

Buildings – Adaptability, Durability and Materials

Subsection of the 'Buildings – Adaptability, Durability and Materials Chapter'. Introduction to the context national, regional and local, generally including paragraphs containing the following information;

Decisions regarding the use of materials have wide reaching environmental consequences, energy used in the manufacture, delivery, and the incorporation of materials and appliances into buildings accounts for some 10% of total energy consumption in the UK alone. Choices developers make in sourcing materials impact upon globally finite resources such as minerals, and fossil fuels. Upward of 250 million tonnes of material are extracted from quarries each year for cement bricks and aggregates.

In addition, the construction industry uses many other materials and components, which all have a range of effects on the environment arising from their production, use, maintenance and final disposal. The construction industry in the UK is estimated to use six tonnes of building materials per person each year in developments; 20% on infrastructure (civil engineering) and 80% on buildings.

Approximately 50% of total CFC's produced have been through uses such as air conditioning, refrigeration, fire extinguishers and insulation in buildings (Blowers, 1993). Poorly evaluated industrial practices, building techniques, waste disposal, and transportation have led to ground, air and water pollution so hazardous to life that we are now having to invest millions in time and costs to reclaim a fit environment for ourselves and future generations. Approaches to building must change.

To reduce the energy used, chemicals required and emitted during the mining, manufacture, finishing and transportation of building materials and development we must adopt a holistically sustainable approach to;

- Pre-build site analysis, records and planning
- Pre-build land reparation and risk mitigation planning
- Pre-demolition salvage, recycling and waste and pollutant management
- Re-use and adaptation of existing builds
- The accurate specification and quantity surveying of materials.
- The sustainability of sourcing and storing materials
- The resilience or durability of materials used and their suitability to re-use or recycling
- The effectiveness of maintenance plans and contracts

The **Sustainable Buildings Task Group Report: one year on** to National Government makes it clear that building control and planning officers will be increasingly required to assess future development plans and final builds to ensure that sustainability issues have been fully addressed throughout the project. Developers, must begin to understand and utilise the range of tools available for assessing the overall impact of development and buildings performance and, be prepared to declare the chosen assessment tools and outcomes used in their designs and development plans. The [Building Research Establishment \(BRE\)](#) tool BREEAM has been recommended by the Sustainable Buildings Task Group (SBTG) as the basis for assessment arrangements for the finally adopted code.

Site Approaches

Subsection of the 'Buildings – Adaptability, Durability and Materials Chapter'. Introducing pre-development considerations.

Sustainable principles and approaches should be established at the outset of the design development process to mitigate against pollution, maximise recycling potentials and ensure long term durability of builds. A pre-demolition, pre-development site appraisal and plan should be completed from the outset to establish the proper approach to sustainable value management and contracting. Such sustainable plans and approaches established at site assessment point are far easier to continue through the construction and commissioning of the building and final maintenance contracts.

Site appraisals should map a site's biodiversity, microclimate and topography, including features above and below ground (such as archaeology, minerals and water), its existing structures, location, access and egress routes, its relationship to the neighbouring environment and community.

Topographic and Bio Features:

A sustainable pre-demolition, pre-development site appraisal and plan should evidence;

- An awareness of ground stability and structure, noting such features as deep plastic clay beds, shales, previous undermining and minerals extraction or other features increasing likelihood of subsidence and implying the need for specialist approaches to foundations. Noted subsidence risk features can then be used to ensure foundations and utilities infrastructure are designed to mitigate against high cost future maintenance or at worst case scenario destabilising leading to demolition.
- Early evaluation of ground substrate properties in consultation with a qualified adviser establishing necessary excavation levels to reduce unnecessary levels of concrete in foundations and floors.
- Consideration of the hydraulic status quo. Including the value of the soils and substrate to the maintenance of stable/usual year round water tables and the likely impact of alteration in the development area to this. The existing pattern of surface water drainage and the existing pattern and courses of natural substrate drainage should also be recorded. Noted hydraulic features can then be used to ensure the incorporation of alternate flood plain and the planned;
 - mitigation of pollution of natural water courses during and post demolition and build (see also water chapter)
 - approach taken to incorporating sustainable drainage systems (SUDS) and soft landscaping and soak away flash flood reduction features. (see also water chapter)
- Consideration of asset bio-features such as trees established hedge rows and scarce native species. Noted bio-features should be maintained wherever possible and the development planned to incorporate them by avoiding damage to roots and aerial parts. Site access for development and building foundations should be designed to reflect impact distances from bio-features.
- Quantity surveying should be included at an early stage to establish volumes of build materials including topsoil and subsoil already on site and plans made for the on-site storage of these for landscaping later, thus minimising adverse impacts on soil resources and wasted transportation

