally Thames Water) is sourced from the river network and groundwater. Since the establishment of groundwater sources in the 19th Century, substantial quantities of water have been removed, peaking in the 1960s when central London’s groundwater table fell to 98m below sea level. The decline in major industrial abstractions from the London Chalk Aquifer over the past 30 years, contributed to a steadily rising groundwater table, although in recent years it seems to be stabilising in central London.

The North London Abstraction Recharge System (NLARS) developed in the 1990s was a regional water management and conservation measure to allow treated mains water to be stored in London’s deep aquifer. This prevents large amounts of treated water stored in surface reservoirs being lost, particularly during extended drier periods. Dry weather conditions and water shortages in the 1990s made us aware of the need to reduce the amount of water we use. In areas of north London, where the NLARS operates, it has contributed towards more rapidly rising levels. But, increasing base load abstractions in south London will reduce flow to these northern areas in the long-term.

3.2 Conserving Water and Managing Demand

As with energy, the first step is to reduce the demand (Policy EP11) and then to find alternative sources to reduce the use of expensively treated drinking water for uses such as flushing toilets. Industry tends to be the heaviest user, followed by hospitals, hotels, schools and residential developments. In commercial and domestic buildings, the demand for water can be reduced as much as 50% using a variety of simple and innovative strategies that are integrated into the plumbing and mechanical systems, as well as the landscaping design. Integrated water management can deliver a favourable economic return while demonstrating responsible use of this precious resource. Options for further reducing water use and cost include the following:

More Efficient Fixtures: Under the Water Regulations 1999 all new toilet fixtures must use no more than 6 litres per flush (previously 7.5-9 litres) or be dual-flush in a ratio no more than 6:4 litres (for light to full flush respectively). This can be reduced to 4.25 litres in homes. Flushing systems may be flap/drop valves, siphons or pressure cisterns approved with the pan. Other water-saving options include flow regulators, faucet aerators in sinks and low-flow showerheads in buildings where showers are provided (typically those that have in-house exercise facilities or on-site bicycle parking).

For new-build, changes of use and alterations/ extensions to water system in non-domestic buildings, the list of installations that must be notified in advance, to the water supplier (and fitted by an ‘Approved Contractor’) include showers, large baths (over 230 litres), water softeners, some bidets and swimming pools of more than 10,000 litres.

Waterless Urinals & Toilets: Building Regulations approval for waterless urinals and toilets is increasing, as is their commercial availability. No water is needed and there is no smell. The urinals are becoming common in institutional settings, such as elementary and secondary schools, campus situations and corporate headquarters. Waterless/composting toilets were initially used in dry or remote locations such as camping, military sites, ski resorts and nature reserves. They are beginning to be used in some schools/universities, visitor centres, corporate settings (e.g. Office of Public Works Ireland; Bradford Metropolitan Council) and residential homes.

Table 3: Water Volume Collected by Roof Area in London

<table>
<thead>
<tr>
<th>Area</th>
<th>Rain</th>
<th>50 sq.m (Semi-detached)</th>
<th>75 sq.m (Detached)</th>
<th>100 sq.m (Self-build)</th>
<th>125 sq.m (Non-residential/ Commercial)</th>
<th>150 sq.m (Non-residential/ Commercial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>650mm</td>
<td>19.5 cu.m</td>
<td>29.25 cu.m</td>
<td>39 cu.m</td>
<td>48.75 cu.m</td>
<td>58.5 cu.m</td>
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</tbody>
</table>
Rainwater Reuse: Rainwater from roof drains can be piped directly to a storage tank and used for gardening, toilet flushing and washing machines. The volume of rain captured (cubic metres) depends on roof area and annual rainfall (See Table 3 opposite).

Water-Efficient Landscaping: Landscape architects and designers can specify native plantings, which use no water after becoming established, as well as drip irrigation and other low-water-using systems.

Cooling Towers: Sub-metering can reduce sewer charges by removing charges for evaporation water loss.

Groundwater can be an environmentally friendly source for many purposes, such as for cooling in air-conditioning air-conditioning plants. Water from such uses can also be reused as grey water for other processes. Groundwater abstraction is subject to hydro-geological assessments of availability and is a licensed activity unless for domestic purposes.

Greywater Reuse: Grey water from basins, kitchens and food service locations can be used for toilet and urinal flushing, cooling tower or boiler makeup water, landscaping and on-site water storage for fire fighting. Such systems require dual piping to route the grey water and appropriate valves, filters and signage.

3.3 Design Considerations, Costs and Benefits
Water conservation is most cost-effective when integrated into the design of a building’s plumbing, mechanical, fire-safety and landscaping systems. A design strategy is to create multiple uses for each litre of water: Potable water can be used for drinking, hygiene and health; recaptured water can be used for toilet flushing, boiler/cooling tower makeup and landscape irrigation.

For long-term savings, it is best to measure water use as part of on-going building operations and to identify short-term improvements in fixture, circulation and wastewater management design.

Where groundwater is used to cool or heat buildings, it is often an energy efficient and cost effective method with secondary benefits (installation and maintenance can be cheaper than conventional systems).

Water conservation can improve a building’s bottom line by reducing water, sewer system and “system development” charges. These tend to include fixed charges that may vary with meter size and consumption charges based on monthly or seasonal water use.

4.0 Materials Specification
The materials specified within a building and its grounds play a crucial role in achieving long term sustainability—the ancient Egyptian pyramids have lasted well over 5,000 years! Other well-known and much-loved buildings have been around for hundreds of years. However, the average modern building is designed to have a life of about 60 years, when it could be designed, with good protection detailing, to last 100-200 years. The energy used in manufacture and transport of materials in the UK amounts to 24% of total used by all UK industry. UDP Policy BE12(c) requires you to consider the environmental effects of building materials.

This section draws heavily on two approaches – firstly, the Environmental reference Method (EPM) pioneered in the Netherlands by Annil, Boonstra & Mack, and the Environmental Profiling System (EPS) developed in the UK by the Post Office, BRE & Oxford Brookes University. The EPM is based on a graded system of weighing the effects of

Checklist of Good Practice Pointers

<table>
<thead>
<tr>
<th>Embodied Energy</th>
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<tbody>
<tr>
<td>• Insist manufacturers provide environmental impact information (using them cautiously – only as an indication of level of impact) and check with independent sources, where possible e.g. BRE’s Environmental Profiles Database;</td>
</tr>
<tr>
<td>• Consider transport, recycling and reuse factors (for the same product, locally derived sources use less embodied energy);</td>
</tr>
<tr>
<td>• Use more recycled &amp; reclaimed products (have relatively low embodied energy);</td>
</tr>
<tr>
<td>• Minimise use of highly processed, embodied energy-intensive products;</td>
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<table>
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<tr>
<th>Toxicity and Emissions</th>
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<tbody>
<tr>
<td>• Avoid materials that are known or suspected to be toxic (highlighted in the Guidance tables in Appendix II);</td>
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<tr>
<td>• Use safer alternatives where available &amp; technically feasible (precautionary approach);</td>
</tr>
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<table>
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<tr>
<th>Biodiversity</th>
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<tbody>
<tr>
<td>• Check materials have a low impact on biodiversity of plants and animals</td>
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<tr>
<td>• Check materials have low impact on soil quality and/or micro-climate;</td>
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<table>
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<tr>
<th>Renewable</th>
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<tr>
<td>• Use as much renewable, natural (raw) materials as possible;</td>
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<tr>
<td>• Minimise use of limited raw materials.</td>
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<table>
<thead>
<tr>
<th>Durability/ Waste/ Recycling</th>
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<tbody>
<tr>
<td>Design for deconstruction &amp; reuse with:</td>
</tr>
<tr>
<td>• Robust, removable materials;</td>
</tr>
<tr>
<td>• Small, easily handled components;</td>
</tr>
<tr>
<td>• Removable fixings, (bolts, screws, and clips) rather than complex mechanical fasteners;</td>
</tr>
<tr>
<td>• Homogeneous rather than composite materials</td>
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<tr>
<td>• Layered, instead of glued, components.</td>
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materials on a range of issues; eco-systems, resource-scarcity, emissions, energy use, waste, re-use & durability considered over the extraction, production, building, use and disposal phases of their lifecycle. The EPS assessed the production, use and disposal of materials against primary energy, emissions, resources, reserves, waste generated and recycling.

Both methods are however, roughly comparable - the differences being that the EPS used relative assessments applicable only within each select group (more liberal interpretation) of mainly construction assemblies i.e. cavity walls, roofing systems - while the EPM used a more absolute comparison of environmental performance (stricter environmental interpretation) across individual materials. The Scottish 'Sustainable Housing Design Handbook', the guide arising from the Findhorn Community's practical experiences in Scotland, 'Simply Build Green', and BedZed's more recent Construction Materials report, have also been very useful resources.

Indications of materials' relative environmental sustainability for a selection of building elements are summarised in the Guidance tables in Appendix II, which are not meant to be definitive or exhaustive. They should be considered as a first step in finding more sustainable materials. There are detailed explanations of the performance of these and other materials in the 'Handbook of Sustainable Building', the 'Green Guide to Specification', the 'Green Guide to Housing Specification' and the 'Green Building Handbooks' (See Appendix III).

New information comes forward continuously, so they should be considered a general guide to the relevant factors to be considered when choosing materials - there may be new issues that make other alternatives more sustainable. Applicants can provide comparable, more up-to-date information, where available, about their choice of materials.

Sustainable specification requires a balance to be struck between the type of design, cost and availability factors. There are few ‘correct’ answers – a project using ‘environmentally-unsound’ types of material for every element may achieve an unacceptably low sustainability rating, on the sustainable development Checklist, but it may also be impractical in some instances to expect only the best of the ‘environmentally-preferred-alternatives’, to be used throughout a development.

An indication of the relative cost of materials is given in the adjacent tables. However, this only represents the capital costs and it should be remembered that any additional costs could lead to long-term savings when the costs-in-use are considered.

<table>
<thead>
<tr>
<th>Guidance Table (example) – See Full Tables in Appendix II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Element</strong></td>
</tr>
<tr>
<td>Thermal Insulation</td>
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<tr>
<td>Thermal Insulation</td>
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</table>

Note: When purchasing materials direct from a large building merchant, check to see if they operate a Supplier Environmental Audit (SEA) similar to that initiated by B&Q. This indicates the extent to which they have ‘greened’ their supply chain. The possession of the ISO 14001 standard is also a good indication of how seriously an organisation takes its environmental responsibilities. (See Appendix VI).

4.1 MATERIALS’ LIFE CYCLE ANALYSIS FACTORS

**Timber Products**

Timber is a versatile traditional material for many building elements. It is also a renewable resource, if forests are managed in a sustainable way. The FSC global forest certification system is a simple label recognised by the main environmental and social non-governmental organisations (including WWF, Greenpeace, Friends of the Earth, indigenous people’s groups & trade unions) as well as the BRE & DeFRA. It is the highest form of accreditation and includes 2 key dimensions: Forest Management and Chain of Custody (COC) certification. Specifying FSC timber demonstrates compliance with BREEAM requirements, and using at least 75% gives full credit for EcoHomes.

**Masonry & Alternatives**

Brick and concrete block cavity walls are the most commonly used materials for residential development in the...
The widespread use of quick setting, high-performance mortars in masonry construction relates to the now rapid setting of materials used in modern construction. However, timber-framed buildings were the standard until the mid-17th century, and are still commonly used in many European countries. Many of the pre-fabricated systems being developed as part of the Egan ‘Rethinking Construction’ push for faster, higher quality construction push for faster, higher quality construction. A growing number of Councils and Housing Associations are adopting PVC-free policies. Many developments are successfully reducing or eliminating PVC use. The new Tate Gallery of Modern Art for instance, minimised the use of PVC. (Alternatives used for all piping (rainwater, soil and waste) roofing materials and electrical cables. (PVC remains only in some underground pipes sleeving).

UK. Brick and stone are common cladding for framed buildings. Masonry products are popular due to their strength, durability and low maintenance, but as materials quarried from non-renewable resources, all have significant environmental impacts (i.e. energy, transport & landscape) in production.

However, timber-framed buildings were the standard until the mid-17th century, and are still commonly used in many European countries. Many of the pre-fabricated systems being developed as part of the Egan ‘Rethinking Construction’ push for faster, higher quality construction are timber framed (with brick or timber cladding).

Other alternatives include perforated clay bricks, rammed earth (stabilised with small stones, a little cement, lime or bitumen) industrial hemp and straw-bale (especially as an infill). Unfired clay bricks are also a good option for internal wall partitions, allowing a building to ‘breathe’ by absorbing and releasing moisture.

Mortars

One of the main challenges to the recycling of materials used in modern masonry construction relates to the slow widespread use of quick setting, high-strength Portland cement mortars, which make the reclamation of attached bricks and blocks very difficult. The use of hydraulic lime mortars in pre-1940s construction has made those bricks easier to reclaim, but their imper-ensure the new work is visually and physically compatible with the old.

Materials which enable lime mortars to set more quickly include ash and brick dust. Known as ‘pozzolans’ after the volcanic additives used by the Romans, these materials are widely found in the lime mortars used in old buildings and monuments. Where conservation work is required, new mortars should match these mortars to ensure the new work is visually and physically compatible with the old.

A ‘pozzolan’ is added to lime mortar (or to Portland cement mortar) to increase durability and, in the case of lime mortars, to provide a positive set’. In general, the softer pozzolanic materials (such as brick dust from clay bricks fired at less than 950°C) yield more permeable and flexible mortars, whilst the hard-burned materials, such as PFA, tend to yield a harder mortar, similar to cement.

