CHAPTER 6

THE ELEMENTS OF DESIGN

URBAN STRUCTURE

6.1   The urban structure, of hamlet, village, urban extension or town, is formed by the interrelationship between the components of built-up areas, the blocks of development and buildings, the streets and open spaces. The urban structure creates an integrated framework that forms the foundation for any new development within it. The urban structure of new developments should ensure that the components work together to form an efficient and integrated whole.

6.2   The urban structure should seek to maximize opportunities for vistas towards landmarks, distinctive buildings, trees, open spaces or fields, or views to the rural setting. Building form, materials and details are informed by the immediate and wider surroundings (see Chapter 3) and in general, natural colours are used that relate to the landscape and traditional materials of the locality. However, cues should not be taken from poor quality examples.

6.3   Many South Cambridgeshire villages present important frontages to the surrounding landscape, contain Conservation Areas or an historic street framework and contain or frame numerous strategic views (both within the settlement and out to the landscape). This contextual development should be used as the basis for analysis to determine the character of new building structure appropriate for the area.

Table 6.1: Getting the layout right

To achieve this:	Do this (these may not all be appropriate in some villages):	Examples/Notes
A choice of interesting routes	•Create routes to link up broken routes on either side of the site. •Align routes along desire lines to provide direct links to schools, shops and other destinations. •Base movement on a loose grid, with new routes every 50-120m. •Avoid culs-de-sac.	

Well defined street-spaces	•Join buildings to create well defined frontages. •Use smooth building alignments for continuity. •Use building fronts to define the street-edge. •Turn corners with buildings to prevent blank elevations presented to streets. •Incorporate focal spaces for human interaction at key nodes.	Unless set-backs are characteristic
Clearly defined public and private space.	•Use perimeter blocks with public fronts and private backs. •Incorporate flexible communal or private garden space in the core of blocks. •Avoid spaces where ownership and the opportunity to use it is unclear.	Give all space a purpose
Lively and safe street space	•Place building entrances on the front of buildings to ensure ground level interaction between buildings and the street. Individual entrances provide more activity than communal stairs. •Incorporate non-residential uses in the ground floor at key nodes for activity. •Ensure public spaces are overlooked by windows/buildings.	

6.4 The following table identifies a categorisation of urban sites, based on shared physical characteristics and/or common issues. This results in shared urban design issues and the potential for similar urban design solutions.

Table 6.2: Layout guidance for different types of site

Type of site	Specific layout considerations (these may not all be appropriate in some villages)
Infill to road frontage	•Building alignments to define the road frontage are important. •Complete perimeter blocks. •Building scale, form and alignment should be determined primarily by the immediate townscape context.
Sites with more than one frontage	•Turn the corner with a double fronted building. •Where the junction is a node can justify an increase in scale over immediate surroundings to emphasise the node. •Trading amenity and parking standards against townscape benefits can achieve a perimeter block fronting more than one space.
Edge of open space	•The extent to which the size and type of space being addressed justifies an increase in building scale. •Using a good outlook and useable balconies to justify a reduction in garden sizes, subject to not losing privacy for properties and the character of the area.
Backland with no frontage	•Whether the proposal would fit with the grain and spatial character of the area. •Whether the site is big enough to enable a new inward looking enclosed courtyard space to be formed (typical minimum site dimensions 30m x 35m). •Ensuring the new space has a satisfactory relationship with an existing place e.g. a vista stop within 65m of a main street, or a maximum access length between side walls of 40m – measured from highway boundary to the first new frontage. •Whether the access can be designed to appear as an approach to a new area; ensure at least one of the units at the front incorporates an active frontage to the new access way wherever possible. •Whether satisfactory access can be formed from a functional point of view;

	2.4m min for shared drive off a lower category road, this may need to be wider to attain the desired visual impression; 3.7m minimum where fire appliance access is required; 4.1m minimum access width where access taken of higher category road. •Securing quality of life for new and existing residents (see privacy/garden size criteria).
Limited road frontage and space in depth	•Carefully address the corner turnings at the access. •Is the site big enough to enable frontage and in-depth development •Securing a good quality of life for new and existing residents.
Public road and space network required	•Get the interface between the new and existing development right. •Create routes that take people where they want to go. •Front buildings onto routes and spaces to provide natural surveillance. •Create workable blocks between active roads or routes that enable permeability; the spacing between roads can be as low as 60m in areas of high movement, near town and local centres; a spacing between roads of 80m and 100m is ideal for most circumstances; and a spacing between routes of up to 120m can be appropriate in areas of low movement; generally the spacing between roads should not exceed 120m as this is a barrier to permeability. •Create areas of strong character.

6.5   These typologies cover the majority of typical development sites with groups of buildings but are not necessarily exhaustive. Sites that are unique or special will always warrant careful appreciation of context, assessment of potential and an appropriately responsive design solution.

DISTRICTS / NEIGHBOURHOODS / COMMUNITIES

6.6   Successful communities require a range of local services and facilities, including retail, educational, health, civic and spiritual. These need to be conveniently located and accessible by safe and comfortable routes.

6.7 From the mid twentieth century different uses in development became segregated. This segregation of uses reduces the overall activity in areas restricting the periods of activity, making them less attractive locations for the establishment of supporting services.

6.8 Local facilities bring residents together, reinforce community and discourage car use, by reducing the need to travel by car. Including mixed-use in larger housing developments can help to foster a more vibrant and cohesive community. It also introduces a variety of building scales and forms, creating diversity and interest in the streetscape. The needs of non-residential uses should be identified at the outset and incorporated into the masterplan, with sites reserved for future provision where necessary.

Sawston village centre illustrating the vitality arising from mixed uses.

6.9 Mixing tenures promotes social diversity; it is important therefore to spread different building types and tenures throughout a neighbourhood, rather than group them into single areas, which divisively subdivides the neighbourhood, instead of supporting the integration of the neighbourhoods differing components. Accordingly mixed-use areas are preferable locations for the establishment of supporting services and facilities.

6.10 Higher density developments are better located close to the local centres to maximise the numbers of people able to support those facilities within the 400 and 800 metre walking distances. The scale and density of a potential neighbourhood centre is dependant upon where the development is located within the urban hierarchy. High-density development may not be acceptable in some villages. Proposals therefore must conform to what is acceptable in accordance with the Local Development Framework.

6.11 Local facilities provide a natural focus to towns, districts and neighbourhoods, drawing people together at informal meeting places. Facilities should be provided at convenient locations and distances from homes. Convenient local facilities are within an average 5 minute walking time, which equates to a 400m walking distance. Developments should be designed so that all residential properties are within 400m of a bus stop to encourage people to use public transport in preference to private cars. Local shops, a primary school and a doctor's surgery should ideally be

located within an average walking time of 10 minutes, which equates to a 800m walking distance. If such facilities are provided further away than 800m from residential properties residents will be discouraged from walking and be more inclined to use private cars to access those facilities, and once people have opted to use a car to access facilities, they may not automatically use the local facilities. To support sustainable communities facilities should be provided within 800m to ensure they are easily accessible and supported by the local community.

6.12   The Urban Task Force report, Towards an Urban Renaissance, illustrates preferred walking distances to facilities from homes, see diagram. Barton et al. develop this work in, Shaping Neighbourhoods A Guide for Health, Sustainability and Vitality, where they identify illustrative catchment populations for various facilities, together with the catchment radius required to support those facilities at different residential densities, see table.

6.13   Local facilities to efficiently support the new communities should be within easy walking distances and the routes to these should be of high quality for both pedestrians and cyclists. The walking distances to facilities are the keystone of any movement framework. The Urban Task Force recommends that residents should have to walk no more than 2 to 3 minutes to a post box, or local open green space; 5 minutes to the newsagents and there should be local shops, a health centre and a primary school within 800 metres, or about 10 minutes walk. This is based on an environment that does not present obstacles to walking, such as busy roads.

Facility / Service	Population required to support facility or service	Maximum walking distances from service
Local Shop	1:1,500	Within 400m
Nursery	1:2,000	Within 600m
Primary school	1:4,000	Within 600m
Pub	1:6,000	Within 800m
Local Centre Cluster (consisting of 4 or more shops)	1:6,000	Within 800m
Post Office	1:5000	Within 800m
Proximity to Bus Stops	-	Within 400m
Proximity to Cycle Routes	-	-
Proximity to Public open space	Park Allotments Playing field	800-1000m Within 400m 800-1000m

Population required to support local facilities and desirable distances for them from homes.
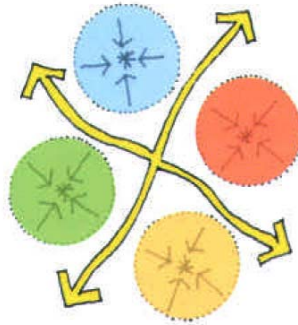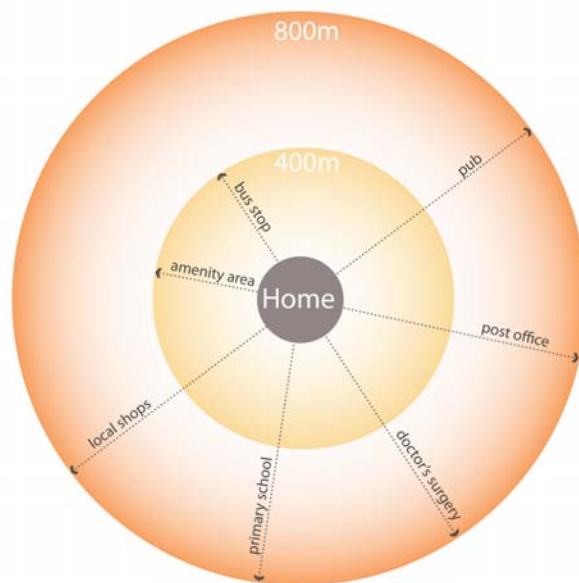
Positioning local centres away from main routes deprives them of life and passing trade
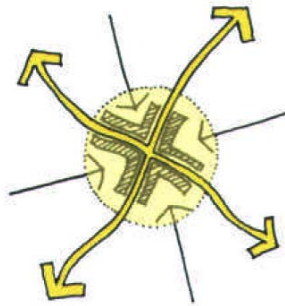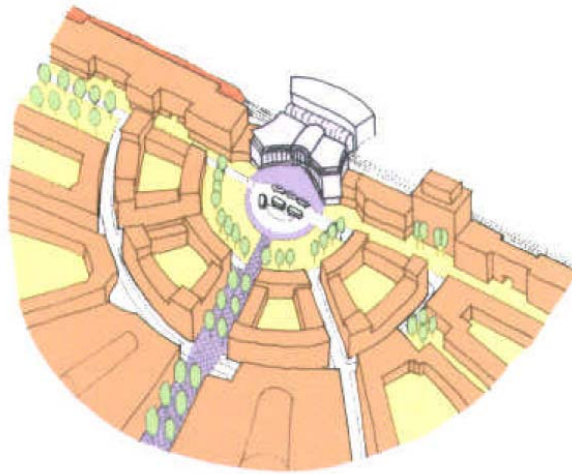

The answer is to create pedestrian and public transport-orientated centres at key focal points

Locating local centres. (Urban Design Compendium, Homes and Communities Agency)

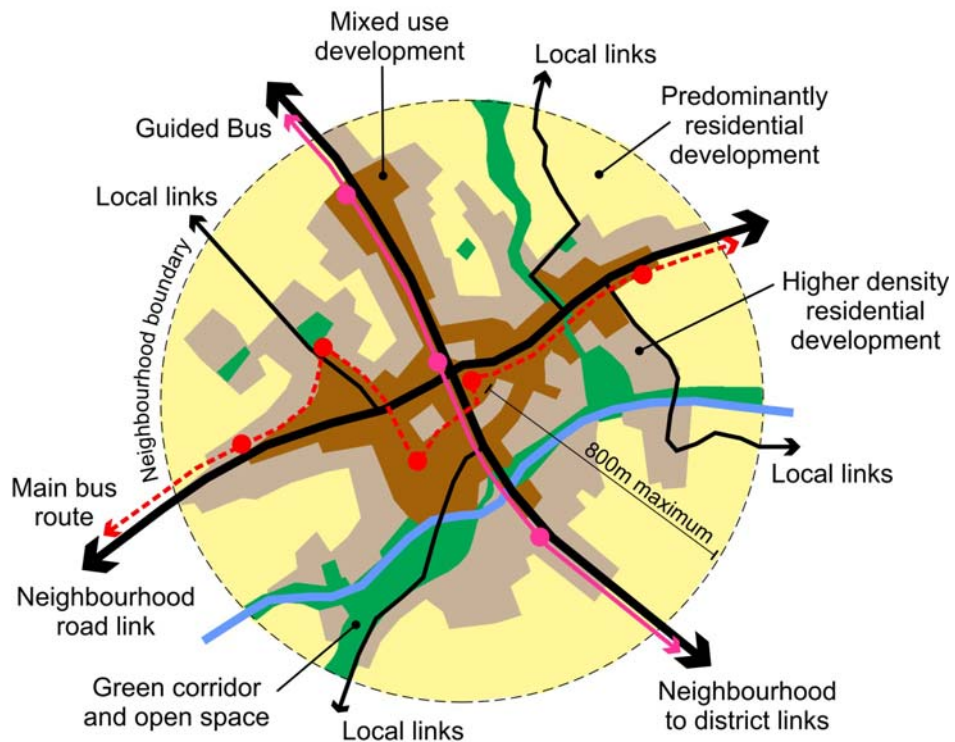*Desirable walking distances to facilities from the home.*

Public transport orientated development ensures that a mixed use community has a railway station or bus stop within walking distance at its heart

Facilities and transport focused development. (Urban Design Compendium, Homes and Communities Agency)

The components of a sustainable 'walkable' neighbourhood. Source Adapted from Urban Task Force 1999

EDGES

6.14   Places are often defined by linear objects e.g. rivers, railways, busy roads, etc. that often form physical barriers to movement and therefore define the edges of places. Less obvious are psychological barriers that can be physically crossed but which people may prefer not to cross e.g. open spaces which no one overlooks, major roads, areas of different tenure of housing or use, etc. New developments adjacent to such features must be carefully considered so that they do not create a barrier to movement within the development. Sometimes it may help strengthen identity to retain such edges, whilst on other occasions it may create new opportunities to create new identities or break down actual or perceptual barriers to create routes that cross these barriers.

6.15   The edges of new development should blend into the landscape by means of lower density towards the perimeter, with increased planting predominately of native species. The use of close-boarded fencing along development edges is not appropriate within a rural context, which is generally local hedging species or a post and rail fence.

ROUTES

6.16   A key to successful development is good access and connections between the site and its surroundings, whatever the size of the development and, the opportunities presented by the context should be harnessed. The structuring of routes in the new development should effectively address the following issues: How will the routes from the new development integrate with those existing in the surroundings? What are the existing movement routes around and possibly across the site? Who is moving from where to where and when? How will this influence the movement into, out of and around the site?