Environmental Reparation: Our understanding of bio-hazards and appropriate waste disposal has significantly improved, today's developers may however inherit site conditions evidencing past insensitivity to such issues. A sustainable pre-demolition, pre-development site appraisal and plan should evidence an evaluation of the need to cleanse soils of any toxicity and safely remove any hazardous materials present, such as asbestos. See also **Land remediation tax relief** in the 'Standards, Policy and Legislation' section of this chapter.

Built Site Context: As well as ensuring that developments preserve bio-features and do not detrimentally impact on their natural surroundings, a sustainable pre-development site appraisal and plan should evidence;

- Understanding of how the development can link with, expand or create sustainable utilities infrastructure i.e.
 - Community renewables heating and lighting networks (see the Energy Chapter)
 - Community reed bed, wetland or other sustainable sewage treatment networks and, planned systems of sustainable drainage (SUDs) (see the Water Chapter)
- Understanding of how the development can link with, expand or create sustainable transport infrastructure (especially transport links, to schools, hospitals, and so on) i.e.
 - Enter consultation with bus companies regarding likely future needs and how these can be incorporated and enhanced (see the Transport chapter)
 - Plan in cycle lanes and storage (see the Transport chapter)
 - Expand off road pedestrian routes and cuts as well as pavements (see the Transport chapter)
- Understanding of how the development can maintain or enhance the character of the existing buildings (see also Historic Environment Chapter). Where priority should be given to;
 - Renovation and reuse of architecturally significant structures in previously developed sites.
 - The high use of legally reclaimed building materials of a type blending with the existing architecture
- Understanding of how the development can incorporate the need for open space and leisure serving the broader community interest (see also Land Use and Open Space Chapter)
- Understanding of how the development can expand and blend the natural environment into the built environment in the interests of wildlife and bio-diversity (see also Wildlife and Bio-diversity Chapter)

Sustainable Demolition: Between 70 and 80% of building construction materials are derived from natural resources such as stone, timber and clay. Given this, developers need to reject historically adopted rapid demolition and clearance approaches in favour of adopting deconstruction principals maximising the potential for materials to be reclaimed for reuse and recycling. Where the contracted party for demolition is separate from the contracted party for construction, the contracts should clearly indicate the joint and separate responsibilities for sustainable development issues such as pollution, waste management, sourcing etc.

A sustainable pre-demolition, pre-development site appraisal and plan should evidence;

- The application of quantity surveying to the understanding of the volumes of onsite pre-demolition materials and their potential for re-use and recycling in order to;
 - Develop appropriate on site separation and secure (from natural elements and human beings) storage facilities for reclaimed materials for re-use and recycling.
 - Develop appropriate on site cleaning and refinishing facilities for reclaimed materials for re-use and recycling which do not pollute ground water or soil.
 - Assess what of the total volume of the separated materials under all categories will be reused on site to minimise overestimation of quantities of new materials and associated environmental impacts through transportation and waste.