Windows & doors

PVCu has become popular, but contains vinyl chloride – a toxic Organo-chloride – other sources include CFCs (which destroy the ozone layer) pesticides, dioxins, chlorine bleach (used in paper manufacture) and PVC plastics. They are bio-accumulative and persistent in the environment. PVCu manufacture is highly energy intensive, using a fossil fuel feedstock. Alternatives to PVCu include ethylene-based plastics. (See Table 4.5.1 in Appendix II for window frames). Many housing providers automatically specify PVC windows because they believe them to require less maintenance. Whilst this may have been true ten years ago, modern high-performance timber windows that have been factory-stained typically have a re-staining/re-painting cycle of 6-8 years. These can now be purchased with 30-year guarantees, as against 15-20 years for PVC windows.

A growing number of Councils and Housing Associations are adopting PVC-free policies. Many developments are successfully reducing or eliminating PVC use. The new Tate Gallery of Modern Art for instance, minimised the use of PVC. (Alternatives used for all piping (rainwater, soil and waste) roofing materials and electrical cables. (PVC remains only in some underground pipes sleeving).
on climate moderation within a development, providing a heat sink, summer shading and shelter from winds, as well as privacy screening and a barrier to traffic pollution. Planting can also be used for boundary treatments. Existing vegetation should be maintained where possible and supplemented after construction with new planting.

The use of native species whenever possible is preferable as they maintain existing ecosystems and are more likely to thrive in local conditions. However, carefully chosen exotic (non-native) plants can add to the aesthetics of a landscape and provide habitat and food, particularly for birds; e.g. Cotoneaster & Pyracanther. Some non-native plant species can be invasive and out-compete native species, causing damage to ecosystems; for example, Japanese Knotweed, Himalayan Balsam, Rhododendron Ponticum and Sycamore.

Planting on the pitched and sloping roofs of buildings (Green or ‘Turf’ Roofs) can help keep buildings cool in summer by providing thermal mass and reflecting solar radiation as well as providing a location for grey water filtering (winter insulation benefits only occur when the roof is dry). Green roofs can also provide an amenity space for the users of the building. Roof planting should only take place on roofs that have been strengthened to ensure they can carry the extra weight of moist soil, planting and associated materials.

5.3 Biodiversity Issues

The external environment has an important role to play in encouraging biodiversity of species. Building surfaces (e.g. green roofs, climbers and vegetated balconies) can also deliver biodiversity benefits. The main principles that should be followed to ensure integration of these issues in the development and planning processes are:

1. Survey
2. Avoid existing habitats, or
3. Enhance existing habitats and create new ones
4. Retain and incorporate
5. Protect against potential negative effects
6. Compensate where damage is unavoidable
7. Manage and monitor

In areas of nature conservation importance, the use of plants and seeds of approved local provenance may be required.

5.4 Hard-Surfacing

In urban areas, impermeable hard surfacing, especially over a large ground area, often causes flooding. Due to the danger to people of floods, damage to property and concerns over global warming, there is a great need to reduce the likelihood and impact of floods, by ensuring:

- Areas of hard materials are minimised where possible by design, or with planting.
- Hard surfacing is incorporated with planting, for example, car park paving can be created with paving blocks with gaps designed within them that allow plants to grow through.
- Life span of materials is at least 10 years, they should be:
  - Vandal proof (where publicly accessible)
  - Fire resistant,
  - Resilient
  - Easily maintained
- Alternative products, such as water-permeable paving, are specified. Permeable blocks and paving are becoming more readily available from DIY companies and trade suppliers (See Appendix III).
- They are being increasingly used in developments. For large car parks, oil interceptors should be installed to capture oil prior to discharge. Depending on the specific use, posi-
tion, and local conditions, the design of the hard surfacing and textures can be varied to enhance the aesthetic qualities.

5.5 Sustainable Drainage Systems
Sustainable Urban Drainage Systems (SUDS) have been developed to cope with draining water from sites in an environmentally safe way (UDP Policies EP9, EP10 & EP13). They reduce pressure on the existing drainage systems, prevent or reduce the likelihood of flooding and also help clean up pollutants in run-off (such as oil from car parks). SUDS are environmentally and physically safer than conventional drainage systems and play an important part in the sustainability of external works.

It is important, where possible, for SUDS to mimic natural drainage patterns and systems and they should incorporate preventative measures as well as resolve problems arising after flooding events have occurred. PPG 25 lists the following contributions of SUDS towards sustainable development:

- Managing impacts at source, not downstream;
- Managing water run-off rates, reducing the impact of urbanisation on flooding;
- Protecting or enhancing water quality;
- Sympathising with the setting and needs of the local community;
- Providing opportunities to create habitats for wildlife in urban watercourses;
- Encouraging natural groundwater recharge (where appropriate)

SUDS systems are now being incorporated into roofs. The Environment Agency should be consulted if SUDS are proposed, especially on contaminated land. Sustainable drainage system work best when ground conditions are capable of absorbing water during wet periods. In Brent, soil strata mainly consist of stiff London clay, which is now becoming saturated and not absorbing water as it did a few years ago. This has become problematic as the Council is receiving complaints from residents regarding flooding and waterlogged gardens. Traditional garden water butts for watering/washing have been fading away with advent of sprinklers.

Most of the public sewers in Brent were laid during 1920/30s. The drainage network is not capable of receiving additional flow from new developments and is in need of upgrading. Thames Water is responsible for its maintenance and now insists that additional flow from large new development is stored on-site.

Onsite Stormwater Detention (OSD) is an option where sustainable drainage systems are not practicable due to soil and ground conditions. This is normally achieved by installing large diameter pipes, culverts or tanks. The basic principal of on-site storage is that during heavy rain, surface water run-off from roofs, car parks and large paved areas is directed to a storage tank. Water is stored and normally discharged to main sewer using suitable control device. At the end of heavy rain, the storage tank is typically emptied either as gravity or pumped system and ready for the next storm.

A sustainable approach is to reuse stored storm water volumes for garden irrigation and/or exposing the system by incorporating visible water features such as fountains and mechanical misters for evaporative cooling. This involves a pump for drawing water from storage tanks/pipes and a filter. Also, an outfall is still required; otherwise tank would fill up and overflow if stored water is not fully used.

5.6 Street Furniture
It is essential to recycle and reuse landscape materials. Fixtures and fittings, materials used externally should take account of the principles in the Materials Chapter and the Guidance Tables in Appendix II of this SPG. Other relevant Guidance includes SPG 5, 13, 17 and 18, UDP policies and any relevant Conservation Area Guidance notes.

5.7 External Lighting
Policy BE8 in the borough’s UDP states a requirement that external lighting should “…conserve energy through the use of low energy or renewable lighting systems where appropriate and should preserve the darkness of the night time sky…”. There has been a new initiative for “dark skies” to reduce the level of light pollution from street-lights. This has biodiversity effects too, particularly for bats. (See the GLA guidance note). The main change to be made to lighting in terms of reducing light pollution in the night sky is to reduce or completely remove the amount of “uplighting” there is from the lamp which is directed towards the sky as well as directed to the ground. By redesigning the lamp to remove the uplift component, this effect will be eradicated.

Controlling the levels of lighting is also important for sustainability in terms of the economic savings that can be made. Many standard streetlights use great amounts of energy, which can be reduced and even cut in half. This can be done through using different lighting systems, for example dimmer systems in areas that are not used as intensively during the night and although a degree of lighting is required, the full level of street illumination is not always necessary.

Using different fixtures and fittings as well as innovative new ideas relating to the makeup of lamps and bulbs used can make energy savings. Directing light more accurately on designated areas, without any uplighting, will reduce glare (light pollution) and also energy consumption as making fewer lights more focused will remove the need for more street-lights. (See Appendix III for more details).
B Sustainable Construction

6.0 Construction

The construction industry in London consumes 10% of over 360 million tonnes of materials used in the UK, but generates 25% of its 70 million tonnes of construction and demolition (C&D) waste per year (4 times more than the domestic sector). The UK is running out of suitable sites for landfill and the cost of landfill is increasing. Construction is also responsible for 30% of all road freight in the UK.

The 1998 Egan Report, confirmed the inefficiency and wastefulness of the industry, recommending new partnering, contractual & pre-fabrication processes, a reduction in waste generated and taken to landfill, and reusing & recycling as much as possible. (See UDP Policy BE12[f-g]).

6.1 Main Issues

• Waste generated during construction (cost and disposal)
• Impacts of construction processes on the natural environment (habitat, water, air) and on people (noise, fumes, dust, public realm/local amenity)

6.2 Waste Management on Site

At a very early stage of the project, the contractor should consider opportunities for reusing and recycling wastes both on and off site – at the very least Egan compliance should be achieved.

Managing Subcontractors:

• Follow a system of allowable waste percentages; this has worked on many other sites in the country. Make a careful assessment of how much waste is acceptable at the pre-work agreement stage, and agree a percentage with the subcontractor.
• Give the subcontractors responsibility for purchasing the raw materials they need, and disposing of any waste material from their activities – this provides them with a direct financial incentive to minimise waste.

Minimise Disposal Costs:

A landfill tax is applied to nearly all controlled waste being disposed to landfill:

• Wastes should be segregated in order to keep disposal charges to a minimum.
• Avoid contamination, by ensuring all types of waste that decompose (e.g. food wastes, grass cuttings, tree branches) are stored separately and taken to a composting site.

Waste Management:

• The Environmental Protection Act (1990) introduced the Environmental Protection (Duty of Care) Regulations, 1991 and spelled out the legal obligation to have waste carried by a Registered Carrier and disposed of, or deposited properly at a licensed facility. It exempts many recycling activities from waste management licensing.

• Ensure that you know the Waste Management Licensing Regulations (1994).
• Make sure you have a Waste Transfer Note which describes what waste you are holding.
• Segregate your waste on site and label each container.
• Appoint or designate a Site Waste Manager.

Site Waste Manager’s Role:

• Ensure compliance with Duty of Care at all times
• Storage of diesel – Place all diesel containers in a bund or a secure drip tray to prevent spillage onto the ground.
• Chemicals & Oils – Store them in labelled containers kept

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Table: Construction Wastes worth separating for reuse & recycling

<table>
<thead>
<tr>
<th>Material</th>
<th>Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Features, and Unwanted fixtures &amp; fittings</td>
<td>Reuse or ask specialist Charities to collect for redistribution</td>
</tr>
<tr>
<td>Blacktop (Tarmac)</td>
<td>Recycle for use in bound layer of road</td>
</tr>
<tr>
<td>Cement</td>
<td>Dispose of waste cement in covered skips to minimise dust</td>
</tr>
<tr>
<td>Clay &amp; Concrete Pipes</td>
<td>Reuse</td>
</tr>
<tr>
<td>Concrete</td>
<td>Recycle for use as aggregate in new concrete</td>
</tr>
<tr>
<td>Excavation Spoil</td>
<td>Reuse for landscaping</td>
</tr>
<tr>
<td>Metals (e.g. RSJ’s, roof sheets)</td>
<td>Reuse/recycle</td>
</tr>
<tr>
<td>Oils, Paints &amp; Chemicals</td>
<td>Reuse</td>
</tr>
<tr>
<td>Packaging &amp; Plastics</td>
<td>Recycle (ask the supplier)</td>
</tr>
<tr>
<td>Pallets</td>
<td>Return to suppliers; do not burn</td>
</tr>
<tr>
<td>Piles &amp; Pile Caps</td>
<td>Reuse</td>
</tr>
<tr>
<td>Timber (e.g. floorboards, rafters, beams)</td>
<td>Reuse for shuttering/hoardings</td>
</tr>
<tr>
<td>Tiles, slates, coping</td>
<td>Reuse</td>
</tr>
<tr>
<td>Topsoil</td>
<td>Reuse for landscaping</td>
</tr>
<tr>
<td>Unused Blocks/Bricks</td>
<td>Reuse or sell on to builder’s yard</td>
</tr>
</tbody>
</table>
in a place known to all staff. Clear any spillage immediately and notify the Environment Agency.

- **Control of Water Supply** – To avoid wasting water, monitor all connections to stand pipes and leaking hose pipes, repairing or replacing as soon as possible.
- **Canteen Waste** – Dispose of immediately in the correct storage bins. Report any vermin to the Council’s Environmental Health Unit.
- **Audit** – Carry out an inventory of the materials on site.
- **Obtain a list** of potential buyers and sellers of used or recycled materials in the location of the site.
- **Draw up and implement** a Waste Management Plan.

### 6.3 Available Tools/Resources:

- **SMARTWaste** (Site Methodology to Audit, Reduce and Target Waste) – A BRE developed PC computer software tool making it easier to record, categorise and track wastes by source, type, amount, cause and cost.
- **Materials Information Exchange** (MIE) – Free internet-based database of sellers and potential buyers of recycled building materials, set up by DTLR and now managed by SALVO.

### 6.4 The Benefits of Construction Waste Management include:

1. **Less environmental degradation** – air (transport, incineration, hazardous gases) land (contamination from fill contents), water (spillages, leakages from landfill) and limited resource use (mining, quarrying, drilling, felling)
2. **Reductions on Cost of Purchasing Materials** (e.g. primary aggregate);
3. **Savings in disposal costs** (e.g. landfill tax)
4. **Reductions in transportation costs** (number and distance of lorry journeys)
5. **Revenues from reuse and recycling**
6. **Employment creation** – 42,000 jobs by 2000 (BRE/SALVO survey)
7. **Environmental credibility.**

### 6.5 Other Construction-related Environmental Issues:

The Construction Industry Board (CIB) operates a ‘Considerate Contractor Scheme’ to address most of the following issues.