6.17   Movement affects uses, activities, density, security and the impact on neighbouring developments. A successful movement framework takes full account of the movement requirements the development will generate, provides maximum choice for how people will make their journeys and makes clear connections between the new and existing routes and facilities. The movement framework should make it as easy and attractive to walk, cycle or take a bus, as it is to travel by car. Direct attractive routes should be established to connect residential areas with facilities, maximising the number of properties, especially residential properties, that can access bus stops within a 400m walk and a local centre within a 800m walk. The maximum number of direct connections to the main streets should be provided. The greater the number of links to the main access roads, round or through developments, the greater choice people have as to which route to take and the greater are the opportunities for successfully establishing mixed use developments and, the greater is the discouragement of crime

and antisocial behaviour as the greater the uncertainty for perpetrators that they may be disturbed. These aspects of the design rationale should be clarified in the developer's Design and Access Statement.
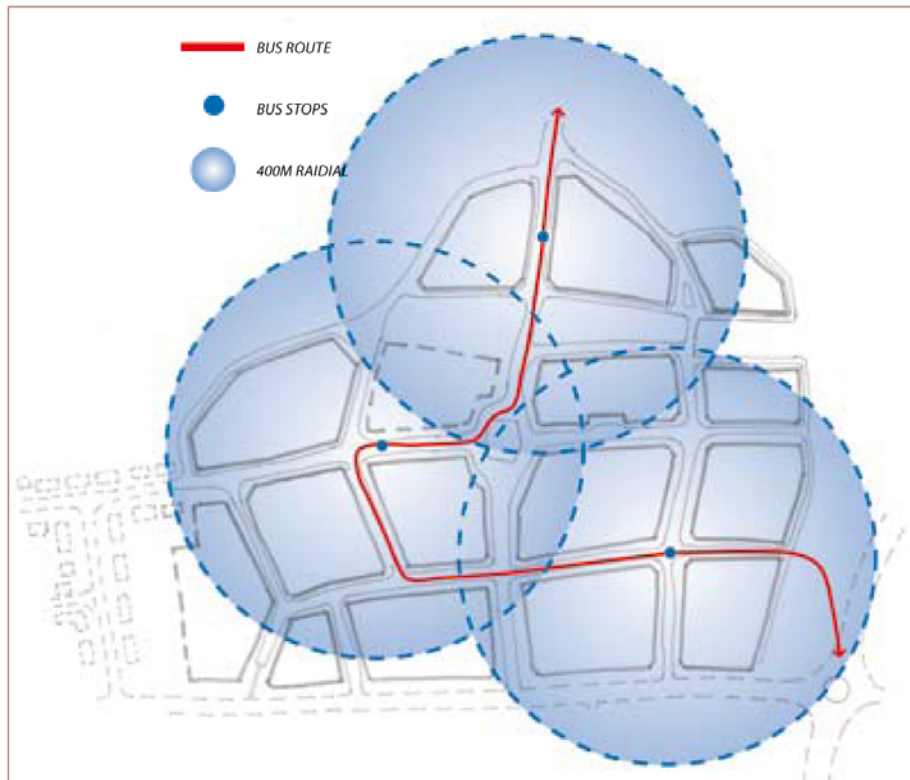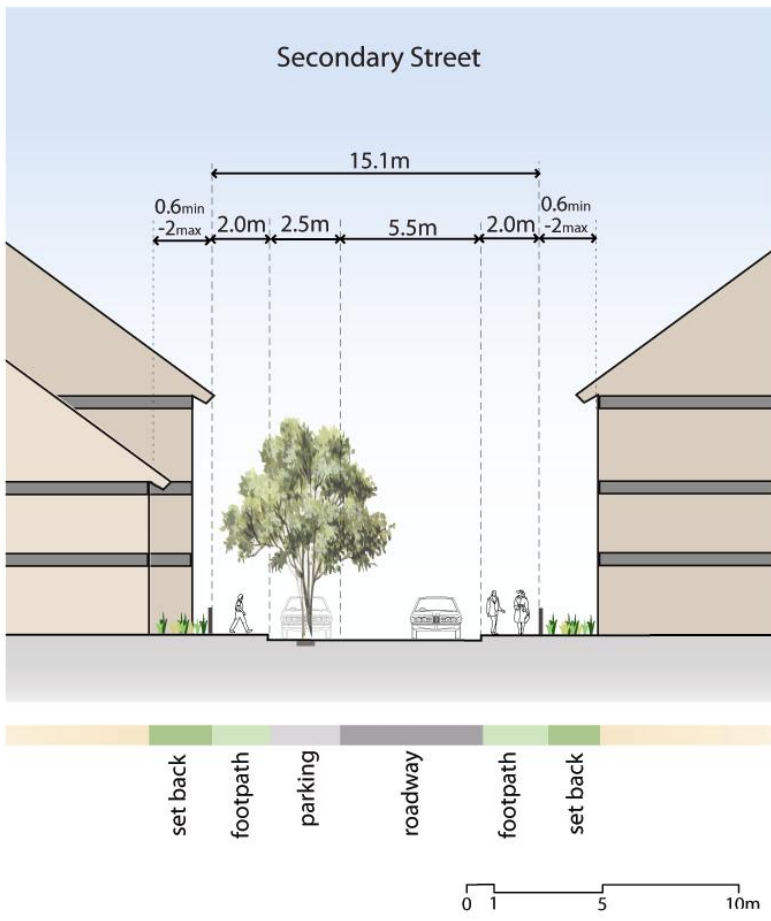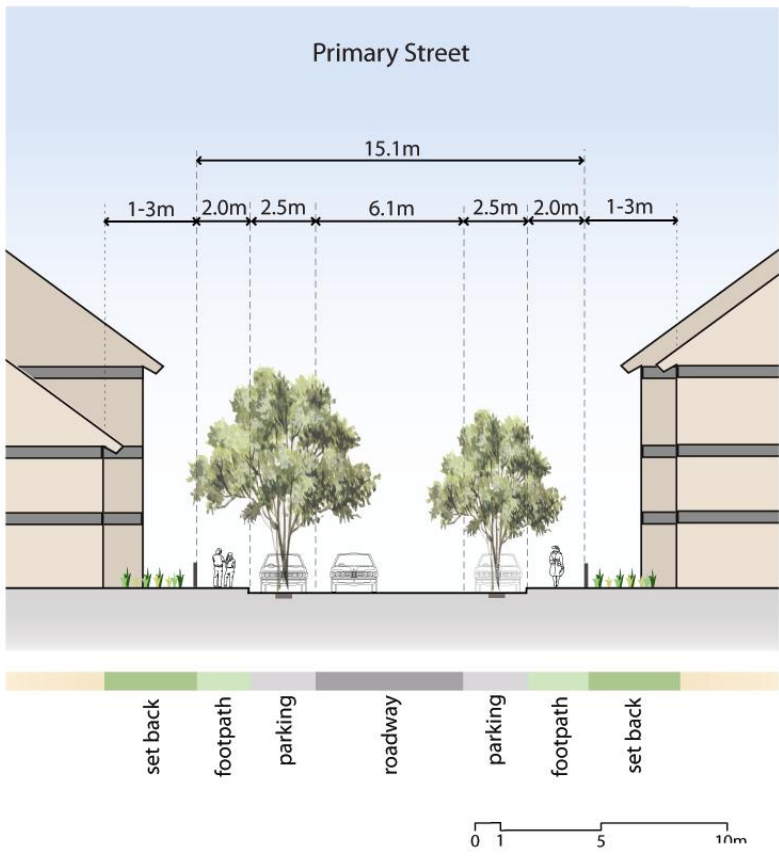

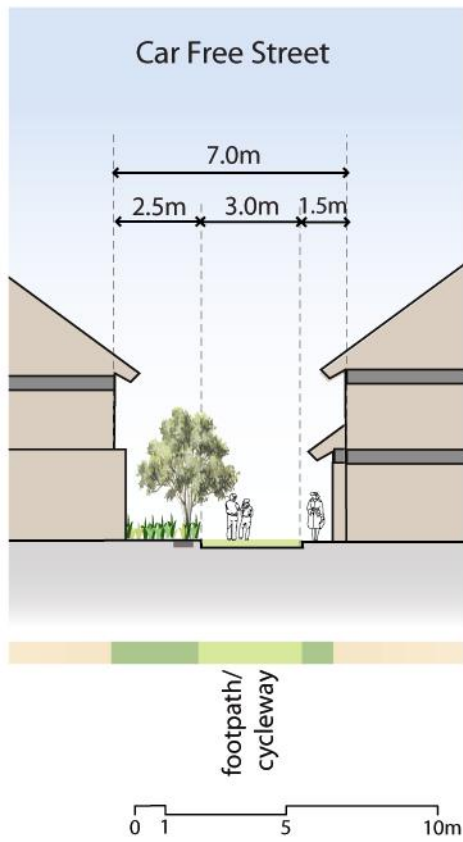*Bus routes and stops (Cambridgeshire Design Guide)*

6.18   Linear spaces facilitate movement, which may be formal or informal in character. The movement network includes all the routes and all types of travel, and should allow easy access. The cycle and pedestrian routes will require a finer grid than those for cars and public transport. Lower order roads should be used wherever possible, while tortuous routes and culs-de-sac, i.e. a street closed at one end, should be avoided. The development should also take into account the type of movement it will generate and promote movement on foot, cycle or public transport.

6.19   The better connected a development is, the stronger is the case for a higher density of development and a lower car parking provision. However, the provision of good public transport connections may only result in the reduced usage of private cars rather than in reduced car ownership and provision is always required for visitor car parking spaces.

6.20   A hierarchy of routes should be established to aid legibility for those moving through an area, so it is clear if people are on a main route through an area, a secondary route providing access into development areas, or are within development areas on tertiary routes.

6.21   All routes should have buildings and windows facing onto them to provide natural surveillance of the routes to deter crime and antisocial behaviour. At the same time, buildings and how they address the routes should be designed to provide privacy for residential properties and any others requiring privacy such a health centres.

6.22   Public realm spaces should be well contained by the buildings that edge them. The fewer breaks there are in the built frontage and the narrower any breaks are the stronger will be the containment of those spaces. The character and built form of a village will determine the level of containment.

6.23   Routes should not be the divide between development parcels. Routes should run through development parcels to ensure continuity of development for those travelling along the route.

6.24   The management of pedestrian, cycle and vehicle movement, together with vehicular parking should be integrated into the design of the routes, streets and public spaces, and not dealt with as an afterthought through the use of painted lines and bollards.

6.25   In order that residents make the best use of the more sustainable travel options presented by the integrated route network, a residential travel plan should be included for new large developments.

STREETS AND SQUARES

6.26   Street design should aim, wherever possible, to reduce the dominance of vehicles, and thus create an accessible and friendly environment. There should be spaces to encourage people to meet, spaces for social and 'spill out' activities, and places with seats on routes to local facilities.

6.27   Development should be designed to accommodate and reflect a hierarchy of street types:

- Primary distributor road for movement through the larger urban area.

- District distributor routes for movement through an area.

- Secondary routes for movement into and out of an area.

- Tertiary routes for movement within development areas.

- Mews courts for access to small numbers of residential units creating an intimate semi-private place.

Primary Street

15.1m

1-3m | 2.0m | 2.5m | 6.1m | 2.5m | 2.0m | 1-3m

set back | footpath | parking | roadway | parking | footpath | set back

0 1   5   10m

Secondary Street

15.1m

0.6min -2max | 2.0m | 2.5m | 5.5m | 2.0m | 0.6min -2max

set back | footpath | parking | roadway | footpath | set back

0 1   5   10m

Tertiary Street

8.0m

0.6min
-2max

5.0m   3.0m

0.6min
-2max

set back

Shared Surface

parking

set back

0 1   5   10m

Car Free Street

7.0m

2.5m   3.0m   1.5m

footpath/ cycleway

0 1   5   10m

6.28   A focus on highway design specifications has in the past led to many residential developments having a poor appearance, becoming car dominated and lacking local distinctiveness. In conjunction with Cambridgeshire County Council, the District Council has collated examples of good practice from other areas and the following points should inform highway design in new developments:

- Engineering standards should be used imaginatively and interpreted alongside other design considerations.

- Highway design should not be the leading factor in determining settlement form; there should be a hierarchy of spaces rather than a hierarchy of road types.

- Buildings should be arranged to fit the local context and to create interesting urban forms.

- Roads should fit within the spaces created; with adjustments as necessary to ensure that minimum road widths and other essential clearances are accommodated.

Reference should be made to the Cambridgeshire Design Guide for Streets and Public Realm (2007): http://www.cambridgeshire.gov.uk/transport/trafficmanagement/networkmanagement/Cambridgeshire+Design+Guide.htm

6.29   As outlined in Places Streets and Movement (DETR 1998) the use of vehicular tracking models can help in laying out buildings to suit the intended character of the street. The following design issues should be considered:

- All forms of movement need to be considered, but pedestrian, cyclist and access to public transport should take priority in the design process.

- Where possible streets should encourage social interaction with shared spaces rather than segregated areas and routes.

- Where segregated routes cannot be avoided they should be convenient, attractive and safe to use.

- The aim should be to achieve traffic calming by passive means through the arrangement of buildings and spaces coupled with surface materials. This may include smaller corner radii rather than sweeping curves, the use of frequent junctions and fewer straight lengths of road, buildings, walls, hedges and trees close to the road and allow for some on street parking.

- Traffic speeds within neighbourhoods should not exceed 20 mph.

- Bus routes may require suitable adjustments to roads. A permeable grid-based layout assists access and obviates the need for turning areas.

- Bus stops should be sited to achieve convenient access for as many people as possible and designed to allow for level boarding.

A 'homezone' that has been retrofitted to an existing development, Groningen, Holland.

GRIDS AND BLOCKS

6.30   Grids are widely used ways to achieve convenient connections through developments. Such grids can be of rigid geometry or may be less rigid and more fluid. Route spacing in a grid of 80 to 100 metres provides an optimum network for pedestrian, cycle and vehicular movement, although it may not be necessary for all routes to be open to vehicular traffic. In town centres route spacing in grids for pedestrians and cyclists can be reduced to 65 metres where high volumes of pedestrian activity will be experienced. Conversely in suburban locations where pedestrian and cycle movement levels will be lower route spacing on grids can increase to 120 metres; spacings greater than this can impede permeability and discourage pedestrians and cyclists. Neighbourhood centres will not all have all facilities present, therefore a network of mutually supportive neighbourhood centres that share certain facilities should be established. To allow neighbourhood centres to be mutually supportive and easily accessible for pedestrians, cyclists, buses and motorcars, a larger grid at 800 metre centres should be established to link the neighbourhood centres.

6.31   Many historic settlements comprise an informal, grid of interconnected roads, streets alleyways and space. This is in marked contrast to the visually and socially less successful twentieth century 'tree hierarchy' type layouts that contain culs-de-sac, dead ends and unnecessarily tenuous through routes.

Consider how best the site can be connected with nearby main routes and public transport facilities

A more pedestrian-friendly aproach that integrates with the surrounding community links existing and proposed streets, and provides direct links to bus stops
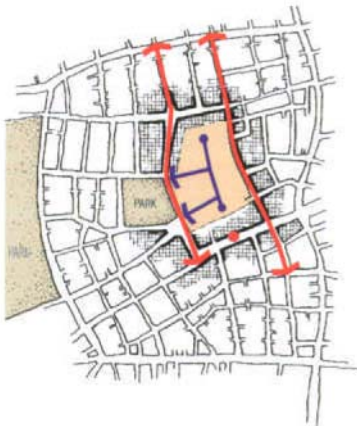
The typical cul-de-sac response creates an introverted layout, which fails to integrate with the surroundings

This street pattern then forms the basis for perimeter blocks, which ensure that buildings contribute positively to the public realm

Key

⊢⊣ Principal routes   ⊢⊣ Internal streets
•   Bus stop

(Llewelyn-Davies 2000)

6.32   It is desirable to create an informal, permeable grid for new developments that connects into the existing street pattern. The layout of grids and blocks should be determined by the grain and visual character of the surrounding area, and the atmosphere that is sought for the new development, coupled with the need to control the degree of permeability (to ensure adequate security), which will focus through routes on 'desire lines' and destinations. The specific location within the South Cambridgeshire district will also affect the type of layout appropriate to a new development (see Chapter 3 on Village Landscape and Settlement Character).

6.33   The orientation of blocks within the grid should, where possible, be arranged to enable the principal living rooms in the dwellings to face south and thereby maximise passive solar gain. Opportunities should also be taken to provide shading when the sun is higher in the sky, such as overhangs, louvres or tree planting. Further detail on passive solar gain is contained in Chapter 8.

6.34   Perimeter blocks that are secure in their core should be provided.

6.35   Developments should not be designed in isolation without due regard to their collective appearance, particularly as a skyline. The collection of buildings within a block should create a varied and interesting skyline; and a collection of blocks should create an interesting wider skyline.

HOUSING TYPES AND MIX

6.36   All large residential areas should include a mix of sizes, types and tenures of property, within neighbourhoods, to cater for all stages in the life of households, from single young people through to residential care facilities, so that whatever their needs, residential opportunities exist for people without having to leave the neighbourhood, if they so wish, in accordance with the principles of 'Lifetime Homes'. Residential development will provide a range of types, sizes and affordability, including Affordable Housing, to meet the identified local needs. Certain types of development mat not be acceptable in some villages. Proposals therefore must conform to what is acceptable in accordance with the Local Development Framework.

DENSITY

6.37   High-density residential development is often misconstrued as being synonymous with poor quality and high-rise urban housing. In comparison medium rise high-density buildings of 3 – 4 storeys maximises density whilst minimising perceived intensity or overcrowding. Density is a product of the design and should not be used as a determining factor in the design approach adopted. Therefore, a design led approach to residential areas should be adopted, that is appropriate to the site, its location, surrounding

density and context. High-density development may not be acceptable in some villages. Proposals therefore must conform to what is acceptable in accordance with the Local Development Framework.

6.38   Higher density residential developments can locate greater numbers of people within the 400 and 800 metre walking distances of local centres improving the viability of the services located there.

6.39   Higher density developments can provide economies of scale in relation to the provision of infrastructure, making such things as district heating or undercroft or basement car parking more viable.