- Enter into effective contracts with other local developers/buildings suppliers for the removal of volumes of the separated materials not required under all categories for use elsewhere.
 - Minimise the volumes of new materials required and their associated transportation impacts.
 - Develop a waste minimisation plan emphasising recycling and reuse and minimising landfill which will then continue to operate throughout construction.
- An understanding of the differing reclamation methods required for differing materials to ensure greatest salvage gains and reusable condition. For example;
- Reusable bricks, masonry stone and slates need to be removed by hand, cleaned if possible at site and stored on pallets to avoid damage and ease handling.
 - Timber flooring, roof beams, doors, door frames and window frames panelling and shuttering need to be carefully hand removed and freed of screws and nails – both for health and safety reasons and to ease reuse. All sound timber products should be stacked or stored in conditions mitigating against damage from weather.
 - Ceramic (i.e. sinks, baths and toilets, period tiles), metal (fire surrounds etc) need careful hand removal and storage if they are to be kept in re-use condition.
- An understanding of the recycling opportunities and methods presented by materials that are not of adequate standards for re-use. For example;
- Where the site conditions permit, separate crush and pack rubbles and hardcore, for use in order of preference;
 - on site (low quality aggregate uses bedding paving, roads, etc)
 - on other sites where crushing will save on excess transport
 - Separate timber which can't be reused into treatment contaminated product and non-contaminated product, shred and store the latter for later use as mulch around landscaping features. Check whether the former can be used in large scale local waste to fuel or bio-mass burning plants before sending to landfill.
 - Separate glass for recycling, where the site conditions permit and health and safety considerations allow, crush and pack to minimise transportation.
 - Separate metal products for recycling
- An understanding of waste reduction targets setting with the aim of minimising waste production throughout the phases of each development project. Waste arising during construction should be estimated within agreed targets then measured and compared with established benchmarks (for example the BRE SMARTWaste web-based tool) and where the demolition is a sub-contract of the developers contract the primary contractor should consider the feasibility of penalty clauses for the creation of waste exceeding targets within an agreed % excess.

Adaptability and Durability in Design

Subsection of the 'Buildings – Adaptability, Durability and Materials Chapter' covering the core concepts in respect of new developments and refurbishment or redevelopment of existing structures.

In York and the region we are proud inheritors of a long history of inhabitation, amongst our buildings are structures of significance from the Roman period through to our recent industrial past. Successful cities adapt as their economic bases change and the demand for housing and the nature of workplaces alter. Sustainability is about improving quality of life today in a manner respecting the needs of future generations. Development must preserve this heritage whilst creating an equally significant and dynamic inheritance for generations in buildings constructed today.

Flexibility: To secure sustainability development must build-in adaptability, durability and flexibility to both its existing and new buildings. Buildings are more likely to be occupied and re-used if they can be easily adapted to meet changing needs. The developer should remember that flexible builds;

- Attract a greater range of potential purchasers or tenants ensuring the best sale, or rental values and minimise vacancy time and under occupation.
- Increase the sell-on or re-let value of a building.

Whilst the approaches taken alter subtly at the detailed level to the refurbishment or redevelopment of existing build and new build, certain key principals can be applied to both. First steps are about maximising flexibility across a spectrum of changing needs.

Contractors and developers should be able to evidence flexible approaches to building and renovation at point of application, these should;

- incorporate possible mixed uses within a building, or complex of buildings such as living accommodation above shops particularly larger development areas.
- allow for adaptation of the space to accommodate for the growing home working market. Particularly domestic property, but also a useful indicator of the need to be able to adapt industrial and office space to domestic or multi-purpose use later.
- incorporate readily adaptive space layouts;
 - including expansion space such as basements or lofts made thermally efficient and damp proof at point of build, refurbishment or renovation for ease future use.
 - built forms that incorporate easily accessible and changeable utilities installations.
 - flexible spaces for changing spatial requirements of building occupiers, including consideration of the merits of non-structural or frame internal walls.
- Improve or maximise the buildings internal and external accessibility without resorting to mechanical aids such as lifts wherever possible. This will mean best use of: gradients, accessible routes, entrance position, level changes, ramps, and the planning of internal disability access features etc.

Reuse: Many abandoned industrial buildings and disused churches are now being refurbished as domestic and business premises. The re-use of existing buildings that do, or could, positively contribution towards the local environment is of primary importance. The majority of buildings can, with investment, be adapted to meet present and future needs. Where buildings are structurally sound and do not present another environmental hazard demolition should not be considered.

The re-use and adaptation of existing buildings represents high sustainable advantages by;

- Reducing the demand for and associated environmental impacts of new building materials
- Reducing the environmental impacts of the construction process
- Promoting a sense of place and historic and cultural continuity.
- Providing the opportunity to upgrade insulation, heating, lighting and ventilation efficiency standards
- Providing the opportunity to adapt previously unusable space – i.e. basements and lofts – to habitable standards.