1. **Protecting the natural environment:**
   - Effects of construction on soil compaction, water quality and drainage (contact Drainage Engineer, Appendix II)
   - Protection of trees/wildlife habitats and/or reinstatement of topographical features (contact Brent Ecology Unit/Planning Landscape designer, Appendix II)

2. **Protecting local amenity:**
   - Noise & vibration (See Noise chapter on pg. 29)
   - Smells, dust, fumes (See Air quality chapter on pg. 27-28)

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**Figs 14c,d,e:** Left, Lenotec timber panel system, Below Left, Steko block construction, Below Right, Steko timber block. Source: Construction Resources.

**Top, Locating protective fencing Above, Unavoidable Service trenching** Fig. 14f: Source: British Standard 5837, 1991 (Guide for trees in relation to Construction)

**Fig. 15a:** Norfolk & Warwick ward block demolition. Source: 77 Demolition & Haulage, ‘Demolition & Dismantling’, NFDC Journal, Winter 2003.

6.6 DEMOLITION

The first preference is to retain and reuse existing good quality buildings.

Where demolition is necessary, the contractor should consider a selective programme, where the most valuable or potentially contaminating materials and fittings can be removed safely and intact for later re-use or processing before the actual demolition commences.

However, deconstruction of buildings and reclamations of materials, are preferable to wholesale demolition. A Demolition Protocol has been produced by EnviroCentre for London Remade and the Institute of Civil Engineers (ICE) amongst others.

The Protocol establishes an ‘audit trail’ for demolition materials – from an initial building audit to the setting of targets for recovery, the recycling/reuse in new build projects – and a process for verifying their achievement. Applications involving demolition will be expected to have regard to the Demolition Protocol.

7.0 Deconstruction

Deconstruction is the dismantling of a structure in the reverse order in which it was constructed - the process roughly entails those materials that were put on last to be removed first. Focusing on each material type in reverse order of the construction process is the most efficient practice for separating materials for reuse, recycling, and disposal at the time of removal.

This section is taken directly from the work of David Turner, NFDC (National Federation of Demolition Contractors) and Bradley/McLendon, of Florida University (Appendix III; Refs. 33 & 32).

7.1 How to Deconstruct a Building for Materials Reuse

Time is the most important resource for deconstructing and reclaiming building materials – there will be no materials for re-use, if there is no time to dismantle re-useable materials! So, adequate time must be scheduled.

The first thing that needs to be done is to carry out an audit of the building(s) to assess the level of reclaimable materials/components present. Other issues important to the deconstruction process are:

1. The working platform or area and how well that assists or impedes the deconstruction of an adjoining, overhead, or element below.

2. Clearing a work site around the building, particularly so that roll-offs and the movement and stacking of materials are not impeded.

3. Timely removal and drop-off of the roll-offs, in order to not impede the removal of components directly into the roll-off, while having them as close as possible to where the major deconstruction effort might be occurring. For example, having a roll-off next to the structure to capture asphalt roofing shingles, but removing it and placing the next roll-off to not impede the removal of exterior siding.

4. Removing both re-useable/recyclable and disposable materials in a timely manner is critical to the safety of the job-site and the efficiency of both the deconstruction and the processing activities.

5. Many nails are placed in such a way as to not be readily accessible to a prying device. Wood is sometimes damaged in the extraction process. In all cases, a material will be removable by use of levelling, unscREWING or unbolting, and should not require a sledgehammer or other smashing tool.

6. Arranging on-site removal of materials as they are processed in order to minimise the effort invested in loading, transporting and storing materials in another location, while at the same time insuring that materials left at the site are not stolen.

7. Good deconstruction sites require sufficient room to work around the building, including de-nailing and stacking areas away from the structure, space for roll-off delivery and pick-ups, but that are also highly visible to attract potential customers for the salvaged materials.

8. Co-ordinating workers and increasing their awareness of how materials must be removed, and the importance of balancing efficiency with minimal damage to the materials is critical. Maintaining awareness of what is salvage and what is disposal requires a high degree of supervision.

9. Placing de-nailing stations either inside or under trees for shade in summer.

10. Nails are often more easily removed when the material was still in place in the building such as a stud wall which would have the nails used to attach a finish material. Damage or multiple nails in the ends of timber are more readily removed by using a battery-powered saw to simultaneously trim the end and cut off the nails.
7.1.1 Extensions
Variations occur between whole building sections, for example, an extension may be removed separately from the rest of the building. Extensions are an obstacle to removing one type of material or whole sections of the original structure, but can provide a working surface for other parts of the building, and be structurally dependent on other parts of the building. Therefore, extensions can be entirely removed, even if this breaks up the material-by-material consistency of the deconstruction process. Entire extensions to a building should be removed at one time, and within each extension or the core structure, materials will be removed in the reverse order of their construction.

7.1.2 Roof Tiles & Slates
• Clay tiles and all natural slates are generally desirable for re-use, concrete tiles tend to be crushed and screened into recycled aggregate (RCA).
• Roofs should be designed with safe access, built in edge protection and anchor points. At present with many tiles, the value of salvage does not cover the cost of edge protection, because most deaths on construction sites are from a height. Therefore the Health and Safety Executive (HSA) only allows roof reclamation if there is scaffolding on the building to the reclamation level.
• Soft non-ferrous fixings should be specified especially with slates (copper and aluminium nails). This simple change prevents almost all the breakages that typically happen whilst stripping a roof.

7.1.3 Steel Sections
UBs, RSJs, Channels, Angles etc. can easily be disassembled using mobile craneage, trained riggers and slingers. Designers should specify simple bolted connections throughout and try not to encase them in concrete, as there is readily available alternative fire protection.

7.1.4 Structural Timbers
These are always saleable especially first growth timber (pre 1929). The best way of reclaiming these are to lift down the large roof trusses intact with a crane, then guard against progressive collapse, and disassemble into scantlings on the ground.

7.1.5 Soft Stripping of Building
This should be carried out in two separate stages.
1 A selective strip out of all valuable or re-useable fittings, hardwoods, panelling features, light fittings, non-ferrous plumbing systems, high value cable and switchgear, plant room contents of etc. (Get the goodies out first!)
2 The complete strip out of all remaining materials, suspended ceilings, floor coverings, internal screens and doors, SORTING everything at ground level.

All timber except that covered with laminates is recyclable for new chipboard etc. and should not be landfillled. Carpets, underlays, ceiling and floor tiles, plasterboard and fibreglass do not yet have further use in the UK and need to be disposed of.

7.1.6 Windows
Try if possible, to remove windows intact. Separate the glass and frame at ground level and recycle the elements. Windows are often left in on explosive demolitions to contain dust.

7.1.7 Timber Floors & Joists
These should be progressively stripped out using mainly hand tools. It is important to have a strict safety regime embedded into the detailed Method Statement when stripping suspended timber floors. Keep a constant look out for movement of structural walls, cracking, bowing etc. Many older buildings, particularly in areas affected by subsidence, have been found to be held up by the floor joists, spanning from wall to wall and built in at the ends.

7.1.8 Masonry Walls
Brick and block walls should be demolished by using a simple collapse mechanism, i.e.: pushing over or removal of support. It is best to avoid pulverising or balling down the walls. Use a wheeled loading shovel (not a tracked excavator or bulldozer) to transfer the demolished bricks to the sorting area on site if possible, for cleaning, dressing, palletising and shrink-wrapping the bricks on site. The bricks should be handled as little as possible, to avoid breakages.

7.1.9 Concrete Cladding Panels
Lifting eyes should not be grouted up as part of construction – a rubber grommet or similar should be Specified instead, as this makes lifting off of the panels easier.

7.1.10 Metallic Profile Cladding
This is a saleable commodity and is commonly reused in the agricultural sector. The sheeting can be easily removed by using a mobile elevating work platform and the fixings can be removed by reversing the construction method.

7.1.11 Steel-Frame Buildings
These can either be disassembled by crane for re-use of sections, sheared down using high reach demolition machines, or felled in the traditional manner. These last 2 options produce scrap metal that can be processed on or off site, ready for the smelter.
The net cost for demolition is:

\[
\text{Demolition Costs} = (\text{Demolition} + \text{Disposal}) - (\text{Contract Price})
\]

The net cost of deconstruction can be shown by the expression:

\[
\text{Net Deconstruction Costs} = (\text{Deconstruction} + \text{Disposal} + \text{Processing}) - (\text{Contract Price} + \text{Salvage Value})
\]

There are various options for contracts and costs/revenues between a building owner and the deconstruction contractor, such as:

- Deconstruction as a service to the building owner and the contractor, with all materials and treated according, with some consideration for the contractor’s costs for processing and handling. The owner will pay more than demolition but could be “buying” very high value materials.
- Deconstruction with shared ownership of the materials, with a reduction in the deconstruction contract based upon the contractor receiving materials as in-kind payment.
- Deconstruction with the contractor retaining all materials, and charging an internally calculated price based upon revenues to be received from resale of salvaged materials.
- A non-profit deconstructor performs a deconstruction for a fee and the owner donates the materials as a tax write-off.

Where off-site sales are needed or value-adding desirable, a deconstruction entity that also operates a reuse facility will enable the combined entity to be more profitable and maintain a consistent workforce. The off-site facility/staff allows for flexibility in responding quickly to deconstruction projects when they present themselves, and processing the materials, and deconstruction provides a diversity of materials for the reuse facility.

On-site sales considerably reduce off-site materials handling costs (increasing salvage revenues) and also help reduce on-site time for the deconstruction, as processing time can be used in the actual deconstruction activity. On-site redistribution of the materials is more likely to be successful when the job-site is either on a busy road, in the urban core area, or near both lower income neighbourhoods and a historic district.

Deconstruction can be more cost-effective than demolition when taking into account the reduction in landfill disposal costs and the revenues from sale of salvaged materials. On average, deconstruction first costs can be up to 20% higher than demolition costs, but the net cost with salvage revenues can be 10% – 35% lower (wholesale prices or retail salvage values respectively) than demolition costs. Deconstruction & reuse of building materials is a vital alternative to demolition and land-filling of demolition waste with these combination of benefits:

- Social (creating low-cost building materials)
- Economic (greater savings & job creation) and
- Environmental (reducing waste, recycling materials, saving energy & reducing demand for finite resources).

7.3 Deconstruction Health & Safety Issues

Demolition and deconstruction are high-risk activities. Workers are injured in falls from edges and through openings and fragile materials. Workers and passers-by can be injured by the premature and uncontrolled collapse of structures or parts of structures and by flying debris.

High levels of dust, noise and other site contamination are also significant problems that need to be considered and controlled when planning any demolition work. The hazards associated with traditional demolition activity have led to a risk management approach that favours mechanical demolition with as little human exposure to the activity as possible.

Safe demolition and deconstruction requires planning. The key to developing a safe system of work for demolition and deconstruction is choosing a work method which keeps...
people as far away as possible from the risks. Proposed working methods may be best detailed in a Health and Safety Method Statement. Everyone involved in the work needs to know what precautions are to be taken. They should be supervised so that these precautions are put into practice. Detailed planning is therefore required if deconstruction is not to result in an increase in accidents when compared with demolition.

It is essential that deconstruction is planned and carried out under the supervision of a competent person. Supervisors should have knowledge of the particular type of deconstruction being carried out, its hazards and how to control them. In particular, they should understand and follow a deconstruction method statement and know of any particular sequence required to avoid accidental collapse of the structure. Before work starts, survey the site. Consider the following matters:

- Are there still any live services? – Gas, electricity and water services need to be dealt with
- Is there any left-over contamination from previous use of the building, for example acids from industrial processes, asbestos on pipe work and boilers or microbiological hazards in old hospitals or medical buildings? – Hazardous materials may need to be removed and disposed of safely before demolition starts. Information on precautions needed are set out in the references (See Appendix III).
- Can a method which keeps people away from the demolition be used
- Will the work make the structure itself, or any nearby buildings or structures unstable? – Is temporary propping required? – The advice of a structural engineer may be needed;
- How will the floors, walls or any other part of the structure, support the weight of removed material building upon them or the weight of machines, for example, skid steer loaders used to clear the surcharge? – Again, expert advice may be needed;

Anyone who is not involved in the work should be kept away. Create a buffer zone around the work area. Where necessary, provide site hoardings. Do not allow materials to fall into any area where people are working or passing through. Fans, or other protection such as covered walkways, may be needed to control falling materials. Fire is also an ever-present risk, so make sure the appropriate precautions are in place.

**Asbestos:**

Any asbestos-containing materials on site should have been identified before work starts. Work with asbestos insulation, asbestos coatings and asbestos insulating board must normally be carried out by an HSE-licensed contractor.

Because deconstruction poses a greater worker exposure than mechanical demolition it is prudent to remove all asbestos containing materials (ACMs) that are in good condition, in accordance with the Control of Asbestos at Work Regulations 2002 (CAWR). ACMs are obviously not suitable for reuse and must be abated prior to deconstruction, which could add significantly to deconstruction costs over traditional demolition. Special waste regulations apply to the transport, packaging and disposal of asbestos waste.

Any components that are either intended for reuse with Lead-Bearing Paints (LBP) remaining on the material or materials that have been repainted to encapsulate the LBP should not be allowed to sit on exposed soils where there is potential for the LBP to leach into the soil...). Other special waste includes varnishes, adhesives and sealants. Salvage materials should either be moved off site to an appropriate storage facility, or stored on 6mm polyethylene sheeting with a waterproof covering. Further information on waste disposal can be obtained from the Environment Agency. The CDM Regulations apply to all demolition and deconstruction work. See the HSE guidance on Health & safety in demolition work.