6.40   Higher density developments can make public transport services more viable. The Local Government Management Board's rule of thumb that densities of 100 persons per hectare are often regarded as necessary to sustain a good bus service. Within a walking distance of 800 metres, generating a walkable neighbourhood covering an area of 97.5 hectares, equates to 45 dwellings per hectare, assuming an average household size of 2.2 persons.

6.41   Policy HG/1 in the Development Control Policies DPD seeks average net densities of at least 30 dwellings per hectare, except in exceptional justified circumstances; and net densities of at least 40 dwellings per hectare in more sustainable locations close to a good range of existing or potential services and facilities, or the potential for good public transport services.

6.42   To assist in place making the density of development should be varied and not uniform in order to create variety of built forms. The higher density development should be provided at or close to the heart of the development, with density decreasing with distance from the heart.

6.43   Special circumstances may exist within a Conservation Area, within widely spaced buildings, or on the rural edge of a settlement. This is considered on a case by case basis and guidance is contained in Chapter 7, Part III and the Council's Conservation Areas SPD.

PUBLIC REALM AND LANDSCAPE FRAMEWORK

6.44   Everything in the public realm, from the design perspective, can be considered as landscape; all hard and soft landscape, relationship to the countryside, streets, and squares, open space, parks and water movement corridors. The landscape framework applies at two levels; the broader level is the structural landscape at the overall development scale; and the detailed level is landscape as setting for spaces and buildings.

6.45   The best development relates well to the topography and geography of a site and acknowledges the pattern of historical use of that site.

6.46   When setting out to design the landscape framework to a new development, the existing landscape character in its broadest sense should be respected, taking in issues of geology, topography, vegetation, hydrology, landmark features and local building character, as well as how to fully integrate the proposed development into landscape.

Table 6.3: Working With Site Features DC46

Achieve this:	By doing these things:
Use existing positive features to create character	•Work retained buildings into new blocks. •Use ponds and watercourses for outlook. •Use specimen trees and shrubs as the focus of new development. •Use existing hedgerows to create structure for new development. •Front established routes. •Formalise informal routes.
Work with the topography of the site	•Allow existing levels to suggest layout options. •Allow hedges and ditches to influence layout and add structure for new development. •Retain all trees and hedges where practical.
Retain uses that are important to the function of an area	•Work important existing uses into a layout in new or retained buildings.
Accommodate below ground constraints in a workable layout	•Avoid disruption to below ground archaeology where possible. •Where block structure permits align streets and spaces along utility easements for ease of access. •Explore the practicalities of rerouting services which preclude efficient layout options.
Ensure protected species are safeguarded	•Protect habitat. •Avoid conflict with the built form. •Build in appropriate protection/relocation or other mitigation measures.

6.47   Maximising the use of existing landscape features on the site will add instant maturity to any development. Existing views and vistas can be harnessed for the benefit of those who will live, work or visit the development. Care should be taken to ensure the development proposals do not obstruct such views and vistas spoiling people's enjoyment of them.

6.48   The landscape needs to be considered early in the design process. It is not something that can be successfully added after the event. The landscape

proposals must therefore be included as an integral part of the design process and the Council will expect landscape proposals to be submitted concurrently with applications for full planning permission, rather than be left as a reserved matter to be sorted out later. A Landscape Design Statement will be required illustrating: how the design will integrate with the local character, how design will relate to the needs of the development and its future occupants, and that the design includes sufficient space (made up of practical areas) for the planting.

6.49   Developers should ensure sites are designed to integrate the built forms with their encompassing spaces to create a unified whole, with no spaces left over that are not properly incorporated into the design of any building plot or public realm area.

6.50   Attention should be paid to the retention, integration and future maintenance of important landscape elements such as trees, hedgerows and ground-slopes. Consideration should be given to the use of products such as the Deep Root Silva Cell to direct tree root growth.

6.51   Landscape is an integral part of any development. It applies equally to housing, business and industrial developments and can fulfil one, some or all of the following functions:

- Complement and/or enhance the proposed built form, providing both a setting and an outlook.

- Assist in integrating development into the existing landscape – with consideration to both visual and landscape characteristic aspects.

- Screen the development.

- Be an entity in its own right.

- Create a sense of place.

- Provide shelter and ameliorate noise and/or air pollution.

- Provide environmental benefits through carbon fixing, i.e. taking in carbon dioxide and emitting oxygen.

- Provide wildlife habitats – assisting in meeting biodiversity requirements.

- Create enclosure and define boundaries.

- Soften and frame views.

- Food production, either on plots, allotments, or smallholdings.

6.52   Spaces around buildings should be designed to integrate with the buildings to enable them to provide clean cool air for natural ventilation and to cool exhaust air from buildings; to provide shade in the summer to reduce the demand for artificial cooling; to reduce the heat island effect by cooling the urban areas.

6.53   The public realm should be designed and managed to enrich people's experience, it should allow for movement and interaction, it should delight the senses, make people feel comfortable and be easy to maintain. Reference should be made to the Cambridgeshire Design Guide.

Table 6.4: Public Realm Design

Achieve this:	By doing this:	Notes:
Safe space	•Ensure public open space is overlooked. •Provide lighting that is appropriate for its setting. •Make routes direct. •Relate spaces to routes. Plan focal space where footfall is greatest. •Create comfortable spaces where people enjoy spending time. •Predict misuse and design it out.	People help to police space. Create pride in civic space
Accessible space	•Relate spaces to the movement network to ensure they are easy to get to. •Think about all users. •Make public space easy to use. •Avoid clutter. •Smooth the public/private transition. •Consider access for emergency vehicles and refuse freighters.	Ramp integrated into steps. Refer to 'Streets for All'
Useful space	•Ensure all space has a clear purpose; avoid 'space left over'. •Design with the purpose of the space in mind to ensure space is fit for purpose. •Avoid unnecessary objects that clutter space. •Consider microclimate at site planning / layout stage and in determining the relationship to adjoining buildings.	Awkward shapes can be difficult to maintain.

Attractive space	•Make use of natural assets; water, trees, hedges or slope. •Design space with the same care as the buildings that enclose the space. •Use good quality surfacing. •Be imaginative and make the most of small spaces. Create simple geometric patterns or informal designs that flow with and reinforce space. •Use material changes to identify intentional changes in use or character. •Mark parking spaces out subtly, or by changes in material. •Play down arbitrary changes in surfacing in overly complex designs or at public/private boundaries. •Co-ordinate and combine street furniture. •Reduce visual clutter. •Place street lighting on buildings where practical. •Integrate public art into the design of spaces. •Incorporate appropriate tree, shrub and other planting. •Ensure boundary treatments work with the space. •Get the detailing right.	All new shared surfaces in setts e.g. tegular. Avoid complicated patterns that are unintelligible to the user. See guidance on public art and Public Art SPD. Manhole covers etc Workmanship
Space that lasts	•Consider future maintenance – keep landscape design simple where ease of maintenance is important. •Get clear management responsibilities put in place from the outset. Draw up maintenance regimes at the design/planning stage. •Use durable products; natural materials weather better than artificial ones. •Remember trees grow; think about both their immediate and eventual impact on buildings and space. •Use indigenous planting species where possible and foster biodiversity. Greater consideration of ecological principles at design stage can improve biodiversity in new open space.	Avoid the use of materials that will result in visible patches of reinstatement. Liaise with landscape managers to see what is practical. Avoid the use of materials that discolour or fade, or become brittle in sunlight. Brownfield sites can have surprising nature conservation potential.

	•Select species that do not require irrigation once established and will survive in predicted changes to climatic conditions. Get the right plant for the right place to ensure planting thrives.	Open space is often too simplistic in design and too intensively /uniformly managed to have much nature conservation value, but this need not be the case.

PUBLIC ART

6.54   Public art should be designed in parallel with the design of buildings and spaces, as an integral part of them and should not be seen as isolated features to be bolted-on to buildings or placed in spaces at a later time. South Cambridgeshire District Council has adopted a public art policy and published an SPD on Public Art. The term Public Art refers to works of art in any media, which contributes to the identity, understanding, appreciation and enhancement of public places. Public Art can promote a sense of place and pleasure for example by evoking local history, be inspiring and/or thought provoking. In South Cambridgeshire Public Art has a role to play in neighbourhood and community development.

6.55   Public art is described as; any work by a recognised artist in a public place, and this policy applies to:

- Residential developments comprising ten or more dwellings.

- Other developments where the gross floor space created is 1,000 m^2 or greater, including offices, manufacturing, warehousing and retail developments.

6.56   The artwork may be large or small, mobile or static, integral to a building or freestanding, fine art or functional. For example, public art may be produced in the following forms:

External Public Space – Sculpture; Mural; Relief; Feature Window; Canopy / Entrance Feature; Paving; Landscape Art; Bespoke Street Furniture; Bespoke Signage.

Internal Public Space – Sculpture; Mural; Painting; Textile; Glass; Flooring; Crafts; Exhibition space for changing exhibitions.

Non-Site Specific – A contribution may be considered though the general public art strategy for off-site works that may be more easily accessed by the public.

6.57   The Council's policy encourages developers to dedicate between 1% and 5% of the associated construction costs of the capital project to Public Art. The council will initially negotiate the principle of an agreement with developers and their agents to commission art within the development, which will then be secured through a Section 106 agreement that will be attached to the planning permission for the development.

6.58   The Council encourages the use of local artists from within South Cambridgeshire, but developers are free to choose and appoint any recognised artist and work by nationally notable artists is also encouraged. The developer's architect or landscape architect/designer should be able to assess possible types and most appropriate locations of art in relation to the project design and context. Ideally the appointed artist will work alongside the architect. It is important that at the outset an artist's brief is prepared. This will clarify what kind of artist is required for the particular development and establish: a theme and character, location(s), budget, programme, identity of the client and any requirements for community involvement (including contacts).

6.59   Developers are advised to ensure that technical consultations and approval for the artwork are carried out in advance of the installation. These may include:

- Statutory utility companies (for underground services in the location of the installation).

- The Highway Authority (for traffic safety and works within public highway land).

- Parish Councils (for works on public open spaces).

- Health and safety issues and Environmental Health issues.

- Whether the art installation requires planning permission in its own right.

6.60   Any resulting art installation will require maintenance during its life. The maintenance will vary depending on the nature of the intervention, but may include running costs for lighting etc, and responsibility for maintenance of the artwork will need to be carefully considered when the artist's brief is prepared. It is anticipated that the investment in the artwork includes a sum for maintenance. Provision for future maintenance should be included within the Section 106 agreement.

6.61   More detailed advice on the public art policy and the procurement process is available in the Public Art SPD or from the Council's Arts Development Officer.

LANDMARKS AND WAY MARKERS

6.62   A variety of built forms and public realm spaces provide identity and interest that enables people moving through an area to navigate by. This can be greatly enhanced through the provision of key landmarks that people can identify. Such landmarks could be distinctive places at the intersection of routes, distinctive buildings at key locations such as intersections and at the end of vistas, or the provision of towers to provide landmarks in a wider context. Existing buildings of special note, or individual mature trees, should be considered to create landmarks. Similarly visual stops need to be carefully considered and achieved using buildings or other focal points.

6.63   Small-scale points of reference that aid orientation and the creation of a local sense of place, such as war memorials, village notice boards, post boxes and distinctive, architectural features. These way markers give the sense of an unfolding journey when travelling through the development.

*A feature corner building acting as a way marker, Orchard Park.*

A corner turning building acting as a way marker, Great Shelford.

6.64   Using a particular house type as a landmark or way marker is acceptable, but if the same house type is repeated it loses its effectiveness and becomes commonplace and confusing.

DAYLIGHT AND SUNLIGHT

6.65   Daylight and sunlight are primary considerations in any proposal, both for the new accommodation, and for that of the neighbouring development and gardens. This depends on orientation and the built form, but buildings must not significantly overshadow a neighbouring property's windows or garden, or where possible block their views, and evidence will need to be shown that this is the case. Buildings will not normally be allowed to protrude beyond a 45-degree line drawn horizontally from the nearest window of a neighbouring property.

45 degrees

Dashed line indicates
continuous extension
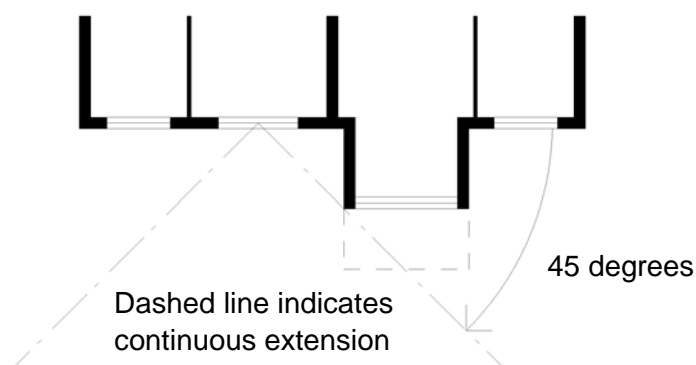
Diagram of 45-degree "rule of thumb" concerning daylighting. The dot/dash line indicates the 45 degree line drawn sideways from the centre of the nearest adjacent window. This also applies upwards from the top of a window.

6.66   Consideration should be given to orienting buildings to the south or within 30 degrees of south to maximising the potential for harnessing solar gain to reduce the demand for space heating and solar power for energy production.

PRIVACY AND OVERLOOKING

6.67   Protecting privacy and avoiding overlooking of neighbouring houses should be given high priority in any residential context and the Council is required to consider any relevant objections received from neighbours.

6.68   To prevent the overlooking of habitable rooms to the rear of residential properties and rear private gardens, it is preferable that a minimum distance of 15m is provided between the windows and the property boundary. For two storey residential properties, a minimum distance of 25m should be provided between rear or side building faces containing habitable rooms;

which should be increased to 30m, for 3 storey residential properties. Where the opposing alignment of facing windows is significantly offset, these distances may be slightly reduced. Where blank walls are proposed opposite the windows to habitable rooms, this distance can be reduced further, with a minimum of 12m between the wall and any neighbouring windows that are directly opposite.
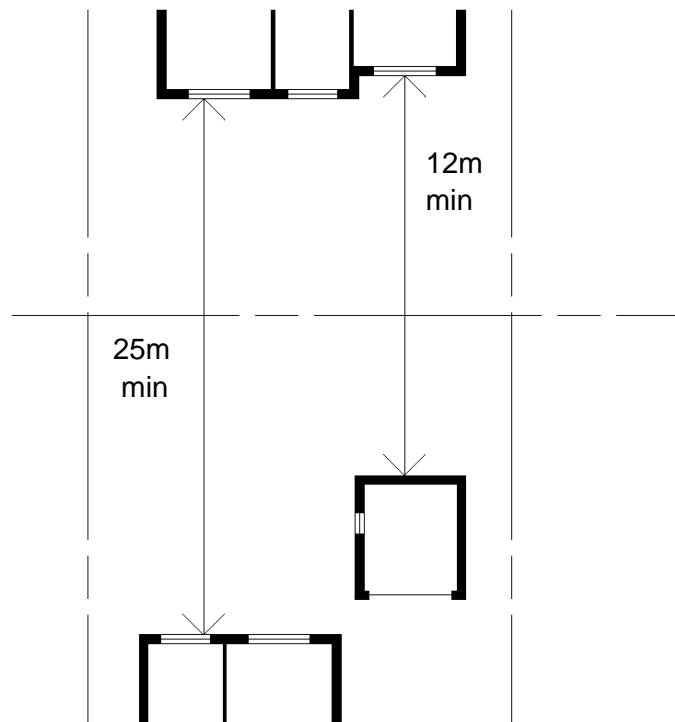
Diagram of 12m and 25m "rules of thumb" concerning daylighting and over-looking. The plan shows two residences with back-to-back gardens. The 25m rule of thumb refers to primary habitable rooms that face each other. The 12m rule of thumb refers to a blank wall that faces a neighbouring room.

6.69   Careful consideration must also be given to minimise the impact of direct overlooking from a new dwelling into a neighbouring garden, particularly from upper floor windows. Where a potential problem is evident, the careful internal planning of rooms will assist, if necessary windows could be of obscured glass and fixed shut (apart from any top vent), or could be at high level. Protective boundary treatments, garden walls and planting, can assist in obscuring views, but as these cannot be relied upon to remain in perpetuity they should not be utilised as the primary means of creating privacy.
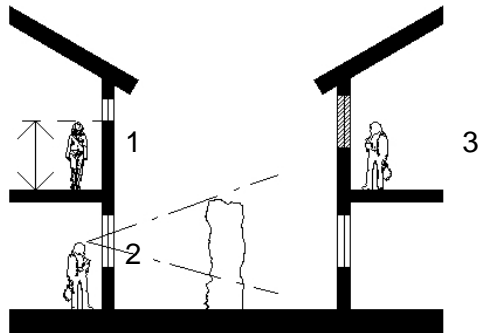
Diagrammatic section illustrating acceptable types of windows in walls parallel to a boundary to minimise overlooking of neighbouring gardens.
1. Cill of window higher than 1.7m from floor level.
2. View blocked by hedge/wall/fence, etc.
3. Use of obscured glass in fixed window.