- Providing the opportunity to modify access – particularly of internal spaces – to disability aware standards

Whilst the re-use and adaptation of existing buildings represents high sustainable value it must be ensured that adaptations respect;

- Important aspects of the building that have historical or cultural importance or are protected by listed building status. When restoring listed buildings or working in conservation areas the effect should be in keeping with the original designs.
- The increased need for visible materials to blend with their surroundings. The use of traditional local materials particularly if recycled can ensure the building respects its surroundings whilst also encouraging the use of local materials and reducing the need for transportation.
- The need to conform with planning and building regulations for any change of use.
- The need to remove any hazardous materials present, such as leaded paints or asbestos.

New Developments: Whilst adhering to all the principals for future flexibility and being sensitive of the conservation areas, new builds should be designed to;

- Ensure high structural standards facilitating a long and useful life avoiding premature obsolescence and dereliction.
- Incorporate flexible layouts that allow for the greatest variety of possible future adaptations and uses can be accommodated
- Include adaptable storage minimising the need for future expansion of the built area; including the consideration of basement garages.
- Include basements insulated, ventilated and damp proofed to allow for future expansion of the liveable area. Consider the following points;
 - 'partial depth' basements provide for better natural lighting, ventilation and damp-proofing than conventional basements;
 - providing a basement can enable more efficient use of individual plots, but should be carefully designed to avoid the creation of substandard living accommodation;
 - basements can provide a substructure that is less susceptible to frost heave, settlement and moisture changes in the subsoil.
- Favour pitched roofs over flat roofs for the following advantages:
 - less maintenance is usually required
 - they provide more ready locations for solar panels (see energy chapter)
 - Additional rooms can be readily created in the space provided if trussed rafters are avoided and careful consideration is used in the choice of roof insulation.
- Make extensive use of recycled and renewable construction materials and techniques.

All Developments:

- Should be designed to incorporate as far as possible the sustainable approaches to resource management covered in the Energy, Water and Waste Chapters.
- Provide for convenient and secure cycle storage whether commercial or domestic buildings
- Provide storage areas for separating containers for recyclable materials.

Sourcing Materials & Construction

Subsection of the 'Buildings – Adaptability, Durability and Materials Chapter'

This section builds on and the sustainable approaches introduced in previous sections of this chapter to ensure they can be carried through the next phases, to recap;

- Establish pre-demolition or pre-build site evaluation and management reports and plans.
- Adopt deconstruction approaches to demolition maximising recovery, recycling and re-use.
- Re-use existing structures over new build as a priority.
- Design both new and re-used structures for adaptability and environmental efficiency.

By point of materials sourcing and construction it would be assumed that the Build/Project Manager and site have organised to;

- Provide easy access to appropriately separated and stored recovered materials from demolition for re-use.
- Ensure that the volumes of such materials have been deducted from the quantity surveying calculations for total materials required; much construction waste could be avoided by carefully calculating the quantities of materials required.
- Have unneeded reclaimed and recyclable materials moved to another site or supplier to minimise damage.
- Established a waste management area for the continued separation of recycle, re-use materials throughout the build
- Consulted on and entered agreements for expanding or creating sustainable and renewable utilities infrastructure.

Some long-lived or durable materials require significant amounts of energy to produce but the final product may require little maintenance and be simply re-used without significant further energy, water or processing being required. Other reasonably available materials may degrade in such a way as to emit harmful substances into the environment or require significant processing to render safe as waste, and/or not contribute significantly to landfill at the end of their useful life.

By point of materials sourcing and construction it would be assumed that the Build/Project Manager will also be ready to adopt a **Life Cycle Analysis** approach to the acquisition of materials and build techniques. Life Cycle Analysis is a tool created to evaluate the sustainability of buildings and the materials contained in their construction at all the stages involved by minimising;

- Reliance on primary sourced raw materials,
- Energy and pollutants required to processing or manufacture and package products
- Energy required for and impacts of storage, transportation and retailing
- Energy required for and impacts of use and maintenance of materials and final build

Whilst maximising;

- The life span, durability and adaptability of the build
- The buildings performance efficiency
- Re-use and recycling
- The incorporation of sustainably sourced materials
- The sustainable management and mitigation of waste

Sustainable Construction can be improved through strict application of the following principles:

- Increase Thermal Mass by using materials with a high capacity to absorb heat energy within a building structure for later released as air temperature drops.
- Incorporate Earth Sheltering by covering surfaces except the south facing side, to provide additional insulation and/or to reduce visual impact and the area of exposed external wall.
- Improve sound insulation through thermal massing and/or earth sheltering this is particularly important in high density developments, such as terrace housing, flats and built up work environments.
- Ensure Ventilation is Natural by using natural cross air flows controlled and adjusted by building users. Install blinds to prevent build-up of heat from sunlight.
- Increase the longevity by incorporating durable materials and products
- Use design details to protect and prolong the life of the building for example;