### C Pollution Control

#### 8.0 Land Decontamination

**8.1 BROWNFIELD SITES**

Land contamination is a material planning consideration for the purpose of the Town & Country Planning Act (1999) and the condition to carry out soil investigation may be placed as a planning condition, should previous land use indicate a possible contaminative use, or as a result of a historical desk study.

In the Brent Replacement UDP, Policy EP6 deals with land contamination. Developers/landowners and contractors should have regard to the requirements or details of the Council’s Contaminated Land Inspection Strategy, which was adopted in April 2002 (See Appendix II).

The aims of the strategy are to ensure that; a) No risk is posed to human health or environment as a result of land contamination past, present or future; b) No land is under-utilised as a result of contamination; and c) Economic cost arising from land contamination is kept to a minimum consistent with this.

**8.2 Site Investigations**

Methodology for investigation is set out in the DETR documents; ‘A Framework for assessing the Impact of Contaminated Land on Groundwater & Surface Water’ (CLR No 1) and ‘Guidance on the preliminary Site Investigation of Contaminated Land’ (CLR No2). The main objectives of the investigation are to assess the impact of contamination on present & future users of the site, to protect workers during development, protect construction materials, safeguard the local environment during construction and protect controlled waters.
8.3 REMEDIATION

Many early reclamation schemes in the UK relied on the use of cover systems to limit exposure to contaminants at the surface of a site. The construction of physical barriers can represent a relatively simple low-cost reclamation strategy, but at worst, cover and conceal contaminant may be a predominantly a cosmetic exercise that simply conceals contamination resulting in property blight and increased liability.

The ‘dig-it-all-up’ disposal costs can easily reach £40 to £90 per cubic metre (per cu. m) or more. At these costs escalation in volumes resulting from poor initial delineation of contamination or inadequate operational management on site can result in remediation costs running quickly out of control.

Alternative techniques such as bio-remediation, soil vapour extraction and soil washing are established in the UK, are frequently cheaper than disposal, and have a successful and proven track record. Therefore there will be a presumption in favour of on-site treatment. The Environment Agency will be consulted when these remediation techniques are considered.

### 8.31 Remediation Techniques & Indicative Costs

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Process Application</th>
<th>Cost per Cu. metre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windrows &amp; Land-farming</td>
<td>Long windrows with added organic bulking agents, built on impermeable surface, &amp; mechanically turned. Regular tiling or plowing to aerate contaminated soil that has been excavated &amp; screened to which water &amp; nutrients have been added.</td>
<td></td>
</tr>
<tr>
<td>Biopiles</td>
<td>Ex-situ aeration or other treatment of contaminated soil to enhance biodegradation of organic contaminants</td>
<td></td>
</tr>
<tr>
<td>Intrinsic Bioremediation</td>
<td>Most effective in dealing with oil hydrocarbons, solvents, some tarry wastes and phenolics. May be achieved ex-situ within weeks subject to optimal conditions, but requires excavation, or in some cases can be combined with active aeration and vacuum extraction and applied in situ.</td>
<td>Approx £20-40 pcm</td>
</tr>
<tr>
<td>Bioventing (In-situ)</td>
<td>Oxygen supplied via perforated piping to stimulate biodegradation by soil microbes</td>
<td>Up to £9 pcm</td>
</tr>
<tr>
<td>Biosparging (In-situ)</td>
<td>Used below the water table. Air is injected via boreholes to encourage dissolution of oxygen &amp; rise of air &amp; volatile compounds</td>
<td></td>
</tr>
<tr>
<td>Soil Vapour Extraction (SVE)</td>
<td>SVE’s are suited to In situ remediation in built-up &amp; industrial areas as vents can be placed between or below buildings and can be applied during construction</td>
<td>Approx £5-10 pcm</td>
</tr>
<tr>
<td>Soil-Washing (Ex situ)</td>
<td>Uses chemical/physical extraction &amp; separation methods to remove soil contaminants, &amp; win back material for re-use as fill. Needs substantial equipment and plant &amp; is best for large volumes of contaminated material</td>
<td></td>
</tr>
<tr>
<td>Solidification (In-situ)</td>
<td>Converts soil into a solid monolith, thus reducing the permeability of the material</td>
<td></td>
</tr>
<tr>
<td>Stabilisation (In-situ)</td>
<td>Changes chemical form of contaminants/ increases binding strength to solid matrix</td>
<td></td>
</tr>
<tr>
<td>Encapsulation (In-situ)</td>
<td>Excavation &amp; construction of a bentonite tanking wall. Site then capped with clay</td>
<td>Up to £8 pcm</td>
</tr>
<tr>
<td>Desorption</td>
<td>Uses temperatures of 600-900°C to physically separate volatile/semi volatile contaminants from soil. (ex-situ)</td>
<td></td>
</tr>
<tr>
<td>Incineration</td>
<td>Generates high temperature (800-1200°C) oxidation reaction (ex-situ)</td>
<td></td>
</tr>
<tr>
<td>Vitrification</td>
<td>High temperatures (1000-1700°C) used to melt soil into an impermeable matrix</td>
<td></td>
</tr>
</tbody>
</table>
9.0 Air Quality

Poor air quality affects human health and the environment. As part of its approach to sustainable development the Government has adopted the UK National Air Quality Strategy (NAQS) to deal with the assessment and management of air quality. National policies on air quality are expected to deliver countrywide improvements on air quality. However, locally because of transport, commercial and industrial activities, air quality will remain poor and will require a more focussed approach to improve air quality.

9.1 Air Quality Management

As part of the Council’s Air Quality Management duties, review and assessment of air quality was carried out to assess the probable levels of air pollution in 2005. The Council has declared Air Quality Management areas covering a large proportion of the Borough on the basis that targets for nitrogen dioxide and fine particles will not be met (See Fig. 16 below). In order to bring pollution levels in the borough to within nationally accepted levels, the Council will be publishing an Action Plan in 2001. The Action Plan will affect the whole borough and will not be linked just to AQMAs since emissions will need to be controlled over a much wider area.

A key principle of Local Air Quality Management is that local authorities should integrate air quality considerations with other policy areas, such as planning. It is important to bring the air quality considerations into the planning process at the earliest possible stage. The Government’s Planning Policy Guidance Note (PPG23: Planning & Pollution Control) recognises that the planning system has a role to play in combating pollution.

Circular 15/97 gives an introduction to the function of local authorities in delivering the Government’s National Air Quality Strategy through the Local Air Quality Management system. UDP policy EP3 deals with air quality. It is important to stress that any development likely to have an impact on air quality in AQMAs or adjacent to such areas would be regarded as significant. This guidance addresses in detail issues of air quality and how the development(s) should be designed to minimise air pollution from the development.

9.2 Dealing with Planning Applications:

Design & Location of Facilities
Careful consideration shall be given to the site and area characteristics. Consideration should be given to elements of a scheme, which are more sensitive to air pollution than others. The following measures shall be considered:

• Locate housing and children’s play area should be away from roads in AQMAs and roads with high pollution levels.
• Use the location and design of buildings to act as a barrier or mitigate the adverse impact of air pollution.
• Discourage car parking in AQMAs.
• Ensure new developments provide parking spaces for car clubs.

Construction/Demolition Impacts
The re-use of existing building stock reduces emissions as well as associated transport and energy needs. New development during its demolition and construction phase will impact on air quality. Major developments, and those within AQMAs should be undertaken in accordance with BRE guidance on Construction and Demolition by Kukadia et al (2003) which sets out best practice techniques and methods to control dust and fine particles.

Promoting Alternative Modes Of Transport
The Council seeks to reduce road traffic emissions by encouraging a modal shift from car use to walking, cycling and public transport, by the following measures:

• Ensure new developments make cycle facility provision
• Seek the submission of Green Travel Plans
• Offset the impact of the development by improving background air quality through the use of traffic management e.g. setting up traffic restricted zones
• Review public transport systems
• Parking management to reduce the number of cars entering an area. Options include reducing the number of spaces available, increasing charges or limiting the maximum stay.
• Regulation of industrial emissions (Environmental protection Act 1990 and Clean Air Act 1993).

9.3 Facilities for Clean Fuel Vehicles
Alternatively fuelled vehicles have a role to play in mitigating air pollution impacts. The Council will seek:

• The provision at petrol stations and other suitable locations of facilities for the sale of alternative cleaner fuels e.g. Liquid Petroleum Gas (LPG) and Compressed Natural Gas (CHG) refuelling and Electric charging points.
• Provision of convenient points for alternative fuel refuelling within developments Developers should ensure these are designed-into schemes;
• Where possible deliveries and other servicing by low emission vehicles, such as natural gas, electric or by vehicles fitted with emission control technologies.
9.4 Indoor Air Quality: Elimination of Pollutants at Source

People typically spend 90% of their time indoors. The impact of poor outdoor air quality on buildings’ indoor air quality, particularly in AQMAs has become an issue of great concern. It is important that pollutant ingress into buildings in these areas, is minimised by effective building design and ventilation. The Council will encourage an approach that prioritises elimination of pollutants at source such as:

- Using renewable energy and energy conservation rather than heating boilers
- Replacing solvent based paints with water-based paints rather than using end-of-stack filters.

9.5 Assessments:

In addition to the requirement to provide an air quality assessment under the Town & Country Planning Act 1999, developers will be required to carry out an air quality assessment where the development has the potential to

- Result in significant emissions of pollutants from industrial activities
- Generate significant increase in traffic
- Result in a significant increase in emissions of one or more National Air Quality Strategy prescribed pollutants.

9.6 Section 106 Planning Agreements & Conditions:

There is scope to use Section 106 agreements and planning conditions to mitigate the impact of emissions by:

- The control of air quality impacts during construction phase
- Specifying the number of parking spaces and their size
- Providing safe pedestrian routes
- Restricting/prohibiting use of specific vehicle classes/types with monitoring maintenance & emissions testing of fleet
- Requirement for operators/occupiers to monitor emissions & specified pollutant concentrations at off site locations.

- Promoting improvements in public transport, walking & cycling
- Use of clean fuel vehicles fleets by companies
- Companies adopting Environmental Management Systems & Air Quality Strategy
- Promoting car clubs
- Junction & road layouts
- Travel Plans covering:

- Management and use of parking spaces so priority is given to disabled people, people with children, visitors or cars with more than one occupant, electric cars
- Removal of parking spaces after specified period, or when public transport access to the site is improved by walking and cycling (e.g. when a bus route is introduced to the site)
- Setting targets on the proportion of employee trips made by public transport & alternative transport modes;
- Public transport facilities e.g. bus stops/lay-bys
- Secure cycle parking and changing facilities
- Creating Car Clubs (car sharing schemes) linked to Car-Free development or Pool cars
- Provision of information to staff & visitors about public transport, walking, & cycling access to the site
- Charging for workplace parking.

9.7 Car Clubs

Car clubs can facilitate higher housing densities, and allow full use of old or redundant buildings, by helping to meet tougher parking standards in congested central urban areas.

Developers should consider promoting or establishing a car club in all low car or car free developments where there is; a requirement to reduce car parking on site and for green travel plans, good access to public transport, and an established car club operator in the area. Brent is a member of the London Car Club Consortium.

9.8 Urban Design Measures for Pollution Dispersal

Small-scale urban design can be used to encourage the rapid dispersal of pollutants near the ground, but advantage is not often taken of this possibility.

The urban canopy (area up to 2-3 times the built form height) is the area that can be most influenced for pollution sources (up to 1 km). Some building shapes have more marked effects than others in dispersing local pollution. The most significant are tall buildings and court yards or enclosed spaces.

This factor should be used in mixed complexes e.g. leisure centre, restaurants etc. all having different ventilation requirements and pollution emission controls. The main urban layout features & effects include:
Effects on Urban Ventilation Rates

10.0 Noise Pollution

10.1 Noise & Vibration

Noise, both inside and outside buildings, is one of the most emotionally charged issues in our modern urban environment. Nuisance from noise can severely impact upon the health and quality of life of residents within the community. It can also affect the ability of pupils to learn effectively in schools and colleges, and can impair health and productivity in the workplace.

Brent is a vibrant London borough, which incorporates a dense residential housing stock often integrated with commercial and industrial premises. The Council strives towards minimising noise levels within acceptable and practicable limits.

Possible sources of noise and/or vibration include roads, railways and industrial/commercial noise, entertainment, construction, mechanical plant and deliveries. Among the most intrusive sources of noise pollution is that derived from people with conflicting lifestyles living in close proximity.

Low-frequency noise (LFN) is around us all the time, but people have different levels of sensitivity to it, so what is inaudible to one person can cause much distress to another. Sources of LFN include road, rail or air traffic, industrial chimneys, boilers, HVAC systems, fans, electrical installations, and amplified music – often heard as a persistent low rumble or hum. This can profoundly affect people’s wellbeing, causing symptoms such as irritation and unease, fatigue, headaches, nausea and disturbed sleep. Low-frequency noise can be difficult to trace, as the frequencies travel far and may seem to come from various directions. It is therefore important to use a consultancy with the right experience and expertise to tackle potential problems.

Planning Applications - The Council bases its UDP noise Policy EP2 on Planning Policy Guidance (PPG 24) when considering the use of conditions to minimise the impact of noise. Developments will be assessed in relation to their possible impact upon the local environment and specific-
10.3 Industrial/Commercial Developments

All developments and/or associated plant should be designed to ensure the existing ambient background levels at the nearest residential premises during hours of operation are not increased (i.e. that the rated level is more than 10 dB below the measured background level), with tonal or impulsive characteristic being taken in to account.

Assessment shall be carried in accordance with BS4142: ‘Rating industrial noise affecting mixed residential and industrial areas’.