PRIVATE GARDENS AND AMENITY SPACE

6.70 The design of the grounds surrounding buildings are as important as the design of the buildings themselves and the two should be designed as an integrated whole.

6.71 Every home should have the benefit of some private or communal outside amenity space. This can take the form of private gardens, communal gardens, roof terraces or balconies. Within denser development of new settlements and urban extensions, the careful design of outside amenity spaces is required to optimise the benefits of good locations and ensure these spaces offer maximum benefit to new residents. In such compact developments within appropriate urban contexts there will be an emphasis on private balconies and communal gardens/terraces. Relatively modest balconies, roof terraces and communal decks can offer significant benefit to residents of urban developments where they are properly integrated into new development, respect local character, are secure, quiet, attractive and have good microclimate.

6.72 Private gardens should:

- Be of a size and shape to allow effective use for the number of people the property is designed for, for growing plants or vegetables, for general amenity, for play in family housing, etc. and where possible be oriented to allow sunlight into each garden.

- Incorporate a private sitting out area positioned close to internal living accommodation.

- Incorporate means of enclosure that do not undermine the quality of adjoining, especially communal, spaces; whilst avoiding excessive wall or fence heights, which could overshadow small gardens and discourage interaction between neighbours.

- Be placed away from public areas within the development.

- Feel safe and secure.

- Enable flexibility of use and personalization.

- Provide accessible yet discreet locations for clothes lines.

6.73   Communal gardens including roof terraces should:

- Be convenient to use.

- Be clearly distinguished from the public realm.

- Not be bisected by vehicular routes to parking courts.

- Feel safe and secure.

- Not unduly affect the privacy of residents' internal accommodation, particularly those at the same level as the communal space, or below in the case of roof terraces.

- Incorporate a variety of semi private sub spaces to permit flexibility of use.

- Provide accessible yet discreet locations for clothes lines.

- Be designed with interesting planting, hard surfacing and places for sitting and socializing.

- Be properly managed and maintained.

6.74   Balconies should:

- Benefit from sunshine and good microclimate (including air quality).

- Be well related to internal accommodation.

- Be of sufficient size as to permit outside sitting / dining.

- Have good outlook.

- Be secure and relatively private.

- Be placed on the quiet side of the building where possible.

- Relate well to the architecture of the building on which they are placed.

Usable sized balconies, Orchard Park.

6.75   Ideally residential units should be provided with access to the following sizes of private amenity space. Each one or two bedroom house should have private garden space of 40m^2 in urban settings and 50m^2 in rural settings; whilst each house with 3 bedrooms or more should have private garden space of 50m^2 in urban settings and 80m^2 in rural settings. Ground floor apartments should have a minimum of 10m^2 private amenity space immediately outside their living accommodation, or use of a communal garden, where 25m^2 is allowed for each apartment. Upper floor apartments should have use of a private balcony, of a minimum of 3m^2, plus use of a communal garden, where 25m^2 is allowed for each apartment. This provision is in addition to the stated requirements for car parking and bin storage. Residential properties in some villages, historically, have small private gardens, in the context of which it may not be appropriate to provide private amenity space in accordance with the above guidelines.

PLOTS

6.76 A settlement may contain numerous different sizes and shapes of plot, but usually an overall pattern can be identified and, when subdividing larger plots, this pattern and scale should be respected, as it adds to the unique character of a cumulative settlement. The pattern will need to be varied to suit the individual location, be it along a straight street, a curving street or at a corner junction. The proportion of width to depth of a plot often distinguishes the density and character of the built environment.

6.77 All plots should promote a human scale with a frontage to the street that reflects the local characteristics. Larger buildings may sometimes be disguised using a smaller building in front to suggest a more human scale where viewed from the public realm.

6.78 Corner plots present special challenges, as the building must relate to more than one frontage. Building position, garden layout and boundary walls can all define their success in the structure of the built environment. Attention should be paid to the layout and orientation of similar corner plots in the same settlement. Access into the plot and the locations of openings within the defining boundary should be carefully considered in relation to the adjacent plots and those on the opposite side of the street.

6.79 Neighbourliness will be an important consideration; therefore privacy and the avoidance of overlooking, particularly from window to window, but also from window to private garden space, should be given high priority in any residential context, as should any effect on day lighting and a sense of 'overbearing' of adjacent properties.

6.80 Developers should always generate innovative design solutions that exhibit architectural excellence. However, where a site is in a landmark location within a settlement, or may be difficult to develop, such innovation and excellence are essential.

PARKING

6.81 One of the major challenges in the design of new residential developments is to accommodate the car in ways that are visually unobtrusive, convenient and safe to use. The number of parking space to be provided should be assessed using the Council's adopted Parking Standards as set out in the Development Control policies DPD. These are a maximum level of provision and it may be possible to provide fewer spaces where there is good access to facilities and public transport. Where appropriate and viable, consideration should also be given to the provision of car clubs and dedicated shared parking bays. Reference should also be made to the need to consider design implications of providing adequate cycle parking as part of new developments.

6.82   Parked cars should not be allowed to dominate the street scene; they should preferably be accommodated within, beneath, or at the side or rear of buildings. If parking is not on-plot it should be as close to the house as possible for convenience and to prevent people parking on the roads. In most cases parking spaces and garages located within the dwelling plot should be recessed from the building frontage so as to lessen their visual impact. Within villages the urban form will dictate the manner of parking and to retain the village character parking may need to be provided in a similar manner.

13. On plot: mews court

Terraced or grouped on plot garages in yard serving homes above. Found within perimeter blocks. Differs from the off plot flats-over-garages of a mews street (page 9) where frontages usually face each across a lane equal in width to building height.

Aptness

Central

Urban

Suburban

(Car parking what works where. Homes and Communities Agency)

15. On plot: integral garage

Garage within footprint of house gives direct access to home, accommodation continues above or around. Risk of inactive street so best used with double-fronted bay windows for surveillance. Garage doors best placed close up to highway.
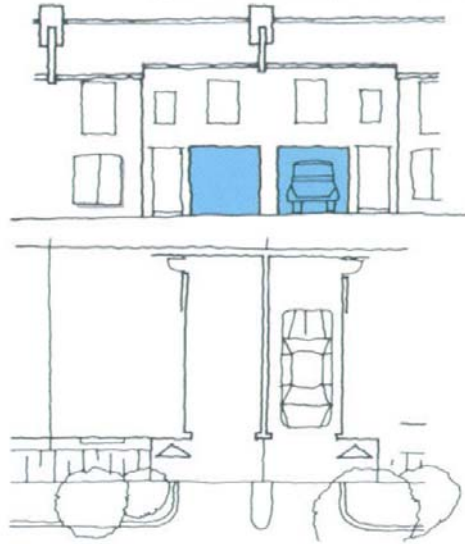
Aptness	
Central	🔴⚪⚪
Urban	⚪🟠⚪
Suburban	⚪⚪🟢

(Car parking what works where. Homes and Communities Agency)

On plot integral garages, Sawston.

16. On plot: attached garage

Garage is located to side of house giving direct access to home, often with "bonus" rooms over. May be paired with neighbour. Garage best placed close up to highway

Aptness

Central

Urban

Suburban
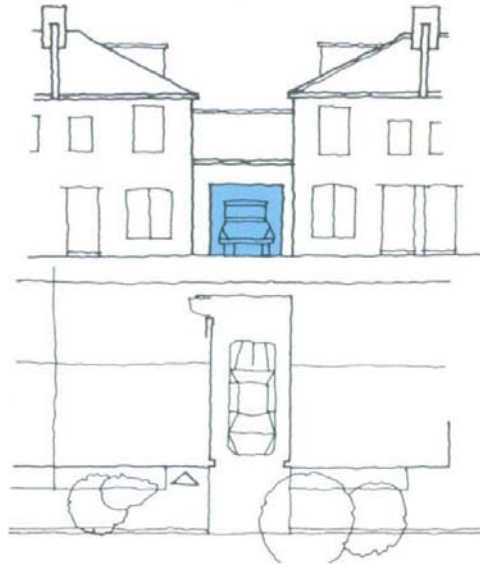
(Car parking what works where. Homes and Communities Agency)

17. On plot: cut out or drive through

Arch formed at street level allowing driveable access under first floor accommodation to hardstanding or garage at rear of plot. Cut out may be shared with neighbour if hardstandings or garages paired.

Aptness

Central

Urban

Suburban

(Car parking what works where. Homes and Communities Agency)

Drive through car parking with garages to the rear of the parking space, Highfields.

6.83   To avoid cars being displaced from garages into the street, it is important that garages are of sufficient size to accommodate a large car together with cycle storage, some degree of other storage and room to pass garaged cars with wheeled bins, if the primary route for taking them to the back-of-footpath is through the garage. To provide garages of adequate size, a 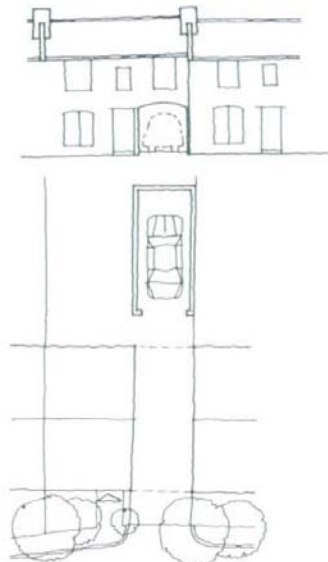minimum of 3.3m X 6.0m should be allowed for car parking and circulation, with an additional allowance of 1.0m at the end or 650mm – 750mm at the side to allow for cycle or other storage.

6.84   Parking facilities should be viewed as public spaces that have cars in them at certain times, and should be created as attractive functional spaces, with planting used to avoid the street scene becoming dominated by the view of cars. The retention of existing trees, in combination with appropriate landscape materials and detailing, can create low key and attractive parking areas.

6. Off plot: front court

Marked or unmarked bays overlooked by fronts of homes partly enclosed by building/walls and within depth of pavement.

Aptness

Central

Urban

Suburban
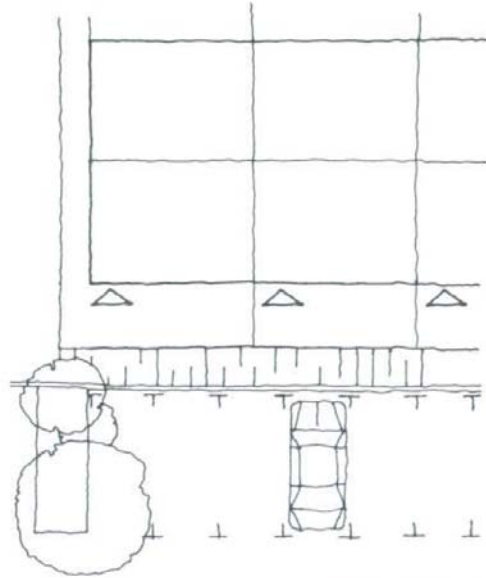
(Car parking what works where. Homes and Communities Agency)

11. On street: in line with pavement

Kerbside parking parallel to the axis of the pavement, bays may be either marked or unmarked. Landscaping a benefit.

Aptness

Central

Urban

Suburban
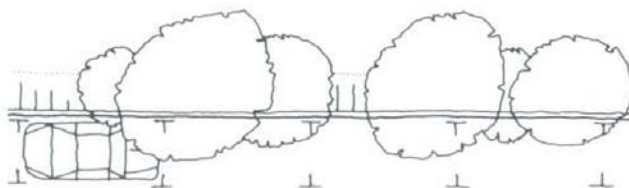
(Car parking what works where. Homes and Communities Agency)

12. On street: housing square

In line kerbside parking arranged around sides of landscaped central space, further parallel parking to other side of surrounding streets.

Aptness

Central

Urban

Suburban
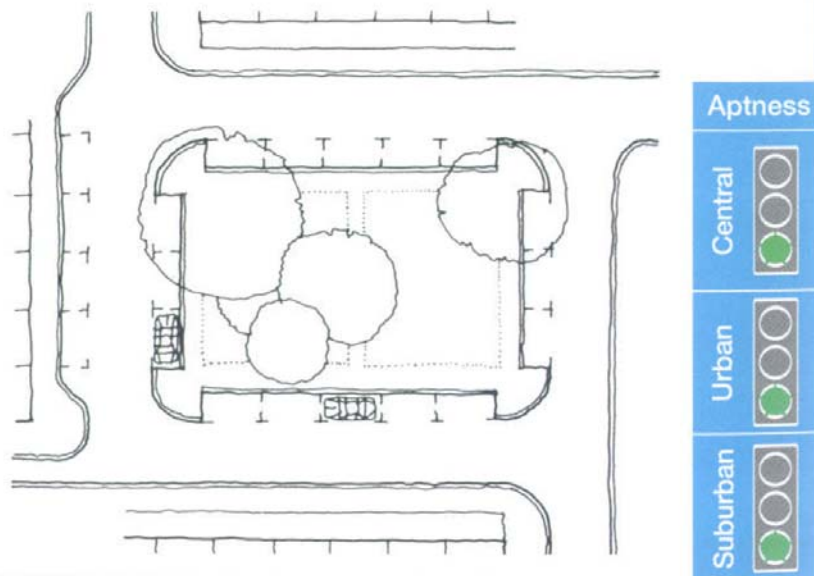
(Car parking what works where. Homes and Communities Agency)

8. On street: central reservation

Kerbside parking arranged both sides of strip dividing traffic flows with marked bays for parking in same direction as the traffic flow. Landscaping a benefit.

Aptness

Central

Urban

Suburban
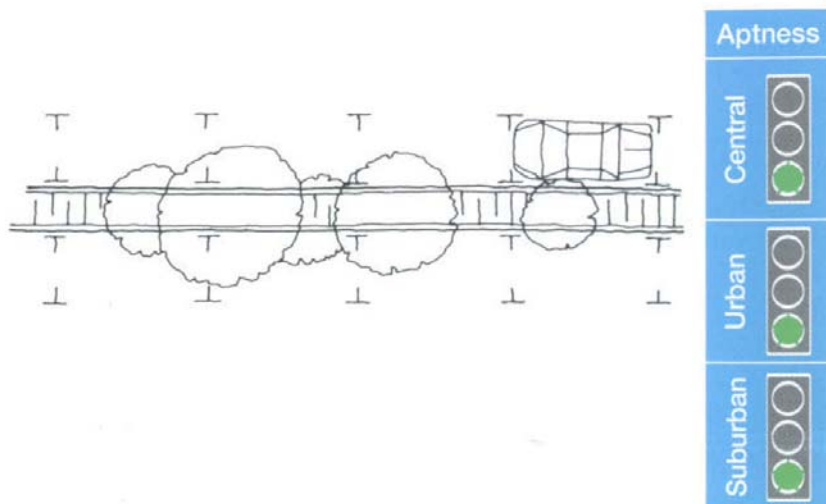
(Car parking what works where. Homes and Communities Agency)

6.85   Any off-plot provision of communal parking courts must be in small, well lit, and overlooked by neighbouring properties, for security, otherwise they may become underused, problem areas. Larger unsupervised parking courts, especially in the heart of blocks that remove the security of the rear of properties are not acceptable as they will be little used, resulting in cars being parked on the streets. One of the benefits of higher density development is that it makes undercroft or basement parking economically viable; this is an option that minimises the visual impact of parking while maximising the land for development. However it is important that it does result in awkward or unbalanced elevations. Reference should be made to English Partnerships' Car Parking What Works Where, especially to the golden rules on p18.

18. On plot: rear court

Single or larger area of hardstanding accessed from and located at rear of property. Differs from 7 in having direct access to home.