- Incorporate features (such as deep roof overhangs) that protect the building from extreme weather
- Avoid vulnerable materials and details such as exposed roof parapets.
- Maximise the developments autonomy, or ability to supply its own energy, drainage and water needs.
- Incorporate thermal insulation to above current Building Regulation requirements. Ensure that windows and external doors are draught sealed. And incorporate air-lock or air lobbies to reduce heat loss. See also Energy Chapter.
- Improve thermal buffering by exploring the potential to link buildings or by attaching conservatories, garages and greenhouses to the outside of heated rooms.
- Improve solar gains through south facing windows with low emissivity double glazing to reduce heat loss etc and ensure window frame materials are thermally efficient timber frames have better thermal resistance than steel or aluminium. See also Energy Chapter
- Work with the natural environment;
 - Avoid herbicides and fertilisers that can damage soils and habitats.
 - plant on walls to help reduce heat loss, airborne dust, ground CO₂ and provide wildlife habitat
 - Plant trees shelter belt trees to reduce wind chill and provide summer shade whilst grounding CO₂ and providing wildlife habitat

Sustainable Acquisition of Materials can be improved through strict application of the following principles:

- Re-use materials from local sources wherever possible. Including reclaimed materials (e.g. second-hand timber) and recycled materials (such as glass / concrete or brick rubble for aggregates).
- Secure locally produced materials to minimise the impact of transportation and support the local economy. Specify that contractors do likewise and insist on examining their supply chain.
- Only buy reclaimed materials from reputable suppliers, to avoid supporting illegal markets of materials taken without consent or inappropriately from listed buildings and buildings of conservation importance, i.e. redundant buildings contributing to the environment of the area e.g. old farm, church and mine buildings which should not be 'robbed' of walling stone or slate.
- Only buy new materials from reputable suppliers, to avoid supporting illegal markets; i.e. specify that all timber hardwood and softwood is Forestry Stewardship Council accredited
- Assess when materials will be required and stagger delivery of materials to be 'Just-in-time' – causing lower likelihood of damage from handling and storage.
- Explore the local market in sustainable prefabricated elements, this has the following advantages;
 - Off-site manufacture is usually very well controlled and so it may produce less waste during construction to put together parts of the building off site.
 - External parts of the house will be erected quickly and internal fitting out may be done at the same time adding to efficiency in terms of reducing construction times. This could include foundations, using pre- cast ground beams on piled foundations for example, as well as the more obvious external and internal walls.
 - Specialist construction of some high rated sustainable elements off site may reduce some of the learning curves issues builders need to overcome to compete in a sustainable market place.

Sustainable Materials Choice can be improved through strict application of the following principles:

- Choose materials with a high-recycled content; recycled metals are often also more economically attractive, especially steel
- Ensure most materials that can be easily recycled when the life of the building comes to an end for example;
 - bricks, are easier to reclaim for reuse when lime mortar is used rather than Portland cement mortar.
 - Avoid composite materials that cannot easily be separated
- Favour materials from renewable resources over non-renewable sourced materials for example;
 - FSC certified timber rather than metal,
 - bio aggregates over primary sourced
 - linoleum made from natural oils and minerals rather than PVC
 - Specify FSC accredited high quality timber window frames and door jams rather than uPVC or aluminium.
 - Choose insulates based on such as sheep shoddy, recycled paper, straw, cork and hemp to create low impact, high thermal mass building and insulation materials
- Avoid materials such as plastic, steel and aluminium which require a high energy input in their manufacture and thus should be used sparingly.
- If stone is chosen for the benefits of being durable, easy to recycle, low maintenance and a high thermal capacity, it should be remembered that unless it is reclaimed these benefits are almost wholly offset by the need for transportation and the impacts of extraction.
- If brick is chosen for the benefits of being durable and re-usable, it should be remembered that unless it is reclaimed these benefits are almost wholly offset the high energy input into their production. This should be mitigated by specifying the sourcing of locally produced to reduce transport costs and the use of lime mortars in construction to facilitate recycling.
- If products such as cement and concrete blocks are chosen then lightweight versions using bio-mass such as hemp, waste or by-product materials should be specified.
- Specify the use of lime mortars in construction rather than Portland cements. Lime mortars not only to facilitate recycling but also significantly contribute to environmental health by absorbing nearly it's own weight of carbon dioxide from the atmosphere during the setting process.
- Choose timber for as many purposes as possible, for example structural timber, cladding, carcassing, window frames and door sets, internal joinery and panel products. Its growth locks up or grounds atmospheric carbon, its processing is relatively low energy and the thermally efficiency of the product is high. Take care however to ensure that it is sourced as locally as possible from well managed, independently FSC certified sources.
- Consider entering into the rapidly evolving use of Bio-Building Materials;
 - Packed Earth is highly sustainable requiring little energy in its manufacture and can be sourced as a by product of crop processing, i.e. beat cleansing for sugar production. It can provide high levels of insulation and in addition, earth sheltered buildings provide opportunities for habitat creation and landscape improvement.
 - Straw Bale is highly sustainable and can be sourced as a by product of cereal crop processing. It has incredible thermal mass and noise reduction properties.
 - Hemp is highly sustainable and can be sourced as a by product of oil crop processing. It also has incredible thermal mass and noise reduction properties.
 - Turf and sedum roofing which reduces rainfall run-off, improve insulation and provide habitat for birds and animals.
- Always use materials that do not produce toxic emissions within the building or whose production and end of life disposal leads to toxic waste;

- Choose natural water based paints or at least those low in Volatile Organic Compounds (VOCs).
- Many traditional wood preservatives used in timber treatment are toxic – attacking the nervous system and liver and increasing susceptibility to cancers. It is better to use hardwood, to avoid getting timber wet and to inspect and maintain the wood regularly. Ensure where timber elements are preserved it is with easily biodegraded low toxicity preservatives; Borates for example.
- Ensure paint strippers don't contain solvents such as dichloromethane, a known and highly toxic carcinogen that can be hazardous to health. In favour of those supplied by Environmental Buildings and décor suppliers based on water safe biodegradable alternatives and containing little or no solvents.
- Specify formaldehyde-free MDF
- Rule out PVCs in Window frames, doors and floor and surface coverings
- Rule out substances containing CFCs (chlorofluorocarbons) and HCFCs (hydrofluorocarbons); ensure CFC's aren't used as refrigerants in air conditioning for example
- Ensure insulants do not contain, or require during manufacture, ozone-depleting substances
- Ensure that fire suppression systems do not contain halons or penta/octa/deca-BDE (bromodiphenyl ether) flame-retardants

There is a growing body of research on the effects of long-term exposure to potentially hazardous materials such as adhesives, mastics, fungicides and other products containing solvents and other volatile organic compounds (VOCs). However, where there is little research available on the effects but a material may present a potential risk its use should still be avoided.

Maintenance

Subsection of the 'Buildings – Adaptability, Durability and Materials Chapter'

The ongoing maintenance, repair and refurbishment of buildings can have a greater environmental impact over their lifespan than their original construction. (Rethinking Construction 2003)

Strictly maintenance and management objectives should be considered at the outset or design stage of projects, as the choice of materials and complexity of its services and monitoring systems (especially for water and energy), will be crucial in determining how efficiency of its operation.

Maintenance responsibilities should be clearly defined, between occupants, utility companies, local authorities and specialist contractors. Owners and occupiers need to be provided with high quality guidance about using a new or refurbished building, improving their capacity and inspiration to optimise its 'green' potential. The onus should be on routine repair rather than replacement or structural change this is important as;

- In some older buildings some types of modernisation may trigger a decline that could threaten their survival.
- In some New Eco-builds some types of modernisation may affect overall performance of heating, ventilation and insulation.

On completion, buildings should be subject to Pre Occupancy Evaluation (POE) to ensure agreed standards have been met and to finalise the scope of maintenance contracts and guidance.