Design schemes to ensure delivery areas are located away from residential areas where possible and/or are enclosed or sheltered. Such considerations should also be applied for general parking areas. Pay particular attention to premises located below or next to residential property where change of use is proposed.

Developers should ensure that there are no increases in noise transmission between neighbouring premises as a result of the new activities. Suitable insulation where practicable shall be installed to achieve this, failure may lead to refusal.

Roads: Consider where new roads or major alterations occur to the existing Strategic Road Network. The ‘Design Manual for Roads and Bridges’, volume 11, section 3, part 7, traffic noise and vibration, 3.5 states: ‘In the period following a change in traffic flow, people may find benefits or disbenefits when the noise changes are as small as 1dB(A)-equivalent to an increase in traffic flow of 25% or a decrease in traffic flow of 20%. These effects last for a number of years’.

The impact of road traffic noise should also be assessed against these criteria. Secondly this statement implies that people become acclimatised to this level of noise. However, it should not be assumed that people always become fully acclimatised to such increases.

Landscape Design: There are some ‘soundscaping’ measures that can help minimise the effects of noise such as:

- Specifying noise reducing surfaces e.g. porous surfaces for vehicles. The open structure of the surface reduces the compression and expansion of air in the tyre tread profiles which suppresses mechanical and aerodynamic noise generated by the rolling tyre on the road. The acoustic absorption effect is not restricted to tyre/road noise only but is also effective in reducing mechanical noise, radiated from the underside of the vehicle where the oil pan and the gearbox housing form the main sources of engine noise.
- Avoiding paving sets and other noisy surfaces where trolleys are in use;
- Loose aggregate pedestrian surfaces to mask voices as people leave pubs;
- Specifying noise reducing surfaces e.g. porous surfaces for vehicles. The open structure of the surface reduces the compression and expansion of air in the tyre tread profiles which suppresses mechanical and aerodynamic noise generated by the rolling tyre on the road. The acoustic absorption effect is not restricted to tyre/road noise only but is also effective in reducing mechanical noise, radiated from the underside of the vehicle where the oil pan and the gearbox housing form the main sources of engine noise.
• Use of willow walls as noise barriers
• Use of earth berms to absorb incident noise from busy roads;
• Vegetation shelterbelts and thick garden walls alongside roads/other noise sources to deaden noise;
• Use of active water, such as fountains, to mask traffic noise.

Building Design: measures including:
• Façade continuity, including use of innovative link and barrier blocks as noise barriers, depending on the extent to which development can offer noise protection not just to primary users, but possibly also to a wider area;
• Other barriers (where acceptable aesthetically and in urban design terms) must be suitably located in relation to either the noise source or receiver. It is important that the barrier is continuous and of sufficient mass and height
• Façade diffusion, fins and reflectivity, or use of cantilevering, arcading, canopies, acoustic balconies, podiums and other set backs where possible in housing estates, to isolate quiet areas and provide to ‘quiet façades’.

10.4 Entertainment
Particular attention should be paid to developments (mainly A3) where music or other entertainment is to be provided. Developers should ensure that there are no increases in noise transmission between neighbouring premises as a result of such activities. Suitable acoustic treatment should be used to ensure that this is achieved.

10.5 Construction
Activities on construction sites which may result in an increase in noise levels at the boundary of the site can only be carried out during the following permitted hours: Mon. to Fri. (8.00 till 18.00); Sat. (8.00 till 13.00) At no time on Sundays or Bank holidays. Exception may be granted due to local circumstances (i.e. emergency works).

Before works commence the contractor may be required to submit for approval a method statement (in accordance with the principles described in BS5228) providing:

1. Information on the type of plant to be used and the proposed noise control methods;
2. A programme of work indicating the level of noise and vibration and the location for each activity, ensuring ‘Best Practical Means’ are used.
3. Calculations of LAeq and Lmax at specified buildings as requested.

Schemes will also be required to comply with other relevant provisions of the Control of Pollution Act 1974 and the Environmental Protection Act 1990. On major sites, there may be a requirement to organise regular site meetings with the Council and involve local residents/tenants associations.

10.6 Schools
Development of new schools or improvements to existing schools should be done with regard to acoustic design in accordance with Part E of the Building Regulations 2003 with guidance from Building Bulletin 93: Acoustic Design for Schools. No development should be undertaken without prior consultation from the local authority.

11.0 Water Pollution

11.1 Connections, Incidents & Responsibilities
All public sewers in the borough are maintained by Thames Water. There are three different network types - North, West & East Brent are served by separate waste & surface water sewer systems - in South Brent, a combined sewer system serves all waste & surface water.

A number of properties in the borough have irregular connections where the wastewater is connected to surface water system, due to inexperienced builders connecting new sanitary connections to the nearest drain. The EA & London’s Waterway Partnership intend to pilot a certification system – ‘Certificate of Correct Drainage’ – whereby all properties changing ownership are surveyed for correct drainage connections to storm & foul sewers.

All surface water sewer discharges to brooks, ditches and rivers. The Council is responsible for maintaining “Non Critical Ordinary Watercourses” and ensuring that flow is maintained all the time. The Environment Agency maintains the two Main Watercourses within Brent (River Brent & Wealdstone Brook). Local residents living adjacent to rivers and ditches tend to report Pollution Incidents, and Brent jointly with Thames Water and Environment Agency carries out investigations.

When the pollution source is identified, Brent’s Environment Health Unit serves a notice on the property owner to rectify the problem and if this is not done within a specified period, the Council carries out the works and recovers the cost from the owner.

11.2 Construction Precautions
The contractor must take measures to ensure that any liquid of a potential hazardous nature on site is controlled in line with COSHH Regulation and properly bunded to avoid contaminants reaching watercourses or ground-water, including aquifers.

In the case of any excavation works below the water table, including any extensive site de-watering, the contractor must inform the Environment Agency and Environmental Health of the works to be conducted. The de-watering and disposal methods must be agreed with the Environment Agency and where appropriate, an abstraction licence should be obtained by the contractor.
**Case Studies**

**12.0 Case Study – Employment Development**

**12.1 Wessex Water Operations Centre**

The Wessex Water Operations Centre on the outskirts of Bath is a good example of sustainable new build offices on a brownfield site.

Wessex Water bought the site on the corner of Brassknocker Hill and Claverton Down Road in October 1997. Approximately three kilometres south east of Bath, the site is 28,000m² (6.75 acres) and was previously used as a hospital, which was demolished in the 1980s. It overlooks the Limpley Stoke valley in the Cotswold area of outstanding natural beauty. Wessex Water gained planning permission for their unique building in 1999 and construction was completed in 2000.

The Wessex Water headquarters achieved an “excellent” rating from the BREEAM assessment and also gained 10/10 in an environmental performance index. The position, scale and location of the building are all influenced by the site topography, mainly to reduce the negative visual and environmental impacts that could result from this new building. The building is two stories high and follows the contours of the site, this also helped to reduce costs and the requirement for excavation. Other measures included:

- Wooded southern areas were retained and all existing trees were protected during the building works
- The design of the building reduces solar glare/overheating through tinted windows
- Overhanging roofs at the south/west/east to avoid glare
- Recycled rainwater flushing toilets
- Energy efficient lighting triggered by sensors
- Inclusion of photovoltaic (PV) panels on the roof of the building to maximise potential energy
- Waste minimisation was a high construction priority – involving a detailed review of the supply chain and waste recycling on site. Overall approximately 75 per cent of all construction waste was recycled
- The design focused on a cut and fill balance on site to avoid the removal or importation of large volumes of earth and rock
- Existing topsoil was stockpiled on site for reuse, and excavated rock was used in boundary walling or crushed to become hardcore
- Recycled aggregate has also been used in concrete on site from old concrete railway sleepers
- There is a shuttle bus provided which travels between the building and the train station
- Secure bike shelters are provided along with showers, lockers and changing areas
- Facilities in the building, such as meeting rooms, are for the use of employees and the local community.

The building’s “thermal performance” was simulated on computer to determine how efficient the structure would be. Like Sainsbury’s building overleaf, the Wessex Water building used concrete in the construction of the building to minimise heat loss in the winter but prevent overheating or solar gain in the summer.

Fig. 20a,b, Left Internal view of Sunscreens. Right, Elevational view of sunscreens. Source: Bennetts Associates

Fig. 20c, Perspective view, Source: Bennetts Associates

Fig. 20d: Atrium view Source: Bennetts Associates
13.0 Case Study – Residential Development

13.1 BedZed “Pioneering Green Village”

An initiative partnered by the Peabody Trust, BioRegional and Zedfactory (Bill Dunster Architects), the BedZed development is a “Zero Energy Development” on a brownfield site in Beddington, Sutton.

It is comprised of 82 housing units, employment space, a shop, sports pitch and clubhouse and a healthy living centre with childcare facilities. The design is pedestrian and cyclist friendly and both electric and hybrid cars are made available to car share groups.

The development was designed to be as energy efficient as possible and to supply much of its own energy on site. The expertise gained from all of the partners has resulted in a truly sustainable scheme, which is also accessible through tenure mix and achieves high quality living space in a high-density development.

The tenures are; Shared Ownership, Outright Sale, Cost Rent & Affordable Rent, plus 23 workspace units for creative/high-tech businesses. The residential and employment units are designed in an unconventional terraced style. All residential units:

• Are south facing with glazed front elevations and triple-glazed timber windows to reduce heat loss.

• Are all fully insulated and have been designed without radiators or air conditioning.

• The energy for the development comes from a central CHP system, fuelled by renewable resources, mainly tree surgery waste from Sutton and Croydon.

• The high insulation and CHP heating means reduced heating bills

• Roof top, wind-powered ventilation “cows” passively recover heat loss from exiting stale air (without mechanical extract fans) and use it to preheat incoming air.

• Have energy efficient light fittings, appliances and other measures, to reduce yearly energy bills by approx. £500.

• Have their own gardens which form part of the “sky terraces” which can be seen in the images opposite. Some of the larger “town houses” even have direct internal access to the employment units if the owner wishes to utilise this opportunity.

• Each house will have solar panels with recharging points for electric vehicles, and will have an automated rain & grey water system for flushing WC’s as well as watering plants.

• This use of renewable energy sources ensures the development is “carbon neutral” which means that there will be no addition to carbon dioxide in the atmosphere.

• Recycled materials are used for the structural steelwork, timer internal doors and in the crushed concrete aggregates.

• It has been built using materials with as low embodied energy as possible.

Beyond the sustainable design and construction measures, a more comprehensive approach to sustainable living has been developed at BedZed by:

• Addressing the ecological footprint per person within the development, and thus

• Creating a close knit community with communal meeting/bar area as part of the exhibition centre

• Providing residents with membership of local organic grocery deliveries to reduce ‘food miles’

Fig. 21c, d, e: Above, Perspective view; Below Right, View of roof solar panels; Source: Bill Dunster, ZedFactory. Below Left, Wind cows; Source: Peabody Trust.

Fig. 21f, View of sky gardens, Source: Bill Dunster, ZedFactory.
Case Study – Commercial Development

14.1 Sainsbury’s “breathing superstore” Greenwich

More and more commercial developments are being built to sustainable standards as it becomes clear that savings can be made on energy bills.

An example of this is the Sainsbury’s supermarket in Greenwich, which was designed by Chetwood Associates. It was opened in 1999 and as well as achieving 31 out of 31 in the BREEAM building test, constituting an “excellent” rating has, to date, been nominated for the Stirling Prize last year by members of the public, and won the Aluminium Imagination Award in 2001.

The supermarket demonstrates how commercial viability and sustainable design can be merged together to form a successful development through the following measures:

• The supermarket has been designed to be as energy efficient as possible with projected energy savings of 50% from that of ordinary supermarkets.

• Turfed earth mounds acting as insulation from wind and extreme weather surround the building and, the massive concrete walls ensures that the building retains heat in the winter yet is cool in the summer.

• The roof is constructed out of recycled aluminium strips, which admits natural light through double glazed, North facing “saw tooth” roof lights. These allow natural light through into the shop and reduce the need for artificial lighting.

• The configuration of the rooflights means that while natural light is kept at an optimum, there is minimal glare emitted into the night sky.

• Internally, there is passive ventilation and an under floor heating system.

• The under floor heating system is powered by heat reclaimed from the refrigeration which is powered by sustainable propane based “ozone friendly” fuel.

• The wasted heat is then used to heat the ventilation system which works by drawing air in externally at ground level and expelling at roof level, creating a “breathing” supermarket.

• Water efficiency is achieved by drawing resources from the water table instead of the local supply to provide the water for the toilets.

• Outside the supermarket, a reed bed has been incorporated into the landscaping; this cleans the grey water from the service yard and releases it into the rear lagoon that is hoped to evolve into a landmark and visitors attraction.