Aptness

Central

Urban

Suburban
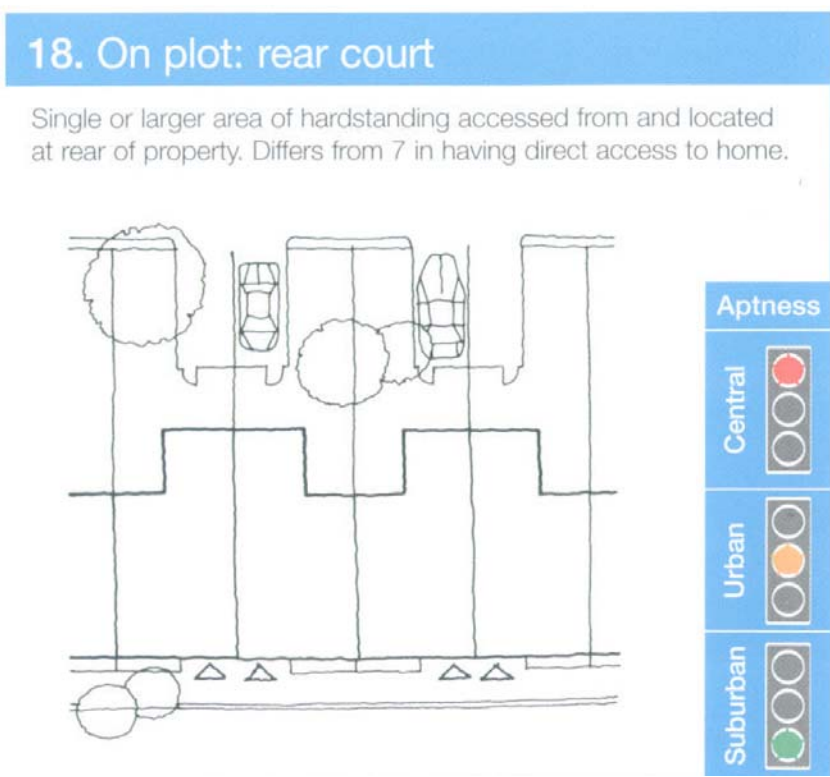
(Car parking what works where. Homes and Communities Agency)

7. Off plot: rear court

Grouped (often terraced) garages or hardstandings (marked or unmarked) around shared court, accessed between and located to rear. Court should serve no more than six homes.
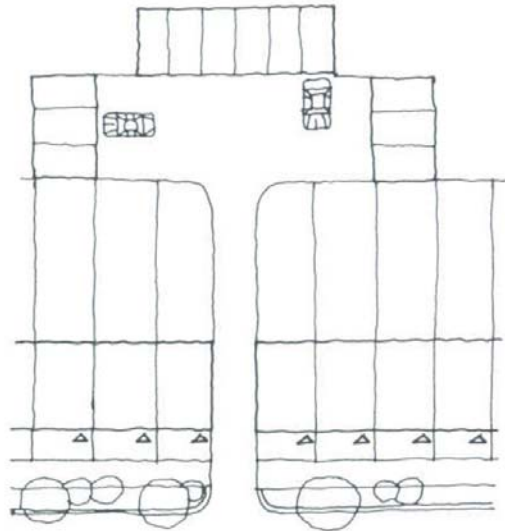
(Car parking what works where. Homes and Communities Agency)

3. Off plot: undercroft

Open sided parking bays at street level or half level down for natural ventilation, best secured with grill or other bar to access from street. Accommodation over. No direct access to homes.
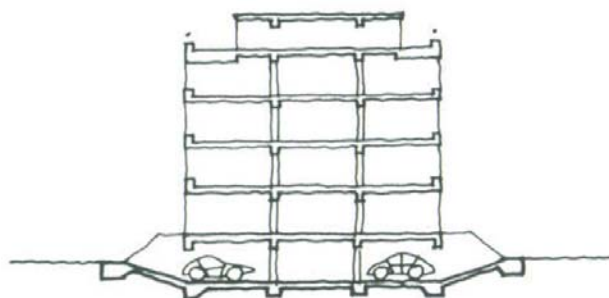
(Car parking what works where. Homes and Communities Agency)

6.86   Adequate provision must be made in all cases for visitor parking and service vehicles.

UTILITIES

6.87   Developers are strongly encouraged to locate all services underground to minimise visual clutter. Common service trenches should be employed to maximise the areas available for planting of trees and shrubs for the visual enhancement of the public realm spaces and the improvement of the setting of the buildings themselves.

6.88   Building Regulation B5 requires access for fire tenders to 15% of a dwelling's perimeter or to within 45m of every point of the building's footprint.

6.89   The location of external meter boxes needs to be considered as part of the detailed design process to ensure they are not unduly prominent in the street scene, with carful attention paid to their position and colour.

SOLAR PANELS

6.90   The Council encourages the design of all new buildings to minimise their environmental impact and be robust in changing climatic conditions.

6.91   Solar panels should be incorporated into the design of the roof rather than be add-on units above the roofline, this will retain the visual integrity of the built form.

6.92   Where solar panels are not incorporated into a building from the outset, the roofs should be designed to enable their easy later addition with minimal visual disruption of the roof form. See Chapter 8 for further details on building integrated renewable energy technologies.

6.93   Where the proposals affect a Conservation Area or Listed Building, the siting of the solar panels should be carefully considered and unobtrusive. Further guidance is contained in the Council's Listed Building and Conservation Areas SPDs.

SATELLITE DISHES AND OTHER PARAPHERNALIA

6.94   Satellite dishes need careful consideration, especially when they are to be located in proximity to a Conservation Area or Listed Building. As a general rule satellite dishes should be located on secondary elevations and rear elevations. Where this is not technically feasible or affects a Listed Building or Conservation Area, alternative options should be considered, such as siting the satellite dish on a pole in the rear garden, or on an outbuilding, subject to not being visually intrusive into public areas or the setting, or detrimentally affecting the amenity of neighbours.

DESIGN THEORY AND AESTHETICS

6.95   In this section the following terms are used in the manner indicated by the following definitions:

- Design theory is the deliberate application of the design elements and the principles of composition to formulate high quality design solutions.

- The design elements are the basic building-blocks of design theory; point, line, shape, form or mass, texture, tone and colour.

- The principles of composition is the aspect of design theory that addresses the combination of the design elements into an integrated design; pattern, rhythm, repetition, variety, contrast, emphasis, dominance, simplicity, unity, harmony, balance, scale and proportion and sequence.

6.96   Good design complements and enhances new development, but poor quality design detracts from the development. Architects, urban designers, landscape architects / designers and engineers should pay careful attention to the application of design theory in their designs, to ensure visually strong design compositions in which all the viewer / user observes / experiences is intentional and not undermined by ill-considered accident. Good architects and designers who posses a strong and controlled command of the use of design elements, may, intentionally break the following 'rules of grammar' to create strong individualistic design solutions.

6.97   Design can be subjective with different people having different preferences of the things they like and dislike. However, a meaningful discussion can be had about designs, free from personal preference, through focusing on design theory, i.e. how the design elements and the principles of composition are used. The following is a guide to how design theory will be assessed in designs submitted to the Council and how design language will be used when providing comments on design considerations will be referred back to designers.

DESIGN ELEMENTS

Point

6.98   These are the aspects of a design intended to act as points of emphasis to catch the observer's eye and direct vision to a particular place or feature. They may be singular, such as a tower on the corner of a building or a statue in a square, or they may be repeated throughout the design, such as a particular feature window, or a particular species of plant. However, too many points of emphasis cause distraction and visual confusion.

The column in Paternoster Square, London, is the focal point of the square. The column is not located at the physical centre of the square, but the paving pattern radiates out from the column leading the observer's eye to it as the focal point.

Line

6.99   Line is the joining up of two or more points, to lead the eye. This is often intentional, such as with a stringcourse, or eaves line, or a path linking two spaces. A line may also be implied by the intentional or accidental repetition of points of emphasis, such as the use of a particular colour, or feature such as trees, resulting in the observer's eye following a line that was not intended by the designer and thus distracting the eye away from the features intended to act as the primary visual attractions.

A gulley used to form a visual line in the paving at Broadgate, London, to draw the eye into the space between the buildings.

The size, shape and alignment of windows on a plain background of the building elevation, creates a primarily horizontal emphasis, giving the impression of a long low terrace. Orchard Park.

Vertical bays on similar terrace to the one above, creates a primarily vertical emphasis, giving the impression of a shorter and taller terrace than the one above.

A change of level results in the deflection of an intended strong straight line.

Shape

6.100 Shape is a two dimensional area on a surface, such as on the floor or a wall, etc. Such intentionally created physical shapes are referred to as 'positive shapes' e.g. areas of panels or windows in a building wall, a building or boundary wall, fence, hedge, paving, grass, plants, water, etc. However, a shape can be implied by the things that surround it, acting as its boundaries, referred to as 'negative shape', e.g. the wall space between door and window openings. Shapes should be co-ordinated to form a harmonious composition to attain the design intention.

The use of colour emphasises the shapes created in the design of the building elevation. Orchard Park.

Form or mass

6.101 These are three-dimensional objects, buildings or features in the landscape used to divide space or to provide points of visual emphasis e.g. pavilions, buildings, plant groups. Such physical objects are referred to as 'positive form or mass'. However a space can be defined by the boundaries that contain it, which is referred to as 'negative form or mass', e.g. a 'public square' is defined by the buildings that edge it.
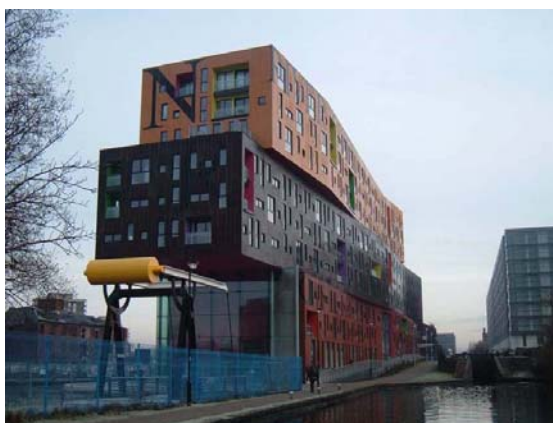
An innovative approach to the form of a building creates the visual impression of 3 separate forms stacked one on top of the other. The CHIPS building New Islington, Manchester.

A building with an unconventional form creates interest in the urban fabric, Piccadilly Basin, Manchester.

Two rows of trees suggest edges and imply enclosure of a space.

Point, something in insolation which forms a focal point

A series of **points** imply a **line**

The **points** join up to form a **line**

An increase in width of a **line** results in a **2D shape**

An increase in depth of a **shape** results in a **3D form**
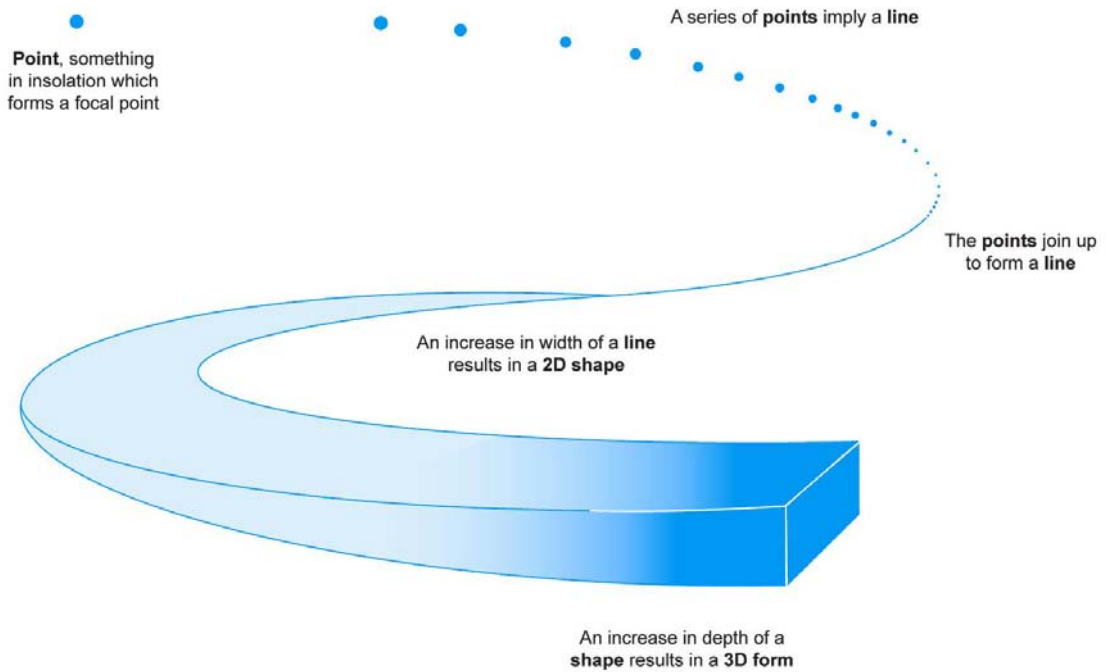
The general relationship between point, line, shape and form. How points, lines, shapes and forms are perceived is dependent upon the context in which they are seen; for example a road is a shape as it has width, but from a distance it may be seen as a line running through a landscape.

6.102   Additive forms comprise the composition of a number of building structures joined together to give a balanced whole. They are derived from traditional buildings where the original structure is added to and extended over time. Subtractive forms involve the cutting away of shapes from the original to leave it truncated or with hollows and, though sometimes they may be architecturally interesting, are not typical of local buildings.
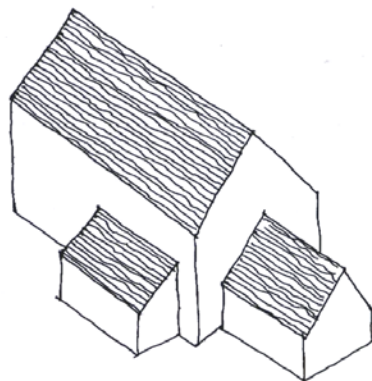
Additive forms

Texture

6.103   Texture is determined by the size and arrangement of the constituent parts of an object and is seen by the pattern they create and intensity of shadows cast. Texture is not an absolute aspect of an object but is relative to the size and shape of the object and the texture of the things around it. The observer's perception of an object is influenced by the texture perceived e.g. coarse, medium or fine.

Tone

6.104   Tone is the observer's perception of how dark or light an object is. Tone is not an absolute aspect of an object but is relative to the tone of the things around it. The observer's perception of an object is influenced by the tone perceived e.g. light, medium or dark.

Colour

6.105   Colour is identified in relation to the positioning of the colour in relation to the colour spectrum and modified by the tone, from white to black, to produce shades. The perception of an object's colour varies according to the colours of other objects it is seen in association with. Some colours make objects appear larger or nearer, whilst other colours make objects appear smaller or further away. Great care therefore needs to be taken in their selection.

PRINCIPLES OF COMPOSITION

Pattern

6.106   This is the use of the design elements, point, line, shape, texture, tone and colour, to create the visual design, to create an integrated whole. Too much use of the same element can become monotonous, but the use of too much variety can confuse the unity of the design.

Rhythm

6.107   This is the frequency of the repetition of a feature at regular intervals to create an intentional series, at regular intervals, which breaks a design down into sub-sections, e.g. a row of windows, pillars, or trees. Too many of the same repetition can become boring, whilst an inconsistent rhythm can destroy any form of unity.

A rhythm of openings in an elevation unifies a terrace of varied built forms. Cottenham.

Blind windows used to continue the rhythm of openings in the façade of a terrace. St. Neots.

Repetition

6.108   This is the repetition of a feature to create unity throughout the design, other than a structured rhythmical repetition. Too much use of the same repetition can become boring, whilst an inconsistent rhythm can destroy any form of unity.

Variety

6.109   This is the intentional variation of the design composition to create interest and prevent the design composition becoming monotonous. Too much variety can become distracting to the observer and disrupt the visual composition, whilst too little can result in monotony.

Contrast, emphasis, dominance

6.110   Contrast is used to create variety and emphasis. Too little contrast will result in the design becoming boring. Too much contrast can disrupt the unity of the design, giving to much emphasis to one particular point, or giving too many points of emphasis.

The addition of a central gable, carriage arch and panel, a different treatment to the window above the arch, the inclusion of a clock and date stone, all add visual emphasis to the centre of the building. Smaller windows to the upper floor add visual emphasis to the lower floors, with the string course between the ground and first floors creating a visual plinth to the base of the building.

On a smaller scale the different shaped window and lintel above the door add emphasis to the centre of the building, whilst the larger lintels above the ground floor windows add visual emphasis to the ground floor. The loss of the chimney stack on the right-hand side of the building imbalances the symmetrical balance of the elevation, as does the later addition the sign and burglar alarm.

Simplicity

6.111   Simplicity is the counterbalance to the multiple use of the other elements and principles, which ensures their repetition does not become cluttered and disunited.