To Ensure Sustainable approaches extend through maintenance;

- Check the quality of the managing companies and/or maintenance contractors previous work and whether [ISO-14001](#) certification has been gained. Take steps before entering into contracts to test their understanding of, and commitment to, sustainable projects, find out if they have been demonstrably successful in previous sustainable projects.
- Assess the future maintenance needs and regime at the design point to;
 - Devise a thorough, and realistic maintenance and assessment programme
 - Ensure that materials, labour and skills can be locally sourced
- Ensure contracts include measures to monitor environmental performance and enforce agreed penalties if targets are not met.
- Whilst choosing longer lasting materials and appliances that can save on operational and repair costs over time, avoid "maintenance-free" products if they involve the replacement of whole components rather than partial repair. Keep and check all manufacturers' servicing schedules.
- Ensure utilities controls are easily comprehensible and install accessible metering even if this is not required as it will provide an early warning system for problems.
- Ensure that funds and maintenance plans are available for routine, medium and long term management of habitats created or surrounding development schemes. Adjust seasonal maintenance regimes for soft landscaping to encourage wildlife and plant diversity, avoid herbicides and fertilisers that can damage soils and habitats.
- For larger schemes, consider training sessions or courses where key occupiers or managers can be 'targeted'.
- Provide a handover manual/occupiers pack with the option of a demonstration at handover; emphasising sustainable practices, clarifying maintenance responsibilities, explaining operating instructions for systems.
- Encourage occupier involvement in the management and monitoring of the developments environmental performance against targets for example;
 - In the analysis of energy and water meter readings.
 - In recycling waste.
 - In the upkeep of grounds / gardens.
 - By encouraging evaluation and feedback about living and working conditions.
 - By encouraging zero-tolerance for non-sustainable neighbourly conduct.

Standards, Policy and Legislation

Subsection of the 'Buildings – Adaptability, Durability and Materials Chapter' introducing policy framework containing the following information;

Local Context

Questions: Does the Authorities Local Plan include a policy relating to substitute materials?

Does this policy enshrine the re-use of building materials from other developments where this is technically and economically feasible as a top level priority?

Has the Local Authority considered facilities for or entertained favourable agreements with suppliers regarding recycled materials storage and distribution?

Does the local authority have a related policy requiring new buildings to be designed for flexibility with the future in mind including creating opportunities to adapt to the changing needs of occupants and the creation of flexible interior layouts?

National policy urges increased use of secondary or recycled aggregates, how do the regional and local planning policies reflect this?

Does the Local Authority have qualified BREEAM Assessors amongst its personnel in readiness for the adoption of the code on Sustainable Building?

Has the Local Authority developed a voluntary 'considerate and sustainable constructor's charter'?

To create a high standards framework to achieve genuinely sustainable objectives Members could adopt the step programme of inquiries and actions detailed at this point in the Energy Chapter

Regional context

Questions: How does the Local Authority know and evidence that at the regional level:

- Is sustainable construction is a key area of action for the Regional Assembly's do they have a Promoting Sustainable Development Group or equivalent?
- Are there key objectives in the Integrated Regional Strategy to manage the natural resources of the region sensibly, minimise waste, and to encourage re-use and recycling of waste materials.
- What policies (list i.e. Policy 31,32) of the Regional Planning Guidance for promote the use of local building materials etc.
- Could the region facilitate – reducing costs to each Local Authority overall - the qualification of BREEAM Assessors in readiness for the adoption of the code on Sustainable Building

National Context

The Government has expressed its commitment to achieving more sustainable developments at the Better Buildings Summit in October 2004 which led to the establishment of the Sustainable Buildings Task Group (SBTG) chaired by Sir John Harman. The task group have now published two reports regarding the reduction of the environmental footprint of buildings including the contribution of building materials. The group have made further recommendations regarding the quality and sustainability of new and refurbished buildings.

The Government is committed to a new Code for Sustainable Building by April 2006 and has been recommended by the SBTG to;

- *Impose a condition on the contract sale of land bought from the public sector so that new housing must apply the code*
- *Adopt a standard of the Code comparable to the EcoHomes 'very good' ...encouraging Regional and Spatial Strategies to do the same.*
- *Create a programme of action for.. Local Authorities to adopt the Code for Sustainable Building by April 2006*
- *Develop the Code to apply to existing housing stock*
- *Adopt Assessment arrangements based on BREEAM*
- *Ensure Part L of the Buildings regulations (on energy efficiency) achieve a 25% level of improvement. And adopt a robust post build checking regime through the buildings regulations to ensure a high level of compliance and enforcement.*
- *Deliver on its target 25% improvement in water efficiency in New Build through regulation*
- *Through the Buildings Regulations require industry to use minimum 10% recycled, reused or reclaimed materials in construction work.*
- *Bring in measures requiring new multi-occupancy build to provide space for the separate collection of recyclable materials*
- *Provide new policy and best practice guidance on Sustainable Building to accompany PPS1 incorporating the Code for Sustainable Building.*
- *Introduce fiscal measures rewarding building quality and environmental performance*