Rainwater is used for irrigating the landscaping which is made up of native species of plants or drought tolerant plants. Outside the supermarket, there are wind turbines and solar panels on site, which power the night store lighting.
**APPENDIX 1 – GLOSSARY OF ABBREVIATIONS & TERMS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>Natural, artificial or recycled granular material used in construction.</td>
</tr>
<tr>
<td>Asphalt</td>
<td>Mixture of bitumen and aggregate</td>
</tr>
<tr>
<td>AQMA Air</td>
<td>Quality Management Areas – where levels of Nitrogen dioxide and fine particles are/will be higher than health targets</td>
</tr>
<tr>
<td>Brownfield Sites</td>
<td>This refers to urban land that has been previously developed.</td>
</tr>
<tr>
<td>BCCS</td>
<td>Building Control Consultancy Services is Brent’s Building Control Unit. It enforces the national Building Regulations</td>
</tr>
<tr>
<td>Carbon Index</td>
<td>Indicates carbon dioxide emissions from a building’s energy use. It Ranges from 0-10 (reckoned from SAP). A dwelling needs to achieve a CI of 8 to meet Part L of the Building Regulations.</td>
</tr>
<tr>
<td>Chp</td>
<td>Combined Heat &amp; Power – uses waste heat from local gas-fired or biomass energy generation within a development</td>
</tr>
<tr>
<td>CO2</td>
<td>Carbon Dioxide – one of the gases that cause greenhouse effect</td>
</tr>
<tr>
<td>Concrete</td>
<td>Mixture of cement and aggregate</td>
</tr>
<tr>
<td>CDM</td>
<td>Construction (Design and Management) Regulations, 1994. This is aimed at improving health &amp; safety to reduce the high number of injuries and deaths on UK construction sites.</td>
</tr>
<tr>
<td>COSHH</td>
<td>Control of Substances Hazardous to Health Regulations 1999</td>
</tr>
<tr>
<td>CLR</td>
<td>Contaminated Land Regulations – new decontamination regime</td>
</tr>
<tr>
<td>DTLR</td>
<td>Department of Transport, Local Government &amp; the Regions</td>
</tr>
<tr>
<td>‘Egan Compliant’</td>
<td>The recommendations of the Egan Report ‘Rethinking Construction’, were the result of an Inquiry into the practices &amp; performance of the Construction Industry. The initiative aims to address the outdated construction methods, delays and adversarial contractual relationships which all contribute to high costs and unreliability.</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment of specified Major projects</td>
</tr>
<tr>
<td>FSC Forestry</td>
<td>Stewardship Council – certifies timber from renewable sources that are managed according to environmental standards.</td>
</tr>
<tr>
<td>HSE</td>
<td>Health &amp; Safety Executive</td>
</tr>
<tr>
<td>ISA</td>
<td>Independent Sustainability Assessment of development proposals</td>
</tr>
<tr>
<td>ISO 14001</td>
<td>International award for organisations that use an environmental management system to limit their environmental impact. Brent Council’s 13 Environmental Service units achieved this in August 2001.</td>
</tr>
<tr>
<td>LA21</td>
<td>Local Agenda 21 action plan drawn by local communities and Councils</td>
</tr>
<tr>
<td>Laeq</td>
<td>The equivalent continuous noise level, is the value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound, over a specified time interval, T, has the same energy as the fluctuating sound in question</td>
</tr>
<tr>
<td>Lmax</td>
<td>The maximum A-weighted sound pressure level</td>
</tr>
<tr>
<td>Masonry</td>
<td>Brickwork, blockwork, stonework</td>
</tr>
<tr>
<td>Material Consideration planning</td>
<td>This is a factor alongside the UDP, that must be taken into account when deciding applications</td>
</tr>
<tr>
<td>Potable Water</td>
<td>Water for human consumption – drinking, cooking, hygiene, etc.</td>
</tr>
<tr>
<td>PPG/PPS</td>
<td>Planning Policy Guidance – national Government policy. Planning Policy Statement – these are replacing PPGs.</td>
</tr>
<tr>
<td>PV</td>
<td>Photovoltaic panels generate electricity from daylight</td>
</tr>
<tr>
<td>Impulsive characteristic of noise</td>
<td>Distinct impulses (bangs, clicks, clatters or thumps)</td>
</tr>
<tr>
<td>RCA</td>
<td>Recycled aggregate mostly from crushed masonry, crushed concrete or crushed/milled asphalt previously used in construction</td>
</tr>
<tr>
<td>RPG</td>
<td>Regional Planning Guidance – Government policy for regions such as the South East</td>
</tr>
<tr>
<td>SAP (1-120)</td>
<td>Standard Assessment Procedure for Energy Rating of Dwellings – it indicates the cost per sqm of providing energy for heating and hot water. Lower energy cost lead to higher ratings – these are used in calculating the Carbon Index.</td>
</tr>
<tr>
<td>Section 106</td>
<td>S.106 or Planning Agreements are used to ensure that developers provide/compen-sate for any necessary facilities or infrastructural improvements or costs that arise from their development schemes.</td>
</tr>
<tr>
<td>SPG</td>
<td>Supplementary Planning Guidance – this is separately produced to give detailed guidance on how a policy or proposal in the Unitary Development Plan can be satisfactorily met.</td>
</tr>
<tr>
<td>SUDS</td>
<td>Sustainable Urban Drainage Systems</td>
</tr>
<tr>
<td>Tonal characteristic of noise</td>
<td>Distinguishable, discrete, continuous note (whine, hiss, screech, hum,etc)</td>
</tr>
<tr>
<td>‘U’ Value</td>
<td>Measures heat transmitted through a material. Low =less heat loss</td>
</tr>
<tr>
<td>UDP</td>
<td>The Unitary Development Plan is the legal plan for the Borough. It contains the policies used to decide applications. It will eventually be replaced by a Local Development Framework (LDF) in the new Planning system introduced by the Planning and Compulsory Purchase Act</td>
</tr>
</tbody>
</table>
### APPENDIX 2 — MATERIALS ENVIRONMENTAL GUIDANCE TABLES

#### 4.2 Floor Structure

**Key:**
- • Most Environmentally Sound,
- • Environmentally Sound,
- • Less Environmentally Sound

#### 4.2.1 Foundations to below Floor Level

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation Posts</td>
<td>Concrete with primary aggregate</td>
<td>N/A</td>
<td>• Forestry Stewardship Council (FSC) Timber with concrete top / Concrete with reclaimed aggregate</td>
<td>• Savings</td>
</tr>
<tr>
<td>Ground under Suspended Floors</td>
<td>PVC membrane</td>
<td>Plasticisers/Carcinogenic</td>
<td>• Shells / Foamed concrete/Sand / Expanded clay granules/Polyethylene membrane</td>
<td>Extra?</td>
</tr>
<tr>
<td>Damp-proof Membrane</td>
<td>Chemical solvent DPC / Bituminous DPC/DPM</td>
<td>Organic compounds/nausea, nervous system, headaches</td>
<td>• Low odour chemical DPC / Polyethylene DPC/DPM / Engineering brick slate/Thin steel sheeting</td>
<td>Additional cost</td>
</tr>
</tbody>
</table>

#### 4.2.2 Ground/Intermediate Floor Construction, Screeds & Floor Coverings

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Floor</td>
<td>Solid concrete with primary aggregate</td>
<td>N/A</td>
<td>• FSC Timber (suspended floors) / Hollow ceramic elements / Hollow concrete elements with RCA or limestone / Solid concrete with reclaimed aggregate or limestone</td>
<td>A third / Half / Savings</td>
</tr>
<tr>
<td>Ground Floor Thermal Insulation</td>
<td>Extruded polystyrene / Polyurethane</td>
<td>N/A</td>
<td>• Mineral wool/Expanded polystyrene / Foamed glass / Perlite/Vermiculite</td>
<td>Saving/Slight extra / Extra? / Extra/Double</td>
</tr>
<tr>
<td>Party/Intermediate Floors</td>
<td>Solid concrete with primary aggregate</td>
<td>N/A</td>
<td>• FSC Timber / Hollow ceramic &amp; concrete elements with RCA /or limestone / Solid concrete with RCA</td>
<td>A third / Half / Savings</td>
</tr>
<tr>
<td>Floor/Ceiling Acoustic Insulation</td>
<td>N/A</td>
<td>N/A</td>
<td>• Coconut fibreboard / Flax felt strips/rolls / Natural wool felt / Wood/fibre boards / Recycled natural rubber &amp; cork</td>
<td>3x cheapest / Small extra / Little &gt; cheapest / Cheapest / Dearest</td>
</tr>
<tr>
<td>Balconies</td>
<td>Concrete with primary aggregate / Non-FSC Tropical wood</td>
<td>N/A</td>
<td>• FSC durable Timber / Sectional steel / Aluminium / Prefab. Concrete with RCA</td>
<td>Half/small extra / A quarter/saving / Half/extra cost</td>
</tr>
<tr>
<td>Floor Screeds</td>
<td>Phosphogypsum anhydride</td>
<td>Flue-gas gypsum anhydrite</td>
<td>• Granitic/terrazzo / Ceramic tiles / Polyester</td>
<td>Significant extra / Significant extra / Significant extra</td>
</tr>
</tbody>
</table>
### 4.3 External

#### Key:
- **Most Environmentally Sound**
- **Environmentally Sound**
- **Less Environmentally Sound**

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
</table>
| Hard paving | • Asphalt  
• In-situ concrete | • N/A  
• N/A | • Recycled aggregate concrete slabs  
• Concrete slabs  
• Turf  
• Brick pavers  
• Concrete blocks  
• Granite setts | • Extra/Saving  
• Same/Saving  
• Extra/Saving  
• 3x/Saving  
• Extra/Saving  
• 4x/Saving |
| Semihard paving | • Gravel  
N/A | • Wood/bark chippings  
• Recycled glass sand  
• Sand | • Hedges  
• Woven wood waste  
• Untreated softwood on concrete spur posts | • Savings  
• Same?  
• Extra cost? |
| Garden separation | • Recycled PVC  
• Non-FSC Tropical wood  
• Copper Chrome Arsenate (CCA) Treated wood | • N/A  
• N/A  
• Organic solvents/ nervous system, headaches/nausea | • Hedges  
• Sustainable FSC timber with concrete footing  
• Masonry | • Savings?  
• Savings?  
• Extra cost |
| Privacy screens | • Non-FSC Tropical timber  
• CCA Treated timber | • N/A  
• Organic solvents/ nervous system, headaches/nausea | • FSC Durable Timber  
• Untreated softwood on concrete spur posts  
• Masonry  
• Prefab. Concrete  
• Recycled PV | • Extra cost?  
• Little or no difference?  
• Extra cost  
• Little or no difference |
| Bin Stores | • Non-FSC Tropical timber  
• CCA Treated timber | • N/A  
• Organic solvents/ nervous system, headaches/nausea | • EPDM/mod. bitumen  
• Blown bitumen  
• Polyester | • Extra cost?  
• Same/Half  
• Extra cost  
• Same/Half |

4.3.1 Landscaping

4.3.2 Drainage, Gutters & Drainpipes

---

Crushed glass sand
Source: BedZed Materials Report, Bioregional
### 4.4 Wall Structure

**Key:**
- Most Environmentally Sound,
- Environmentally Sound,
- Less Environmentally Sound

#### 4.4.1 External Cavity Wall

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>External wall Skin</td>
<td>Non-FSC Tropical wood</td>
<td>N/A</td>
<td>FSC durable timber/clay honeycomb block</td>
<td>Sig. extra/sig. extra</td>
</tr>
<tr>
<td></td>
<td>Preserved softwood</td>
<td></td>
<td>Loam/cob/recycled brick &amp; lime mortar</td>
<td>Extra/extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Masonry (new brick with lime mortar)</td>
<td>Extra/little diff./saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fibre-cement/new brick &amp; cement mortar</td>
<td>Same/saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Resin-bonded plywood</td>
<td>Extra/extra</td>
</tr>
<tr>
<td>Internal wall skin</td>
<td>Concrete</td>
<td>N/A</td>
<td>FSC Timber elements</td>
<td>Savings?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sand-lime blocks</td>
<td>Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flue-gas gypsum blocks</td>
<td>Extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cellular concrete blocks</td>
<td>Extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Natural gypsum blocks</td>
<td>Savings</td>
</tr>
<tr>
<td>Cavity wall insulation</td>
<td>Polyurethane;</td>
<td>Toxic ingredients/</td>
<td>Cork board;</td>
<td>Little/no difference</td>
</tr>
<tr>
<td></td>
<td>Extruded polystyrene</td>
<td>Hazardous additives</td>
<td>Cellulose (recycled paper)</td>
<td>Significant savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mineral/rock wool;</td>
<td>Extra cost/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Expanded polystyrene</td>
<td>Savings?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Glasswool/foamed glass</td>
<td>Savings</td>
</tr>
<tr>
<td>Cladding</td>
<td>Non-FSC Tropical wood</td>
<td>N/A</td>
<td>FSC timber/compressed unfired clay brick</td>
<td>Sig. extra/double/extra</td>
</tr>
<tr>
<td></td>
<td>Composite Steel Panels</td>
<td></td>
<td>Sustainable plywood</td>
<td>Extra/extra/saving</td>
</tr>
<tr>
<td></td>
<td>Composite Aluminium Panels</td>
<td></td>
<td>Fibre cement</td>
<td>Same/small extra/saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Recycled Profiled Steel or Aluminium cladding</td>
<td>Savings</td>
</tr>
<tr>
<td>External wall rendering</td>
<td>N/A</td>
<td>N/A</td>
<td>Ceramic Tiles</td>
<td>3x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mineral render</td>
<td>Cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Synthetic render</td>
<td>4x cheapest</td>
</tr>
</tbody>
</table>