Unity

6.112   Unity is the combination of the design elements and principles into a united composition.

Harmony

6.113   Harmony is the perceived comfort of the design composition to the observer.

Balance

6.114   Balance is readily identified in a symmetrical design where whatever occurs on one side of a centre line is repeated on the other side as a mirror image. Balance can also be provided by offsetting a large feature against a small feature, with the large feature set further away from the centre of a composition.

The asymmetrical Kingspan building at the Off-Site exhibition, BRE Watford.

Buildings designed to break the symmetry of the front elevation to ensure future personalisation or alterations by residents will not visually unbalance the elevation. New Islington, Manchester.

Scale and proportion

6.115 This is the size of features within the design in relation to each other and in relation to human beings, in terms of people's perception and comfort.
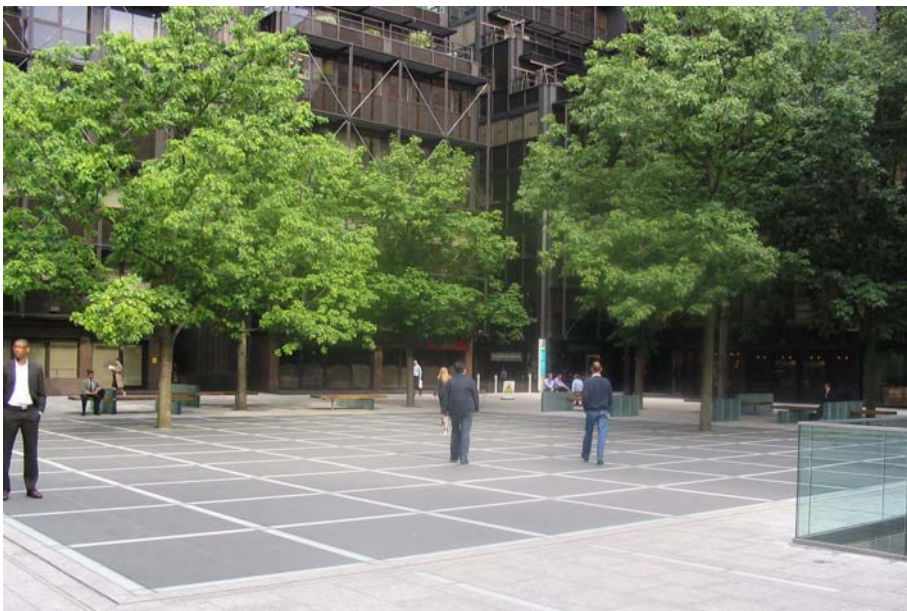
The tree group counterbalances the open space to create an asymmetrical balance; whilst the trees, paving pattern and street furniture maintain a human scale in a large space overlooked by large buildings. Broadgate, London.

Sequence

6.116   This is how the observer sees and perceives the overall design as they proceed through a series of spaces. This addresses how the design of spaces and places aids people to know where they are in a sequence, i.e. are they making an approach to a place, crossing an actual or perceived threshold to enter a place, or have arrived at a destination place.

1. The western approach to St. Neots provides a built edge to the town on the eastern bank of the river. Buildings edge on either side of the roadway create a narrow gateway to the town centre. The top of a church tower can be seen above the roofs on the right and the top of a church spire can be seen above the roofs left of centre.

2. Arriving at the gateway the roadway ahead meanders right and left passing through a visual pinch-point in the distance. The landmarks of the church tower and spire are obscured from view, whilst on the right hand side of the road a tall building as a new focal point.

3. Passing through the gateway the market square opens up to the right and the church tower becomes evident again.

4. Exiting the market square the street narrows through the pinch point and can be seen to widen out on the left hand side again ahead, whilst the tall building on the right acts as an intermediate focal point, with the white building at the end of the road acts as the primary focal point.

5. The roadway widens ahead, with the main route continuing off alignment to the right, with the central building ahead closing the view as an end stop at the opposite end of the main street to the gateway adjacent to the river.

6. On the right hand side a passageway providing a view of the church tower from the main street.

7. On the left hand side an opening in the built form fronting the street provides a view of the second church front with its spire.

BUILDINGS AND STREETSCAPE

6.117   The relationship of surrounding buildings to the street and the placement of buildings within their plots create a precedent that should be considered when designing new developments.

6.118   Within a settlement it is usually the buildings that define the boundaries of the public realm (street or open space) and, typically, the front wall of a building and the ridge to the roof are placed parallel to the street. This relationship should be followed on new developments, although deviations may be appropriate in special circumstances.

6.119   The size, shape and orientation of buildings in the streetscape will define the 'weave' of the built fabric. For example, detached buildings, which are placed in the centre of larger width plots, define a looser-knit settlement pattern than lines of terraced houses. Also, buildings that directly front on to the pavement generally define a narrower street than buildings set back with front gardens and garden walls.

6.120   Buildings should be grouped together to create unity in the townscape. At the same time buildings should be designed to create some variety and interest in the street scene. In villages this will be dictated by the existing townscape context.

6.121   The street frontage typically forms a public face, behind which lie the more private interiors and gardens. It is the public face that people directly relate to on a day-to-day basis, but it is the density and depth of accommodation away from the street that defines the life on the street itself. New sites affect both of these aspects and the impact on the public realm should be considered as part of the design process.

6.122   The height and massing of buildings is traditionally greater towards the centre of towns and neighbourhoods. Reinforcing this trend will mean that most efficient use is made of land that is particularly central or well connected relative to local facilities etc.

6.123   Building depths should respect the local character. Uncharacteristically large building footprints should not be located in sensitive areas. Domestically scaled traditional buildings have spans of no more than 5 – 6 metres.

6.124   In order to achieve a degree of visual cohesion developments should incorporate the following general principles:

- Building lines should normally run parallel to the back of the pavement, not at an oblique angle to it.

- In more urban situations buildings should front onto streets and other public spaces, creating perimeter blocks.

- Buildings should be grouped together to create positive public spaces; these may be streets, squares, crescents or courts.

- Buildings should be properly linked or properly detached; narrow gaps between them create a cramped appearance.

- Specially designed buildings should be used to turn corners so that a building face is presented to both street elevations.

- Blank facades facing public areas should be avoided.

- Buildings should reinforce the local character whilst creating distinctiveness.

- Design detailing and materials selection should prevent monotony and create interest commensurate with the building's context.

- When access to parking at the side of properties or in rear parking courts is required, suitably proportioned archways or other openings should be used to maintain the building line (where appropriate), rather than leaving gaps in the street frontage.

- Well-designed front boundaries can provide continuity within the streetscape but generally façade lines create a stronger definition.

- To ensure that developments have a unified 'feel', particularly where several developers are involved, the Council will require the prior agreement of a set palette of materials and details. This will ensure an element of co-ordination between developers, their house designs and finishes, so that unconsidered changes in form and materials are avoided.

6.125   Consideration of larger scale buildings in less sensitive areas outside the closely built settlement centres should include efficiency of the building in use. A depth of 5-7 metres provides the most flexible form and where buildings are less than 13m deep, they can be lit and ventilated naturally.

ENCLOSURE AND BUILDING LINES

6.126   Buildings need to properly enclose the spaces between them in order to achieve cohesion and a satisfactory urban form. A key factor in this is the relationship between street or space width and building height. The number and size of gaps in street frontage also has a significant impact upon the

degree of enclosure. Traditional urban areas tend, or appear, to feature continuous building frontages punctuated by occasional streets, lanes and archways. By contrast many suburban housing schemes are dominated by detached and semi-detached properties separated by modest gaps and garages, providing little sense of enclosure.

6.127   The height / width ratio of a space influences the dynamics of the use of that space. If it is too low physical containment is lost, together with a loss of orientation; if it is too high a deep claustrophobic space results. Empirical studies have shown that certain height to width proportions are generally regarded as the most satisfying (The Planting Design Handbook, Nick Robinson, 2004). The following enclosure ratios between the height of the buildings and the distance between their frontages are used as a guide to achieve a satisfactory degree of enclosure:

- Squares   Between 1:2 and 1:4
- Streets   Between 1:1 and 1:2.5
- Mews   Between 1:0.75 and 1:1

6.128   The way that buildings are aligned in relation to one another should be informed by the analysis of good examples of local urban form and the aim should always be to achieve a coherent, attractive and efficient layout.

6.129   The buildings enclosing the public realm create active frontages when the designs incorporate the provision of:

- Frequent doors and windows.

- No blank walls.

- Narrow frontages to create a vertical rhythm to the street.

- Enlivening edges with articulation of facades with projections, bays, porches, balconies, colonnades, awnings, providing interest and a welcoming feeling.

- Lively internal uses and activities visible from the street or spilling out onto the street.

- Opportunities to enliven the space and create interest using a hierarchy of buildings, a landmark building or by positioning a building more prominently, subserviently or closely, relative to its surroundings; using a hierarchy of views within the space and enhancing the group using glimpses between buildings or long views over green spaces and countryside; and creating an element of surprise.

- Opportunities for those inside to see out 'eyes-on-the-street'.

6.130   An increase in the height of a building relative to surrounding buildings can, in certain instances, be justified by the building's townscape role. Height can be used to provide variety to rooflines, form strong edges to otherwise undefined space, define nodes, provide increased presence for important spaces and act as local or district landmarks. The use of height other than in these instances undermines the legibility of a place to the detriment of the character of an area. A corner at the junction of two minor streets for example should be turned with a building that fronts both streets but the corner location in itself does not justify an increase in height.

Table 6.5: Enclosure and Building Line

Justification for increased height (above that determined by context bearing in mind the height/width guide)	Criteria
To provide variety to roofline. Townscape basis.	•Generally only appropriate where variation in roofline is already characteristic of an area. •Building should follow the plot width and building depth of adjoining buildings to avoid a massive appearance. •Height should not generally exceed 150% of the height of adjoining buildings.
To act as local landmark. Townscape basis.	•The townscape significance of a site revealed in a site and context appraisal should provide clear justification for a vista stop. •Height should not generally exceed 150% of the height of adjoining buildings.
To form an edge to a space. Townscape/functional basis.	•Appropriate where a large space warrants a built frontage for definition (e.g. a park).
To define nodes Townscape/functional basis.	•Typically only appropriate at the junction of two or more busy routes. •Importance of the node should be reinforced by the presence of non-residential elements in the block.
To provide presence to important spaces Functional basis.	•The space being addressed should have a clear civic or community function.
To act as a district landmark. Locational basis.	•The location should provide justification for a landmark.

Architectural Qualities

6.131   There are a number of general architectural qualities that come together in the design of a building and help convey a range of messages and meanings.

6.132   The size of a building is important but this is most often read and measured in relation to other buildings or features. The relative size of buildings and their parts is called scale.

6.133   The shapes of buildings are described as their forms. Massing of buildings often refers to the way different forms are combined together.

6.134   Proportion describes the relationship of one dimension or area to another. The proportions of a rectangle come from the relationship between the length of the long and short sides. Different proportions give different messages and some have a special balance or beauty.

6.135   Different proportions also give a building (or building element) a greater or lesser vertical or horizontal emphasis. Buildings with strong horizontal proportions can be seen as hugging the ground while those with strong vertical proportions take the eye up to the sky. The elements and details of a building can reinforce or play against these overall emphases. For instance, the walls of many traditional buildings have a horizontal emphasis but the windows can often have a vertical emphasis.

6.136   The proportions of the floor plans of buildings (the relationship of length to depth) and the proportions of cross sections (height to depth) are important, as is their shape and division. The plans of traditional houses in the district often had long walls running parallel to the street but were shallow in depth. Sections of vernacular house were often tall and narrow, and roof pitches were often steep, particularly those designed for thatch.

6.137   The impact of one part of a building relative to another is an important part of a building's expression. For example, a large roof which runs down to a low eaves can dominate a smaller area of wall below. Or walls can be dominant, with the impact of roofs reduced by screening parapets. Details emphasis these relationships: eaves and verges with deep overhangs make roofs more dominant.

6.138   Similarly, certain elements of a building – usually those most important and which the owner, builder or architect wants to highlight – are more prominent than others.

6.139   The way that the elements of a building, particularly doors and windows, are positioned is also a form of expression. (The windows and door at the front of a house can be compared to the eyes and mouth of a face). A

symmetrical balance of openings conveys a different message to other formal or informal arrangements and can give a sense of status, formality and completeness.

6.140   The degree of uniformity or variety in a building is an important part of its expression and is closely related to its function and meaning. A high degree of uniformity, for example, can suggest organization and discipline and has traditionally been used for military and institutional buildings.

6.141   Buildings with too much uniformity can appear dull and over-regimented and those with excessive variety, can seem haphazard and unsettling. Good architecture often combines and plays off the regular and irregular, the expected and the unexpected.

6.142   Buildings also have and combine different degrees of decoration and complexity. Traditionally, complex buildings are often of higher status than those that are simpler. Again the contrast between simplicity and complexity can be used to good effect.

6.143   Different materials inspire very different feelings. For example, stone walls can give a sense of strength and weight. Combinations of materials can make use of these differences so that a 'heavy' masonry plinth supports a 'light' timber frame wall above. Selected well, they can add to the sculptural qualities and interest of a building.

6.144   The way individual materials are used also increases or changes our associations and perceptions. Stone transformed into the delicate tracery of gothic windows creates a different feel to when it is used in massive castle ramparts. Deep window and door reveals can reflect or suggest a thicker wall and weight.

6.145   The ratio of wall to windows and doors is also important in terms of suggesting weight and how open, and even welcoming, a building is.

6.146   These architectural qualities combine with the relationship between a building's form, function, date, status and the other aspects described earlier in the chapter to give expression and meaning to a building. This is further enhanced by the 'patterns of buildings' considered next.

ARCHITECTURE

6.147   The detailed design needs to acknowledge the materials and vernacular traditions of the region (outlined in Chapter 3), but without resorting to pastiche. There are examples of contemporary design that have successfully achieved this, while others have been equally successful in adopting a more traditional design approach. Both approaches require a

rigorous and consistent design ethos, coupled with a careful attention to detail, proportions, scale and hierarchy.

FORMS, MATERIALS AND DETAILS

6.148   Building forms, materials and details can be drawn from surrounding examples, whilst also relating to the particular use proposed and qualities of space to be provided. Details and materials should be of as high a quality, or higher, as those found on existing adjacent properties. The existence of poor quality detailing and materials on existing properties will not be accepted as a reason for poor quality details and materials being proposed on a site.

6.149   The intention should be to specify new materials from local sources to minimise energy intensive transportation and costs.

Infill houses, Melbourn. The rendered walls and tall window proportions make reference to the listed house, with contemporary metal roofing and window frames (Plum Developments).

6.150   Traditional materials can offer guidelines for new buildings, although just as important is the quality of the element in its final form. For example, a wall may be designed to portray a feeling of mass and solidity, or be light and ethereal. Windows may be set deep within a recess, casting a shadow and appearing as openings 'punched' into a solid wall, or set flush with the face to maintain the plane of the wall. Each element carries a design intention, and appropriate justification should be presented for each.

6.151   Other than the purely decorative, detailing of materials should be related to the type of material and function of the new building. Timber rafters and beams may have expressed connections where they join, and brickwork may be detailed with projecting or recessed stringcourses. Careful study of historic details will reveal the design intent behind them; it is this intention that should be the starting point for new details, rather than the mimicking of form for its own sake.

6.152 Adjacent buildings should be studied for guidance on the proportion, form and spacing of window and door openings. The design should also take into account the orientation of the building (including the opportunity for passive solar gain) and the desired levels of daylighting. Architectural styles should be relevant to the particular location within South Cambridgeshire. Composition and elevational rhythms should clearly reflect context, even if the form of the building is contemporary.

6.153 Traditional forms may consist of simple wall planes with recessed windows under a pitched roof. Study and analysis will reveal the design intent of existing buildings; this could be based on historic use, or the status of the building, and it is this process that should be the starting point for the generation of new and appropriate building forms, related to choice of building materials and detail, whilst at the same time being specific to the village location.

6.154 The junction where a wall meets a roof is particularly sensitive. Eaves and verges may project or be cut tight back to the face of the wall. The wall may terminate with a dentil course or project past the roofline to form a parapet. Each type of detail places emphasis on a different element of the construction and should be consistent with the overall design intentions for the building.

6.155 Within the design of individual houses, chimneys are important elements of the skyline and help to provide an appropriate scale and articulation of the building and group.

6.156 Traditional walling materials found in South Cambridgeshire are, typically, buff coloured Gault Clay brick, stone (clunch, flint, claybatt and, occasionally, greensand) and timber weatherboarding. Windows are generally of timber or metal, and traditional roofing materials include clay tile (peg tiles and pan tiles), thatch and Welsh slate. Combinations of roofing and walling materials are common, often reflecting a hierarchy of building usage.