- *Use the compulsory introduction of the Home Information Pack to improve environmental performance of existing housing stock including water efficiency and eco-labelling.*

*Source Sustainable Buildings Task Group report: one year on
Progress 17th May 2004 – 17th May 2005*

Such standards as adopted must be quickly incorporated into local authority policies, planning guidance and post completion checking regimes.

- **Building Regulations** require minimum standards for heat loss through the fabric of the building, heating, hot-water systems, the insulation of pipes and ducts and space-heating controls. April 2002 Revisions increased standards for the insulation of the building fabric and introduced extra standards for reducing cold-bridging at junctions between walls, roofs, floors and windows and reducing air leakage for all buildings. The performance of replacement windows and improvements to insulation if existing buildings are being altered materially. And proposed 2006 revisions on the conservation of fuel and power covering both dwellings and buildings that are not dwellings and targeting improved standards for the insulation of pipes and water storage, and minimum energy performance requirements for new buildings in the form of target CO₂ emission rates.
- **Revisions to the Planning Policy Statement 22 on Renewable Energy** now make clear that the wider benefits of renewable energy developments are material considerations in planning decisions.
- **Aggregates Levy**
The aggregates levy, is applicable to any sand, gravel or crushed stone extracted in or imported into the UK. The levy makes the price of aggregates reflect environmental costs by increasing the cost primary sourced aggregates (in line with the 'polluter pays principle') and making the use of recycled and secondary materials more viable. Revenues raised are marked for the delivery of local environmental improvements aimed at delivering local environmental benefits to areas subject to the environmental costs of quarrying. The Aggregates Levy Sustainability Fund uses revenue from the Aggregates Levy to reduce the environmental impacts per tonne of aggregates extraction and helps to stimulate the market for recycled and secondary materials
- **Land remediation relief:** Businesses may claim relief from corporation tax if they clean up contaminated land, in the UK acquired by the company to carry out its trade and contaminated at the time it was acquired either wholly or in part. The relief can total upto of 150 per cent of the clean-up cost. Land remediation tax relief should be claimed for in **tax returns** and companies making a loss because of spending money on cleaning up land may apply for a tax credit of 16 per cent. The relief is only available to companies, not to individuals or partnerships.

European Context

Need more checking at this point as there have been a number of recent changes which need addressing.

International Context

By becoming a signatory nation of the 1997 Kyoto Protocol the UK has signed up to a legally binding target of reducing greenhouse gases as a whole by 12.5% by 2008-12. In line with the advice of the Intergovernmental Panel on Climate Change (IPCC) the UK must aim for a reduction of 60% in CO₂ emissions by 2050.

It will be impossible to achieve such targets without developer maximising the integration of energy from local renewable sources where ever possible. This might include solar space and water heating, solar electricity generation (photovoltaics), wind power, biomass fuel and other sources of energy.

Voluntary Standards

In addition to all the legislative standards there are also some voluntary standards which developers are increasingly choosing to meet, and which the Sustainable Buildings Task Group have used as indicative of the scope of the developing National code, these include;

Environmental Standard Award

The Environmental Standard Award is administered by the Building Research Establishment (BRE) and is intended to provide an indication that a development has reduced its impact on the environment. New homes are assessed under a range of criteria including emissions of greenhouse gases and CFC's, use of materials, site ecology, water use and levels of comfort.

BREEAM

For non-residential development assessment methods such as the BREEAM rating can be applied. Using BREEAM, buildings are given a score which provides an indication of their environmental impact. Issues considered include CO₂ emissions, healthy building features, air quality and ventilation, minimising ozone depletion and acid rain, recycling and re-use of materials, ecology of the site, water conservation, noise and lighting. Major building elements (i.e. upper floor slab, external walls, roof and windows) should achieve an overall 'A' rating as detailed in the Green Guide to Specification 'A' (BRE 1998).