#### 4.4.2 Internal Wall Construction

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party walls</td>
<td>Solid concrete with primary aggregate</td>
<td>N/A</td>
<td>Earth-based (Loam)</td>
<td>Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FSC Timber frame</td>
<td>Small saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brick (sand-lime)</td>
<td>1/5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cellular conc. block</td>
<td>A quarter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Porous brick</td>
<td>Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Concrete with RCA</td>
<td>Savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Limestone</td>
<td>Savings</td>
</tr>
<tr>
<td>Solid walls</td>
<td>Pre-cast concrete elements</td>
<td>N/A</td>
<td>Earth-based (Loam)</td>
<td>1/25th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FSC Timber frame</td>
<td>1/15th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brick (sand-lime)</td>
<td>1/12th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cellular conc. block</td>
<td>1/5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Natural gypsum block</td>
<td>1/13th</td>
</tr>
<tr>
<td>Plasterwork</td>
<td>Phosphogypsum</td>
<td>Phosphorus/radioactive</td>
<td>Flue-gas gypsum</td>
<td>Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lime mortar</td>
<td>Same</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Natural gypsum</td>
<td>Sig. savings</td>
</tr>
<tr>
<td>Wall &amp; ceiling</td>
<td>N/A</td>
<td>N/A</td>
<td>Softwood</td>
<td>Little or no difference</td>
</tr>
<tr>
<td>Framing systems</td>
<td></td>
<td></td>
<td>Steel</td>
<td>Substantially more</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aluminium</td>
<td>Extra cost</td>
</tr>
<tr>
<td>Wall &amp; ceiling</td>
<td>Phosphogypsum board</td>
<td>N/A</td>
<td>Phosphorus/radioactive</td>
<td>Extra cost</td>
</tr>
<tr>
<td>Panelling systems</td>
<td>Medium density fibreboard (MDF)</td>
<td></td>
<td>Formaldehyde/skin &amp; eye irritant, respiratory system possible carcinogen</td>
<td>Extra cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Formaldehyde-free MDF</td>
<td>Extra cost</td>
</tr>
</tbody>
</table>

---

Rammed earth, Eden Centre
Source: Apex Photo Agency
### 4.5 Windows, Doors & Glazing

#### Key:
- Most Environmentally Sound,
- Environmentally Sound,
- Less Environmentally Sound

#### 4.5.1 Window Frames & Doors

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External window/door frames</strong></td>
<td>• Non-FSC Tropical wood</td>
<td>• N/A</td>
<td>• FSC durable timber</td>
<td>• Little extra/same</td>
</tr>
<tr>
<td>• uPVC</td>
<td></td>
<td></td>
<td>• Untreated softwood</td>
<td>• Extra/significant extra</td>
</tr>
<tr>
<td>• Vinyl chloride/</td>
<td></td>
<td></td>
<td>• Softwood with solid borate implant</td>
<td>• Significant extra</td>
</tr>
<tr>
<td>carcinogenic &amp; phthalates/suspect</td>
<td></td>
<td></td>
<td>• Sustainable plywood (door)</td>
<td>• Significant extra</td>
</tr>
<tr>
<td>hormone disrupter</td>
<td></td>
<td></td>
<td>• Aluminium</td>
<td>• Significant extra</td>
</tr>
<tr>
<td>• Preserved softwood</td>
<td></td>
<td></td>
<td>• Softwood with solid borate implant</td>
<td>• Significant extra</td>
</tr>
<tr>
<td>• Recycled uPVC</td>
<td></td>
<td></td>
<td></td>
<td>• Significant extra</td>
</tr>
<tr>
<td><strong>External Window sills</strong></td>
<td>• N/A</td>
<td>• N/A</td>
<td>• Ceramic</td>
<td>• 1.8x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Concrete</td>
<td>• Cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Natural stone</td>
<td>• V. Expensive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Prefab Conc.</td>
<td>• Cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cast stone</td>
<td>• 3x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Synthetic stone</td>
<td>• 3x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Aluminium</td>
<td>• 2.5x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fibre conc.</td>
<td>• 2x cheapest?</td>
</tr>
<tr>
<td><strong>Internal window frames</strong></td>
<td>• Non-FSC Tropical wood</td>
<td>• N/A</td>
<td>• FSC timber</td>
<td>• Little extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Galvanised &amp; coated steel</td>
<td>• Significant extra</td>
</tr>
<tr>
<td><strong>Internal Window sills</strong></td>
<td>• N/A</td>
<td>• N/A</td>
<td>• Ceramic tiles</td>
<td>• 4x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Natural stone</td>
<td>• V. expensive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Softwood</td>
<td>• 5x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sustainable plywood</td>
<td>• 3x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cast stone</td>
<td>• 8x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fibre cement</td>
<td>• 2.5x cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Chipboard</td>
<td>• Cheapest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Synthetic stone</td>
<td>• 8x cheapest</td>
</tr>
<tr>
<td><strong>Internal doors</strong></td>
<td>• Non-FSC Tropical wood</td>
<td>• N/A</td>
<td>• Honeycomb with hardboard skins</td>
<td>• Extra cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• European softwood</td>
<td>• Double</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sustainable plywood</td>
<td>• 3x</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Chipboard</td>
<td>• Extra cost</td>
</tr>
<tr>
<td><strong>Internal door thresholds</strong></td>
<td>• Non-FSC Tropical wood</td>
<td>• N/A</td>
<td>• FSC durable wood</td>
<td>• Extra cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sustainable softwood</td>
<td>• Little/no diff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Steel with coating</td>
<td>• Extra cost</td>
</tr>
</tbody>
</table>

#### 4.5.2 Glazing

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glazing type</strong></td>
<td>• Single</td>
<td>N/A</td>
<td>• Argon-filled low emissivity</td>
<td>• Significant extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Air-filled low emissivity</td>
<td>• Significant extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Double</td>
<td>• Extra</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>• N/A</td>
<td>N/A</td>
<td>• Dry</td>
<td>• Cheapest?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Semi-dry</td>
<td>• Same as cheapest?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Wet</td>
<td>• Dearest?</td>
</tr>
</tbody>
</table>

Benfield ATT window
Source: Benfield ATT website
4.6 Roof Structure

Key:
- Most Environmentally Sound, • Environmentally Sound,
- Less Environmentally Sound

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Shape</td>
<td>• N/A</td>
<td>• N/A</td>
<td>• Pitched</td>
<td>• Lowest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Arched</td>
<td>• Extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Flat</td>
<td>• Slightly more</td>
</tr>
<tr>
<td>Pitched Roof construction</td>
<td>• Plywood from Non-FSC tropical wood</td>
<td>• N/A</td>
<td>• Sustainable FSC timber</td>
<td>• Significant extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Box panels/Sustainable plywood</td>
<td>• Significant extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Chipboard (low formaldehyde)</td>
<td>• Significant savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Chipboard</td>
<td></td>
</tr>
<tr>
<td>Pitched roof Insulation</td>
<td>• Polyurethane/Polysocyanurate</td>
<td>• Isocyanate extremely harmful to human health</td>
<td>• Cork/Cellulose/Sheep’s wool</td>
<td>• Extra/Saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Hazardous additives</td>
<td>• Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Flax</td>
<td>• Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mineral wool/Expanded polystyrene</td>
<td>• Extra/Same</td>
</tr>
<tr>
<td>Pitched roof Covering</td>
<td>• Zinc with PVC/PVF coating</td>
<td>• Plasticsisers/carcinogenic &amp; phthalates/suspect hormone disrupter</td>
<td>• Green (Turf)/Timber shingle/Reed/reclaimed tiles</td>
<td>• Extra/Saving</td>
</tr>
<tr>
<td></td>
<td>• Asbestos cement</td>
<td>• Fibrous silicate/ carcinogenic</td>
<td>• Clay or concrete roof tiles/natural slate</td>
<td>• Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fibre-cement slates/Bituminous slates</td>
<td>• Half</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Corrugated panels/Copper</td>
<td></td>
</tr>
<tr>
<td>Flat roof construction</td>
<td>• Concrete without reclaimed aggregate</td>
<td>• N/A</td>
<td>• Softwood rafters &amp; joinery</td>
<td>• Significant savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Steel sheets/Cellular concrete</td>
<td>• A quarter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Concrete with reclaimed aggregate</td>
<td>• Significant savings</td>
</tr>
<tr>
<td>Flat roof insulation</td>
<td>• Polyurethane/Polysocyanurate</td>
<td>• Isocyanate extremely harmful to human health</td>
<td>• Cork</td>
<td>• Same/Saving</td>
</tr>
<tr>
<td></td>
<td>• Extruded polystyrene</td>
<td></td>
<td>• Expanded heavy duty polystyrene/Dense mineral wool</td>
<td>• Savings/Extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Foamed glass</td>
<td>• Savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Perforl</td>
<td>• Savings/Extra</td>
</tr>
<tr>
<td>Flat Roof Covering</td>
<td>• Steel with organic coating</td>
<td>• Plasticsisers/carcinogenic and phthalates/suspect hormone disrupter</td>
<td>• Green ‘sedum’ (turf)</td>
<td>• Extra</td>
</tr>
<tr>
<td></td>
<td>• PVC sheet</td>
<td>• As above</td>
<td>• EPM Sheet/natural rubber</td>
<td>• Half/small extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Modified bitumen felt</td>
<td>• Half/small extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Blown bitumen felt/EPDM with bitumen layer</td>
<td>• Saving/extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recycled PVC</td>
<td>• A third/small extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Stainless Steel/Aluminium/Copper/Zinc sheet</td>
<td>• Same/extra/extra</td>
</tr>
<tr>
<td>Flashings</td>
<td>• Lead</td>
<td>• Lead/nervous system</td>
<td>• Polyethylene membrane</td>
<td>• 1/6th to Half</td>
</tr>
<tr>
<td></td>
<td>• Zinc</td>
<td>• Toxic to water organisms</td>
<td>• EPDM membrane</td>
<td>• Savings/double</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Polysobutene (P1B) with Al. gas</td>
<td>• Small saving/double</td>
</tr>
</tbody>
</table>

Green ‘turf’ roofs are an environmentally friendly alternative and may be flat, arched or pitched. They reduce surface water run-off in urban areas, ‘heat islands’, and improve urban air quality. There are two types; ‘extensive’ green roofs (lightweight with shallow soil & low maintenance aesthetic planting) and ‘intensive’ green roofs (for recreation & trafficking, with more robust construction, and a variety of surfaces & planting, requiring more maintenance). Green roofs can last up to three times longer than standard roofs.

4.7 Plumbing & Internal Water

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Supply piping</td>
<td>• Lead</td>
<td>Lead/nervous system</td>
<td>• Polyethylene (cold water only)</td>
<td>• Saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Polybutylene / Polypropylene</td>
<td>• Saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Stainless steel</td>
<td>• Saving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Copper</td>
<td>• Saving</td>
</tr>
<tr>
<td>Internal waste</td>
<td>• PVC</td>
<td>Plasticsisers/carcinogenic and phthalates</td>
<td>• Ceramic</td>
<td>• Extra</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Polypropylene/Polyethylene</td>
<td>• Savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recycled PVC</td>
<td>• Extra</td>
</tr>
</tbody>
</table>
### 4.8 Heating Installations
(for highly insulated buildings)

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual space heating</td>
<td>N/A</td>
<td>N/A</td>
<td>Gas wall heaters, Low wattage Electric heater (wall mounted)</td>
<td>Small extra, Cheaper</td>
</tr>
<tr>
<td>Central Space/Water Heating</td>
<td>Standard oversized boiler, Standard combi-boiler or Electric water heater</td>
<td>NOx/Respiratory problems</td>
<td>Correctly sized Solar &amp; condensing boilers, Condensing combination boiler, High-efficiency combination boiler</td>
<td>Extra cost, Extra cost, Extra cost</td>
</tr>
</tbody>
</table>

It must be clearly understood that the use of certain materials in these tables, need to be carefully specified to comply with Building Regulation requirements. Building Control Consultancy Services are happy to discuss specific proposals at an early stage in the design process.

### 4.9 Paint Finishes

<table>
<thead>
<tr>
<th>Element</th>
<th>Environmentally Unsound</th>
<th>Toxicity/Health Effects?</th>
<th>Environmentally Preferred Alternatives</th>
<th>Cost Relative to Env. Unsound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Painting (wood)</td>
<td>Alkyd (oil based) paint</td>
<td>Organic solvents/nausea, headaches, nervous system/reproductive effects</td>
<td>Natural wax, Water borne natural stain, Water borne acrylic (gloss), Water borne alkyd, Natural paint, High-solids alkyd</td>
<td>Small extra, Small extra, Extra cost, Savings, Small extra, Small extra</td>
</tr>
<tr>
<td>Exterior Painting (wood)</td>
<td>Alkyd (oil based) paint</td>
<td>As above</td>
<td>Natural paint, Boiled paint, Water borne alkyd, Water borne acrylic (gloss)</td>
<td>Small extra, Small extra, Small extra, Savings, Extra cost</td>
</tr>
<tr>
<td>Wall Surface Preparation</td>
<td>Solvent-based preservative</td>
<td>Benzene/reproductive effects</td>
<td>None, Natural preservative, Water borne preservative</td>
<td>N/A, 7x?, Small extra</td>
</tr>
<tr>
<td>Interior Painting (walls)</td>
<td>Alkyd (oil based) paint</td>
<td>Organic solvents/nausea, headaches, nervous system/reproductive effects</td>
<td>Whitewash, Linseed oil emulsion, Mineral Paint, Water borne natural stain, Natural paint, Water borne acrylic emulsion</td>
<td>Savings, Extra cost, Expensive, Small extra, Savings, Extra cost</td>
</tr>
<tr>
<td>Exterior Painting (walls)</td>
<td>Alkyd (oil based) paint</td>
<td>As above</td>
<td>Mineral Paint, Water borne natural stain, Natural paint, Water borne acrylic paint</td>
<td>Expensive, Small extra, Savings, Extra cost</td>
</tr>
<tr>
<td>Ferrous Metal Painting</td>
<td>Lead red lead, Epoxy alkyd paint, Thermal galvanising</td>
<td>Lead/nervous system, Harmful emissions to workers</td>
<td>Natural paint, Duplex galvanising, High-solids alkyd, Alkyd (oil-based) paint, Iron red lead</td>
<td>Extra cost?, Expensive, Small extra, Same?, Saving?</td>
</tr>
</tbody>
</table>

Source: Natural Building Technologies Ltd.
APPENDIX 3 - REFERENCES & BIBLIOGRAPHY

(Items marked * may be viewed for reference in Brent Planning Service)

General:
5) P. Littlefair et al (2000), Environmental Site Layout Planning, BRE, J oule & DETR.