LARGE BUSINESS PREMISES

6.157 New buildings in business parks and on industrial sites are often large structures that can make use of 'state of the art' construction methods and materials. As a result they can have a significant visual impact on their locality and may be visible over a considerable distance, if sited in a prominent, isolated or exposed location.

6.158 Large buildings should be sited to avoid their mass breaking the skyline. Where this is unavoidable their design should mitigate the problem, possibly

by breaking the building down into articulated blocks and through the use of landscaping as a screen and to break up the silhouette.

The large building form of South Cambridgeshire District Council offices has been broken down into sub-forms to reduce its bulkiness and visual impact.

6.159   The blank 'boxes' of large retail, industrial and storage buildings are particularly difficult to successfully integrate into the streetscape. 'Big-box' uses should be mixed horizontally or vertically with other uses to remove or minimise the blank inactive frontages they present to their neighbours. As many of the active uses as possible that will take place in the building e.g. cafes, offices, etc, should be located at the outer edges of the building to create active frontages. Smaller units can be constructed along the faces of the building.
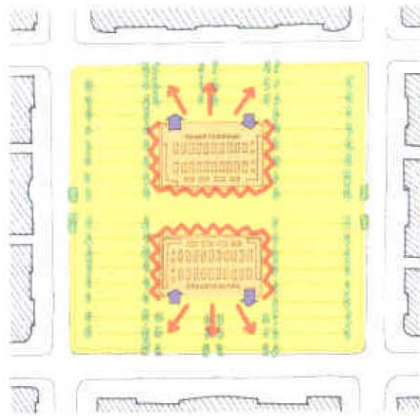
Big box sheds surrounded by parking: potential
active frontage is projected into the car park, rear
elevations exposed and the streetscape undermined
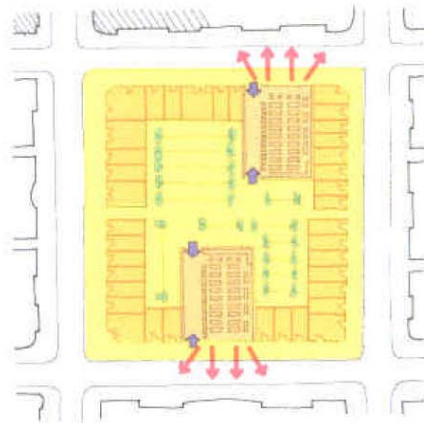
By turning the sales floor 90° and inserting
the building into a perimeter block, access is
provided from both sides but active street
frontage is ensured
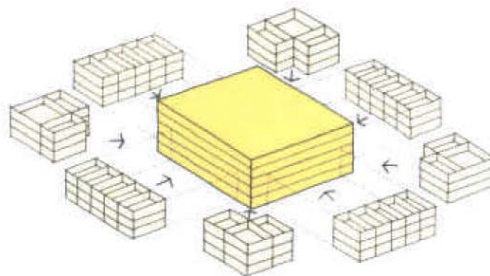
Wrap big boxes with smaller units to create
active frontage

*Reducing the visual impact of large buildings (Urban Design Compendium,
Homes and Communities Agency)*

6.160　Travel Plans will be required to minimise car parking provision. Other uses can be constructed above the main building. Car parking, subject to the context of the location of a building, could be provided in a basement or on the roof to remove the expanse of surface car parking, associated with such buildings, that creates a void in the urban fabric and divorces the units from their neighbours. Other methods to mitigate the impact of large structures include articulation (employing L or T shaped plan forms); multi-span roof forms to reduce overall height of deep plan structures; and the graded massing of buildings, whereby smaller buildings are sited in front of larger structures. Avoid roof-mounted plant that exacerbates the visual appearance of large structures. Design buildings to incorporate such plant requirements within the building structure.

6.161　A good example of a local business park is at Kings Road, Hardwick, where barns have been converted for business use.

Kings Road, Hardwick, view of the main barn from the car park.

Kings Road, Hardwick, view into the central core.

Kings Road, Hardwick, view from the main road.

MATERIALS FOR BUSINESS PREMISES

6.162   The choice of materials and their colours can have a significant affect on the overall impact of a large new structure. When making the selection consideration must be given to how the materials will perform over time; bright colours frequently fade, while 'fashionable' detailing may quickly appear dated and shiny or reflective materials can attract undue attention to a structure, whereas natural materials (such as brick and stained timber) have been proven to 'grow old gracefully' and are particularly suited for sensitive locations.

6.163   A more contemporary approach may be appropriate utilizing high quality, modern materials, whilst ensuring that the building complements the character of the surrounding development or its landscaped setting.

PUBLIC AND PRIVATE SPACE

6.164   The network of streets, squares, parks and greens, forms the structure of the public realm. These places need to have a clear function and should be easily accessible. High quality materials should be used to enhance the character and attractiveness of public spaces and maintain their quality in the longer term. House frontages should be visible from these public spaces and enable surveillance of the public realm by occupants.

6.165   Creating high quality public and private spaces requires all those involved to develop places that suit the needs and activities of people rather than for cars. It also means designing public areas that are attractive, safe and comfortable, which are easily accessible and provide a range of facilities for the local community.

6.166   Opportunities should be found to incorporate existing features and to create squares, market places (streets wide enough to accommodate a market), greens, small seating areas, and play areas. Development is best designed around a pattern of connected streets and public spaces that can be easily understood; which should focus on busy pedestrian places that have an

identifiable and accessible heart. The heart of the development should have a sense of enclosure and include features and landmarks that define it as a special place. Development should be designed to ensure there are no left over spaces, with each space having clear purpose and definition. They should provide a hierarchy of spaces with, spaces to go to, spaces to stop in and spaces to go through.

6.167   Spaces at and associated with the local centre should be designed in a manner that creates emphasis for the location, reinforcing its role as the heart of the neighbourhood. It should be of sufficient size to accommodate community activities, so they can take place in the heart of the community and not have to go elsewhere, where they would become disconnected from the community.

6.168   Policy SF/11 of the Development Control Policies DPD sets out the Council's open space standard of 2.8 hectares per 1,000 people, comprising:

- Outdoor Sport – 1.6ha. per 1,000 people;
- Children's Playspace – 0.8ha. per 1,000 people;
- Informal Open Space – 0.4ha. per 1,000 people.

Reference should be made to the Council's "Open Space in New Developments Supplementary Planning Document". "Sport England's publication 'Active Design', promotes the concept of integrating opportunities for sport and physical activity into master plans through good design."

6.169   Public open space requirements should be provided in a variety of forms, formal pitch provision, informal games areas, formal park space, informal amenity space within development areas, play areas for different age groups and areas for wildlife conservation. Open space areas should be connected to provide a co-ordinated network. Ensure buffers are provided to protect any existing wildlife habitats from the pressures associated with people in new development areas. The Urban Design Compendium recommends that all residents should have some form of park space within a 400 metre walking distance of their home.

6.170   When there is a clear distinction between public and private spaces, management responsibilities can be clearly defined. The involvement of the local community in the design and management of local spaces can help to foster a sense of ownership and responsibility amongst local people. The Parish Council should be consulted if they are to take on the maintenance responsibility for public spaces.

6.171   Within more dense developments the importance of the quality external public space increases.

PAVING

6.172   Paved areas, including carriageways, footpaths, cycleways and other hard surfaced areas, are a major element of any new development and, as such, have a significant impact on the character of that development. The design of paved areas should be considered in its entirety as a unified design from building face to building face. Paving should be designed in a manner that creates visual interest as well as meeting the functional requirements.

6.173   Natural, high quality paving materials, such as stone, gravel and brick, as well as quality modern materials, can contribute positively to the appearance of outdoor spaces. Materials should be appropriate to the character of the development and its context. In Conservation Areas it is especially important to complement local traditional patterns, textures, materials and colours, and in rural areas the character of simple gravel or grass finishes should be preserved.

6.174   Muted colours are generally considered more suitable for paving materials, while large, unbroken areas of any particular surface materials should be avoided, especially where there are in situ materials that are protected by Listed Buildings legislation or cannot readily be lifted and re-laid. Areas can be successfully broken up using materials of the same colour but with different textures or simple patterns. Creative approaches can result in an equally functional but significantly more attractive alternative for highways requirements such as avoiding dividing areas of paving with concrete edging strips to identify the limit of highway adoptions.

6.175   Concrete kerbs with a high up-stand create a harsh and over-engineered appearance. They are particularly inappropriate in shared use and low traffic areas. Changing levels to reduce or omit the upstand will improve the appearance and enable wheelchair access, and using natural materials such as granite will improve the texture and appearance of the edging.

6.176   Granite or concrete setts may be useful for defining areas such as parking bays and shared-surface roads. A bound gravel or shingle surface dressing may be suitable for paths, private driveways, squares, and other shared-surface areas designed for low vehicle speeds and movements. It is more appropriate to use changes in surface material rather than painted demarcation to define changes of surface use.

6.177   Consideration should also be given to the appropriateness of the materials selected, with the use of non-slip and non-trip materials, especially where the elderly or infirm will walk. Where possible permeable paving materials are encouraged to maximise surface water percolation into the ground and minimise run-off.

STREET FURNITURE

6.178   Street furniture is anything erected on pavements or streets, including seats, bollards, litterbins, railings, lamp-posts, post-boxes, street-signs, telephone-kiosks. These should be selected and designed into the public realm from the outset, in an integrated manner. It should be carefully selected for its appropriateness for its location. Street furniture is a necessary part of the street-scene in terms of giving information and ensuring the street is suitably lit and a safe place, but it is important that the location, amount, design and materials of street furniture is carefully controlled to avoid unnecessary visual and physical clutter.

6.179   Where appropriate, street lighting and street nameplates should be mounted on buildings. Where posts are required for street lighting or road information, these should be used in a co-ordinated manner and carry more than one sign, thereby reducing the number of posts in any one street. The street furniture, including lighting, seating and local direction signposts, should be chosen imaginatively to complement the building design.

ADVERTISING, LIGHTING AND SIGNAGE

6.180   Advertising, lighting and signage are aspects of commercial developments that can have a significant impact, but are frequently not considered as part of the design. This can result in excessive lighting and signage, frequently of poor quality, being added to a development after its completion. The Council will expect planning applications for commercial developments to show how advertising, lighting and signage are to be integrated into the design, with the expectation that they will be kept to a minimum, use suitable materials and avoid light pollution.

6.181   Where the proposals replace existing signage or affect a Conservation Area or Listed building, a traditional, simple and minimal approach is appropriate and the intention should also be to retain any historic signage in situ. Advice is contained in the Council's Listed Building and Conservation Areas SPDs.

LIGHTING THE PUBLIC REALM

6.182   As part of and integrated with the design of the public realm, a lighting strategy should be developed, appropriate to the location and context, as there are some places where lighting would not be required or be appropriate. This should not only ensure the provision of well lit public areas, to assist in the creation of a safe and secure environment, but should also support and add emphasis to the hierarchy of public real spaces. Key landmarks, building and features should be lit to provide visual interest and support legibility for people moving through the development.

6.183   Where possible, lighting should be incorporated into the design of buildings and spaces, or wall mounted, minimising the number of freestanding lighting columns. To reduce the overall number of columns and posts in the public realm, other signage and/or landscape furniture should be attached to lighting columns where they are used.

6.184   Lighting of external areas will have an impact on surrounding properties. Consideration should be given to the appearance of lighting units, their efficiency in lighting the areas and features intended, and prevention of light spillage that could cause light pollution to other locations and adjacent landholdings. Lighting should also be efficient in its consumption of energy to minimise the production of greenhouse gases arising from the energy generation to power the lighting.

6.185   Lighting affecting Listed buildings or within their curtilage or setting should refer to the Council's Listed Buildings SPD.

COMMUNITY SAFETY

6.186   Good places are safe and secure. Safety and security stem from good site planning and the careful design of buildings and spaces. As well as being inherently safer, such developments will have a sense of public ownership and civic pride. Developments that meet the need of communities and are well managed are safer.

6.187   Developers will need to ensure that crime prevention is considered as an integral part of the initial design of any development and not as an after thought. Development should incorporate the principles of 'Secured by Design'. In particular, they will need to demonstrate how their development proposal has addressed the following issues, in order to design out crime:

- Natural Surveillance of public and semi-private spaces, in particular, entrances to a development, paths, play areas, open spaces and car parks.

- Defensible space and the clear definition, differentiation and robust separation of public, private and semi-private space, so that all the spaces are clearly defined and adequately protected in terms of their use and ownership.

- Lighting of the development, in particular streets and paths.

- Design and layout of pedestrian, cycle and vehicular routes into and within the site, including how these integrate with existing patterns.

- Landscaping and planting, in particular, potential hiding places and dark or secluded areas should not be created.

6.188   The design and layout of access opportunities is of fundamental importance to designing out crime and needs careful consideration to avoid the creation of opportunities for crime. Manual for Streets provides advice on security issues in relation to the design of routes and connections. It emphasises that while clear and direct routes through an area for all forms of movement are desirable, they should not undermine the 'defensible space' of particular neighbours.

Avoid arranging buildings in a manner that does not afford surveillance of main cycle or pedestrian routes and bus stops, Histon road, Cambridge.

6.189   In practice this means that Secured by Design status for new housing developments can be achieved through careful design and the use of a limited number through routes, so that they are well used, effectively lit and overlooked, thereby creating a safe and secure atmosphere (www.securedbydesign.com). To aid this process, public spaces and routes should, where possible, be defined by frontages that are visible from the street and are able to offer surveillance of the street from their occupants.

6.190   Developers should, at an early stage, seek advice from the Police Architectural Liaison Officer on designing out crime.

Table 6.6: Designing Out Crime

	Do (subject to site size and context)**:**	**Don't:**
Routes	•make routes direct; •ensure they follow desire lines so that they are well used; •ensure routes are overlooked; •make sure routes are well lit; •ensure routes feel comfortable.	•make indirect routes; •provide unnecessary routes that will be little used; •create opportunities for people to hide close to paths, cycleways and entrances; •create dark alleys; •place routes between high fenced/walled/hedged gardens.
Structure	•use perimeter blocks; •create active elevations to routes; •plan in clear public and private space; •ensure public entrances are clear and visible; •gate accesses to private areas; •use robust, low maintenance materials; •mix compatible uses to create diversity of use.	•create long culs-de-sac; •place blank walls against public routes; •create indeterminate space without clear purpose; •create public entrances that are hidden from view; •provide parking courts that are not overlooked; •use poor quality materials that can be damaged easily or are difficult to maintain; •create areas of mono-use or monoculture that will be inactive at certain times of the day.
Public space	•relate spaces to the movement network to ensure they are used; •design attractive public realm that people enjoy using; •ensure public spaces are defined by buildings and are overlooked; •use robust street furniture; •carefully consider the location of street furniture; •ensure soft landscaped areas are robust and clearly defined; •ensure spaces are well lit; •think about the integration of play equipment at an early stage;	•create public spaces that are difficult to get to; •create non-descript spaces without a sense of place; •position back gardens against public space; •create undefined boundaries between public and private space; •use poor quality or weak street furniture; •position street furniture without considering its visual and functional impact on space or the potential for it to be used to assist in the execution of crime; •use fussy landscaping without identifying a regime for appropriate management and

	•design with due consideration for the ongoing management and maintenance of public spaces.	maintenance; •place sub stations etc within public open space.
Security measures	•incorporate modest glazed panels or spy-holes in front doors; •specify good locks to all doors and windows; ensure cycle stores are secure; •ensure bin stores and sheds are secure.	•add in over specified or aggressive security measures that give a fortified appearance – they undermine the quality of buildings and space and give the impression that an area is particularly susceptible to crime; •create gated communities that weaken the scope for community integration.

6.191   Boundary treatments such as garden walls, fences, railings and hedges should relate in scale and material to the overall streetscape and the character of the context, whether urban or rural.

6.192   Streets can be characterised by trees, hedges and shrubs that overhang and define the edges of pavements and roads, but care should be taken when encouraging such features that they do not obstruct footpaths, cycleways or roads. Front, side and back gardens should be considered in conjunction with the new building/s, so as to create a plot design coherent with the street context. New indigenous planting will be encouraged, including trees. Such planting should be based on species and locations that take account of the implications of climate change.

ALLOTMENTS

6.193   Allotments provision is also required as part of the provision of community facilities. Provision of allotments on the Cambridge city fringe will be required in accordance with Cambridge City Council policy; and in the rest of the district in accordance with national guidelines of the National Society of Allotment and Leisure Gardeners.