Energy:

Materials:

Health & Safety:
39) HSE Health and Safety in Construction (G) 150 ISBN 0 7176 1143 4
40) HSE Managing Asbestos in Premises INDG223(rev2)
41) HSC The Control of Asbestos at Work-Approved Code of Practice L27
42) HSC Designing for Health and Safety in Construction ISBN 07176 0807 7
43) HSC Managing Construction for Health and Safety DM Regulations ACOP L54
44) HSC A Guide to Managing Health and Safety in Construction
APPENDIX 4 – RELEVANT COUNCIL DOCUMENTS & CONTACTS

BRENT DOCUMENTS:

Planning:

Environmental Health:

Environmental Strategy:

Streetcare:

Parks/Ecology:
17. Brent Best Practice Guidelines for Role of Parks in Flood Prevention, 2001

Transportation
20. Interim Local Implementation Plan (ILIP), 2002-2003

BRENT CONTACTS:

The Planning Service:
Ken Hullock/Dellé Odeleye (Policy) 020-8937 5315
R. Buckle/M. Smith (Urban Design) 020-8937 5213
Chris Barrons (Landscape Design) 020-8937 5112
Geoffrey Hewlett (North Area) 020-8937 5223
Meg Hirani (South Area) 020-8937 5228
Neil Bleakley (West Area) 020-8937 5227
Steve Weeks (Area Planning) 020-8937 5238
Chris Walker 020-8937 5246

Environmental Health:
Yogini Patel (Air, Land, Water) 020-8937 5252
Richard Buckley (Noise) 020-8937 5252

Energy Solutions – Northwest London:
Roger Kelly 020-8903 9369

Building Control Consultancy Service:
Andy Hardy 020-8937 5476
John Humphries 020-8937 5477
Govind Dabasia (North) 020-8937 5478
John Flynn (South) 020-8937 5479

Streetcare (Waste & Recycling):
Chris Whyte (Waste Management & Recycling) 020-8937 5342
Tony Talman (Waste Recycling) 020-8937 5081

Transportation:
John Fletcher (Development Control) 020-8937 5111
Adrian Pigott (Transport Planning) 020-8937 5168
Hash Patel (Drainage) 020-8903 5275

Parks:
Shaun Faulkner 020-8937 5619
Leslie Williams (Biodiversity) 020-8937 5628

Health & Safety:
Geoff Galilee 020-8937 5358
Colin Conboy 020-8937 5409

Wembley Project/Env. Strategy:
Keith Tallentire 020-8937 2273
Joyce Ip 020-8937 2274
Lella Durante/Suzanne Coster 020-8937 5324

Environmental Services Directorate:
Michael Read 020-8937 5302
Richard Saunders 020-8937 5002
## APPENDIX 5 - USEFUL ORGANISATIONS & RESOURCES

### GENERAL:
- **ASSOCIATION FOR ENVIRONMENT-CONSCIOUS BUILDING (AECB)** - publishes directories of practitioners & suppliers - Tel: 01559-370 908, Email: admin@aecb.net, Website: www.aecb.net
- **CONSTRUCTION INDUSTRY RESEARCH & INFORMATION ASSOCIATION (CIRIA)**, Tel: 020-7222 8891, Email: enquiries@ciria.org.uk, Website: www.ciria.org.uk
- **CENTRE FOR SUSTAINABLE CONSTRUCTION**, Building Research Establishment (BRE) Tel: 01923-664 462, Email: breaam@bre.co.uk, Website: www.bre.org.uk
- **BRITISH STANDARDS INSTITUTION (BSI)**, 2 Park Street, London W1A 2BS Tel: 020-7313 4900 Fax: 020-7727 9268, Website: www.bsi.org.uk
- **GREEN REGISTER of Building Professionals** - a register of architects, engineers and tradespeople with a commitment to sustainable design and construction Tel: 020-7820 3159, Website: www.greenregister.org
- **Chartered Institute of Building Services Engineers** (CIBSE) window design manual - Website: www.virtual-conference.com/cibse97/conference/papers/e-html/
- **NATIONAL RADIOLOGICAL PROTECTION BOARD** (NRPB) Radon Enquiry Bureau, Tel: 0800-614 529
- **ENVIRONMENT AGENCY**, General Enquiry Line Tel: 0845 9333111 North East Area Office (Thames Region) Tel: 01707 632300
- **BEST PRACTICE PROGRAMME** - offers free project consultation and advice, Tel: 01923 664000, Email: DesignAdvice@BRE.co.uk
- **NATIONAL GREEN SPECIFICATION (NGS)** - detailed specification clauses compatible with the NBS, hosted by BRE, Website: www.greenspec.co.uk

### BUILDING SERVICES:
- **BUILDING SERVICES RESEARCH & INFORMATION ASSOCIATION (BSRIA)**, Tel: 01344-426 511, Website: www.bsria.co.uk/bsriaweb
- **HEATING & VENTILATING CONTRACTORS’ ASSOCIATION (HVCA)**, Tel: 020 7313 4900 Fax: 020 7727 9268 Email: contact@hvca.org.uk
- **BOILER & RADIATORS MANUFACTURERS’ ASSOCIATION LTD. (BARMA)**, Tel: 0141 332 0826 Fax: 0141 332 5788
- **THAMES WATER UTILITIES** SN38 1TU Tel: 0118-964 0526
- **WATER REGULATIONS ADVISORY SCHEME (WRAS)** - water supply industry-funded scheme to encourage consistency of interpretation of the water fitting regulations across the UK Tel: 01495-248 454 Email: info@wras.co.uk, Website: www.wras.co.uk
- **COMBINED HEAT & POWER ASSOCIATION (CHPA)** - provides advice, information & access to grants, Tel: 020-7828 4077 Email: info@chpa.co.uk, Website: www.chpa.co.uk

### RENEWABLE ENERGY:
- **NATIONAL ENERGY FOUNDATION (NEF)** Renewables Service, Tel: 01908-665577 Email: renewables@natenerg.demon.co.uk, Website: natenerg.org.uk/nefrenewables
- **CENTRE FOR ALTERNATIVE TECHNOLOGY (CAT)**, Machynlieth, Powys SY20 9AZ Tel: 01654-702 400
- **THE SOLAR ENERGY SOCIETY**, c/o School of Engineering, Oxford Brookes University Tel: 01865 484 367 Fax: (+44) 1865 484 263 Email: uk-ises@brookes.ac.uk, Website: http://www.thesolarline.com
- **BRITISH WIND ENERGY ASSOCIATION (BWEA)**, Tel: 020-7402 7102
- **SOLAR TRADE ASSOCIATION** Tel: 01908 442290 Fax: 0870 0529194 Website: www.greenenergy.org.uk/sta Email: enquiries@solartradeassociation.org.uk

### MATERIALS/TRADES:
- **CONSTRUCTION RESOURCES**, builders merchant specialising in ecological materials, Tel: 020-7450 2211 Email: info@ecoconstruct.com, Website: www.ecoconstruct.com
- **NATURAL BUILDING TECHNOLOGIES Ltd.**, Tel: 01491 638911 Email: info@natural-building.co.uk, Website: www.natural-building.co.uk
- **GREEN BUILDING STORE**, green building product supplier, Tel: 01484 854898, Website: www.greenbuildingstore.co.uk
- **THERMAL INSULATION MANUFACTURERS & SUPPLIERS ASSOC., TIMSA**, Tel: 01252 739154 Fax: 01252 739140 Email: info@associationhouse.org.uk
- **Council for energy efficient development, national cavity insulation, insulated render & cladding & draft proof advisory associations and national association of loft insulation**, Tel: 01428-654 011
- **BRITISH EARTH SHELTERING ASSOCIATION** - Website: www.besa-uk.org
- **GREEN ROOFS** offers background & details on greenroof architecture. Website: www.greenroofs.com
- **FORESTS FOREVER**, provides further information on sources of sustainable timber, Tel: 020-7839 1891, Website: www.forestsforever.co.uk

### MATERIALS RECYCLING & DECONSTRUCTION:
- **SALVO MATERIALS INFORMATION EXCHANGE** hosted by Internet-based exchange for buying and selling used, second hand & unutilised construction materials, Tel: 01923-664461 Website: www.salvomie.co.uk
- **NATIONAL FEDERATION OF DEMOLITION CONTRACTORS (NFDC)** Tel: 01784 456799 Email:info@demolition-nfcc.com, Website: www.demolition-nfcc.com

### POLLUTION CONTROL:
- **INSTITUTE OF ACOUSTICS** maintains a list of suppliers and information on best practice/research, Tel: 01727 848195, Website: www.ioa.org.uk
- **ASSOCIATION OF NOISE CONSULTANTS** – can provide a list of consultants dealing with noise and vibration, Tel: 01763-852 958, Website: www.association-of-noise-consultants.co.uk

### FINANCIAL:
- **THE ECOLOGY BUILDING SOCIETY**, fund rescue/conversion of derelict buildings, new ‘green’ buildings, buying ‘back-to-back’ houses, ecological lifestyles, Tel: 0845-674 5566 Email: info@ecology.org.uk, Website: www.ecology.co.uk
- **ENERGY SAVING TRUST**, Grants, Website: www.est.org.uk/solar
- **CARBON TRUST**, Interest-free loans, Website: www.actionenergy.org.uk
APPENDIX 5 – CREDITS & CONSULTATION

Credits:
Members of the Sustainable Design Working Group:

Dr. Noel Thompson (A Kilburn Ward Member)
Dellé Odeleye (Planning - UDP Policy & Research)
Yogini Patel (Environmental Health - Pollution Team)
Roger Kelly (Energy Solutions - Northwest London)
Dina Gillespie (Formerly Energy Solutions - Northwest London)
John Humphries (Building Control Consultancy Services)
Mumtaz Patel (Planning - Development Control Western Area)

The contributions of Richard Buckley (Environmental Health), Hash Patel (Transportation), Colin Conboy (Health & Safety), Suzanne Coster (Environmental Strategy), Geoff Raw, Allie Savage, Robin Rigg, John Walker, Andrea Brochocka and Tav Kazmi are gratefully acknowledged.

Background & Consultation:

1. A rather weak policy had been formulated in the 1st deposit draft the UDP March 2000 (on the basis that was the most that could be done at the time). However, within the supporting text was a commitment for the Council to produce an SPG during the life of the Plan (i.e. within 5-10 yrs) depending on resource availability. Cllr Noel Thompson, Kilburn Ward, presented a paper to the UDP Members Steering Group, which was considering the Council’s response to the objections received from the 1st deposit consultations (Spring 2000). The paper bemoaned the low sustainable design content of the Revised UDP. As a result, the UDP Steering Group Members agreed the production of an SPG should be prioritised and produced in time for the UDP Inquiry.

2. A working party was formed in Dec 2000 with the interested Member, and representatives from other Env. Services departments such as Env. Policy & Performance, Building Control and Env. Health, as well as Brent’s local Energy Advice Centre, to formulate a stronger policy which went into the 2nd Deposit UDP. It also researched and compiled current best practice into a Draft Supplementary Design & Planning Guidance document, in Oct. 2001.

3. Internal consultation was carried out within Environmental Services (Oct 2001-June 2002) to consider a range of implementation options, and with representatives of other Council units (Education, Housing, Legal, etc) as well as liaising informally with efforts of a couple of other Boroughs, the GLA & GoL. The drawn out internal consultation process, was to ensure other staff across the service units were all consulted and had an opportunity to influence the document, so that all units would be ‘signed-up’ to sustainable design objectives and could deliver a joined-up approach.

4. It was thought there’d be an avalanche of objections to the stronger Policy in the Revised deposit UDP, but surprisingly there was not even 1 objection! So it did not have to be defended at the UDP Public Inquiry in Feb 2002.

5. Members early in July 2002 approved the draft SPG for public consultation from Aug – Sept 2002. Those consulted included: Statutory organisations, Residents associations, Professional bodies, agents, planning and design consultants, and officers in other Boroughs. A workshop session was also held in Brent Town Hall as part of the consultation. The responses and/or workshop contributions of the following have been very useful:

- Chris Revell (Kensington & Chelsea Primary Health Trust)
- Dr Vina Kukadia (BRE Environment)
- Ken Bean (Government office for London)
- Tim Johnston (Greater London Authority)
- Mathew Sounders (Ancient Monuments Society)
- Emma Nafzger (Environment Agency)
- Alex Machin (English Nature)
- Michael Wetherell (Landscape Institute)
- Mark Mathews (Thames Water Property Services)
- Prof. Tom Woolley (Queens University Belfast)

6. The results of the consultation and proposed changes were taken back to Executive Members in April 2003 and they adopted a revised SPG and Checklist, subject to any necessary editorial changes necessary to obtain the Plain English Campaign’s (PEC) Crystal Mark.

7. It was later realised that many of the type of changes involved in securing this accreditation were not all appropriate for a technical document of this nature. However, some of the plain English suggestions, and recommendations from further Member feedback, were included in the amended SPG and Checklist documents finally agreed by the Executive in November 2003.

8. Final Steps:
- Operating the SPG/Checklist & refining the implementation procedures;
- Further training for Planning Officers & Planning Committee Members.
- Producing a promotional summary leaflet
- Publishing a householders guide to sustainable development