CHAPTER 7

SMALLER SCALE DEVELOPMENTS

7.1   Smaller scale developments include new infill developments within established built environments, small groups and residential schemes, conversions of redundant buildings to appropriate new uses, extensions to existing buildings and minor householder alterations.

7.2   The single building and smaller scale design parameters and guidance contained in Part II are especially relevant to each of the above types of development. The following sections supply detail on further considerations unique to small developments. Smaller scale developments within Conservation Areas should be read in conjunction with the Conservation Areas SPD.

INFILL DEVELOPMENTS

Context

7.3   Infill plots are small-scale plots within existing developed areas. The basic context and criteria for small development infill plots is contained in Chapter 5. To retain the semi-rural character of villages it is appropriate to retain some vacant plots.

7.4   New uses may include (but are not limited to) residential and commercial. Mixed-use developments may be appropriate, and will be encouraged where they positively add to the variety of life of the area. Unsuitable new uses would be those that have an adverse impact on traffic congestion and use patterns in the locality.

Criteria

7.5   Each infill plot has unique characteristics. Infill plots typically relate to a street or village frontage, and to adjacent buildings and gardens.

7.6   Proposals will be expected to relate well to the topography and geography of a site and to acknowledge the pattern of historical use of that site.

7.7   New buildings should respect important vistas within and views out of streets and settlements. The aim should also be to create new views and juxtapositions of elements which add to the variety and texture of the setting.

7.8   Proposals for infill developments must respect their surroundings. These may contain buildings from the fourteenth to the nineteenth centuries, but that does not mean that the new development should necessarily be pastiche or attempt to mimic historic styles. High quality design, relevant to

context, is the most important factor, and a contemporary solution that provides modern spaces, while at the same time considers the scale, materials, grain and elevational rhythm of its context may provide a better solution. Today's high-quality buildings are tomorrow's heritage.

7.9 What may be a difficult site to develop, or a landmark site within a settlement, should generate innovative design solutions and architectural excellence.

ANCILLARY BUILDINGS

Context

7.10 Ancillary buildings include garden buildings, garages, stables and boathouses. They are subservient to a main building, usually a dwelling.

Criteria

7.11 The location, scale, proportions and materials would be characteristic of a subservient building.

7.12 Garden buildings include summerhouses and sheds. Traditionally, sheds are simple and constructed in brick, flint, clay bat or weatherboard on a timber frame and have a subservient roof material such as thatch, pantile, slate or corrugated iron. In Cottenham, traditional black boarded sheds sit prominently gable on to the road frontage, interspersed between houses, but elsewhere sheds tend to be smaller or set well back in rear gardens. Summerhouses are set within a landscape which may be extensive or intimate. They may hark back to historic examples using substantial materials such as flint or brick, or be much more lightweight in character using timber boarding on a timber frame. They use local materials, sometimes in an imaginative and contemporary way, and have simple balanced proportions. Contemporary garden buildings sometimes have large expanses of glass, which may not be appropriate in a historic context and should be sited carefully to avoid becoming a hazard to birds or bats.

7.13 Garages are generally prominent within the streetscape. Within a historic context specific care is needed to ensure they merge into their surroundings. Often the traditional cartshed is used as a basis for the design of a detached garage, but the depth of a garage, even when limited to 5.5 or 6 metres, is greater than many traditional single storey outbuildings and a double garage is almost square, giving roofs that are uncharacteristic of traditional forms. Often where the building is prominent, the depth is visually reduced by incorporating a lower eaves level on one side giving a lean-to with a catslide roof. Where the gable is seen, the lean-to may be set back nominally to give a balanced symmetrical gable. First floors above garages are discouraged as they tend to give a top-heavy appearance.

Garage doors are better set in the long elevation rather than the gable as they resemble cart openings but are unlike any proportions of doors traditionally found in gables. Doors to traditionally designed garages in sensitive settings, such as in Conservation Areas, should be traditional side-opening timber doors with traditional wide vertical boarding and external strap hinges. Apart from the garage door, there should be very few openings and care should be taken to avoid the building appearing domestic.

7.14   Stables and other buildings for animals are generally set to the rear of a site and are agricultural in character with traditional walling and roof materials as described for sheds. New stables are often timber framed with boarding rather than traditional masonry. Poor quality examples have narrow shiplap boards and fibre cement or felt roofs at a very slack pitch. These are not long-lasting and not appropriate for a traditional or historic setting.

7.15   Boathouses are appropriate additions to the waterfront where there is a built-up river frontage and groups of boathouses already, but elsewhere they disturb the tranquility of open views across rural watercourses and meadows. Reflecting the unfussy natural surroundings, they are characteristically low, single storey, lightweight and simple, with timber frame and timber weatherboarded walls.

CONVERSIONS

Context

7.16   The buildings proposed for conversion include rural and agricultural buildings, industrial buildings, large houses and outbuildings, commercial and community buildings.

7.17   In all cases, the District Council will expect sufficient detail to determine the principle of conversion; to include the significance and character of the building, the efforts made to keep the building in its existing use, and the full implications of the proposed change of use including proposed and necessary changes to the structure, fabric and setting. The retention of the building in its existing use is normally preferable, and if so, the justification for a change of use should include extensive marketing of the building.

7.18   The intention with all conversions is to sustain, enhance and preserve the quality of our built and natural environment. This involves preserving the language of existing buildings, whilst adding to them in ways that respect contemporary building materials and methods of construction. Designs for conversions must aim to facilitate new and sustainable uses without compromising the character of the existing building.

Criteria

7.19   Every conversion is unique. To determine how appropriate a building is for conversion, consideration should include location, accessibility, the character of the surrounding area, and the character and condition of the building.

7.20   Policy ET/7 in the Development Control Policies DPD states that conversion of rural buildings to employment uses will be permitted subject to specified criteria being met including that the buildings are in keeping with their surroundings and that their existing characters are retained. Policy HG/8 says that conversion of rural buildings to residential use will only be accepted in exceptional circumstances and subject to specified considerations and criteria including that the buildings are in keeping with their surroundings and that their existing characters are retained. Under PPG15 it is accepted that the best way to ensure the retention of a Listed Building is for it to have an appropriate and viable use. Where the original use has ceased and cannot be reasonably reinstated, or the building is designated as being at risk, the local authority will encourage sympathetic conversion, if it represents the best way to retain a Listed Building. However, conversions of Listed Buildings that result in significant loss of historic fabric or elements of the building's special character, and thereby compromise the reason for their listing, will not be supported. There is also a presumption against conversion should the Listed building represent a significant, sensitive and comparatively rare example of a particular period or type of building that would potentially be harmed by any works for conversion, or by works inherent in the specific type of conversion proposed. In those cases, a low key use such as non-intensive storage would be more appropriate. The building should also be capable of conversion without significant extension.

Special Characteristics

7.21   Special opportunities arise within each situation, and these should be taken advantage of; notable places are made through recognising and enhancing these particular local characteristics.

7.22   The conversion may be directed to a specific type of use by the context, local infrastructure, access roads and local transport links, existing links to communications, and the local provision of employment or residential buildings.

7.23   It is important to understand the special characteristics of the particular building and what makes it capable of conversion. These may be structural, spatial, environmental and architectural.

7.24   To understand the building and the impact of the proposals, a historical study and impact of alternative uses will be required and this should inform

the proposals. The extent of information required to establish the acceptability of proposals should be available at an early stage and would include plans, elevations, sections and surveys with overlays of any inserted floors and clarification of any disturbance of an historic timber frame.

7.25   An understanding of the original structure, materials and modes of construction forms an essential basis for any proposal for conversion. Evidence in the form of a structural engineer's report will normally be required to accompany planning proposals.

7.26   Buildings originally constructed with specialised uses may pose a challenge for new use proposals. Examples include churches, chapels and schools, and agricultural and industrial buildings such as barns, stables, drying sheds, maltings and mills. Part of the character of the building may incorporate minimal or no window openings, very low floor to ceiling heights, large undivided internal volumes, fittings and fixtures from the previous use, insubstantial structure, exposed finishes giving minimal thermal provision, large windows or an open rural non-domestic setting. The loss of any element of that character is likely to weaken the interest of the building, and this would need to be considered against the justification and principle of conversion, benefits of the scheme to the future of the building, its setting or local community, and identification of the most sensitive design reasonably possible.

7.27   Rural and agricultural buildings are characterised by simple traditional elevations and materials. The barn may be a large black weatherboarded box or a box in undisturbed brickwork and will provide a challenge to any designer to provide any windows to sizes required under the Building Regulations without significantly damaging the structure or interrupting the simplicity of the form. In the limited instances where any new build is justified, the character of rural buildings limits it to structures that resemble simple modest traditional farm buildings. Domestic additions such as conservatories or garden rooms are therefore alien in this setting. New outbuildings should be resisted, but where a new building would enhance the group it should respect the scale, form, setting, massing and materials of the original building. Existing ancillary buildings and structures should be retained and repaired. If small, they may be able to accommodate meter boxes or storage. The interior of a barn would normally be an open volume that does not readily accommodate subdivision into rooms or inserted intermediate floors. If there is an attached smaller building, it may better accommodate the smaller spaces. Even where some subdivision is accepted, it would be expected that the majority of the internal volume would remain open. Original features such as doors, vents, boarding, floor bricks and threshing floors should be retained and may limit the use of the building. Original divisions and larger features such as stable stalls should be repaired and retained although in some justified cases they may be

relocated within the same space. New fixtures and fittings should retain a simple character in detail and materials, in sympathy with the existing quality of the building; this does not mean reproduction 'heritage' ware, but appropriate design functionality. The setting may be rural and open, so vulnerable to harm by subdivision, car parking and domestic paraphernalia. Conversions should involve a minimum of change to a building's setting, especially the large simple open external areas and rural agricultural boundaries characteristic of the farmstead. Where re-surfacing is considered appropriate, gravel or bound gravel, and occasional limited brick or granite paving may be considered.

A contemporary addition and interior to a converted barn. ('Quaker Barns', Hudson Architects)

7.28   Commercial buildings proposed for conversion are often in village centres or as part of an industrial or agricultural group. The change of use of buildings such as pubs and post offices often represents a significant loss of village and rural facilities. Any proposal for change of use of a community facility should investigate the history of that use, the possibilities of retaining the use including the extent and results of the marketing process, the potential relocation of the community facility, alternative new uses, and the implications of each alternative use on the character and setting of the building, to include highways and parking provision, and signage. If the building has a long historic link with its original use, such as a historic building originally built as a pub, the impact of the proposed change of use is expected to be more harmful than it is to a more recently established use. Signage is an important element of commercial buildings and again if the signage is historic or relates to a historic name of the building, such as the earliest pub names, its loss will not be supported. It will be expected that the proposal would include some enhancement of the site and building where reasonable.

7.29   Restoration of original built fabric is considered an essential part of any conversion. Equally, the objective with any repair or addition is to clearly identify the building's evolution.

7.30   Converting historic buildings can involve complex structural work. For structural surveys, façade retention, underpinning, internal demolitions and temporary works, advice must be sought from a professional structural engineer and negotiated with the Council as necessary.

7.31   Integrating new work with the old fabric is essential to the success of the conversion. However, contemporary insertions should not necessarily be designed in a way which tries to mimic historical styles. A well-considered and detailed contrast can often be a better way to respect and enhance the existing built environment.

7.32   Innovative plan forms and uses are often required to successfully convert a building from its historic use to another. Rather than compromising the fabric and character of the existing building, new uses will be expected to be adapted to fit the constraints and challenges of the building. Some new uses with less flexibility, more subdivision and requirements for numerous new openings are inherently more difficult to accommodate in this way.

7.33   There is an assumption that original openings in the building envelope will be retained, complete with historic frames, doors, windows and shutters, and that new openings in the historic fabric will be kept to a minimum. Original openings that have been subsequently blocked may be re-opened as part of the adaptations. New openings should be justified and only considered where necessary to achieve minimum day lighting levels and it is noted that open plan internal layouts are often easier to light from existing windows. The effect of new windows on the building's elevations must be carefully considered and they should refer to the size and proportions of existing openings.

7.34   A sparing use of rooflights may be acceptable to achieve internal day lighting levels, provided that they are compatible with the style of the building and do not clutter a roof or distract from a simple form. Depending on the design and materials, they can be compatible with an industrial or domestic character but are less easily accommodated on some structures such as a barn, small scale agricultural building or building with a thatched or pantiled roof. They may take the form of cast metal conservation rooflights or, in certain instances larger areas of carefully detailed patent glazing may be appropriate. Dormer windows are usually too fussy unless the building is domestic in character, and are at variance to the simple rooflines found in other vernacular and agricultural buildings. The positioning of any rooflights should reflect structural bays.

7.35   Modern materials, detailing and techniques of construction can add to the quality of a conversion project and may be appropriate when having to repair or replace larger areas of fabric, provided any potential differences in the structures (such as thermal movement and permeability are resolved);

for example, large openings such as barn doors could be suitable for an expanse of minimally framed glazing.

Contemporary sliding metal window applied to surface of existing brickwork wall, separating new materials and elements from old, clearly showing the building's evolution (Hudson Architects)

7.36   Old roofs can be a haven for protected wildlife species, such as bats and owls. It is an offence to damage or disturb their habitat, and their presence may have implications for any conversion work. Advice should be sought from the Council's Ecology officer and reference made to the Council's Biodiversity SPD.

EXTENSIONS

Criteria

7.37   All extension proposals must offer a high quality of accommodation and design that will sustain, enhance and preserve the quality of our built and natural environment. By definition, extensions are additional components and should consequently remain ancillary or subservient to the original building. Every extension site is different, and will have a different level of impact depending on whether it is at the front, side or rear of a property, or involves work to the roof.

7.38   Extensions should always complement the form and character of the original building rather than seek to transform it into something else. This may be achieved either by continuation of the established design form, or through an appropriate contrast in high quality contemporary design. The design of an extension should not necessarily be pastiche or attempt to mimic historic styles. High quality of design, relevant to context, is the most important factor, and in certain cases a contemporary solution that provides modern spaces, while at the same time considers the scale, materials, and elevational rhythm of its context may provide the better solution.

Extended cottage, Barrington. The openings of the right-hand extension balance the front cottage elevation, with painted render and a clay pantiled roof. The dark stained open timber frame of the left-hand carport helps it to recede from view.

7.39   The scale of an extension and its position will normally emphasise a subservience to the main building. This will usually involve a lower roof and eaves height, significantly smaller footprint, spans and lengths of elevations, and the use of different and traditionally subservient materials.

7.40   Some buildings are more sensitive to extension than others. Symmetrically designed buildings or buildings with a complete design (such as lodges) or inherently small size may not be able to accommodate an extension without becoming unbalanced or dominated by the extension, or by detracting from the original design. Buildings that have been extended before may also be limited by the cumulative impact of the extensions.

7.41   An analysis of the immediate surroundings should form the foundation of any design. This must consider:

- Whether or not the property is Listed, or is contained within a Conservation Area.

- The location of the extension in relation to the public zone of the street and the nature of that streetscape.

- The effect that the extension will have on adjacent properties and land.

- The effect that the extension will have on the existing property.

- The forms and scale of existing built structures near the site.

- Traditional and contemporary building materials used in the locality.

- The condition of the land upon which the extension is to be built.

Location

7.42   Many South Cambridgeshire villages present important frontages to the surrounding landscape, contain Conservation Areas and contain or frame numerous strategic views (both within the settlement and out to the landscape). Extension proposals may be to Listed or unlisted buildings, and the sites may be adjacent to buildings of particular architectural merit or important open spaces within the fabric of a settlement. Consequently, the impact of the extensions on the wider village, or landscape, must be considered. Further detailed advice should be read in conjunction with the Council's Listed Buildings and Conservation Areas SPDs.

Streetscape

7.43   Adjacent buildings can often provide pointers for the design of an extension. This includes the relationship between the surrounding buildings and the street, and the placement of adjacent buildings (together with any extensions) within their grounds. The immediate context should frame the design approach.

7.44   Extensions on a street frontage should typically follow the pattern set by previous developments on adjacent buildings. This includes the distance from the building's front walls to the pavement edge, and storey heights of buildings. Extensions can dramatically change the character of a street; for example, infilling between detached or semi-detached houses can change the appearance from one of individual villas to a terrace. Consideration must therefore be given to the existing character of the street, to ensure that the extension will not compromise the established rhythm or visual identity.

HOUSEHOLDER MINOR CHANGES

Criteria

7.45   Householder applications can be submitted for minor works to single non-listed dwellings, including dwellings in a Conservation Area. The relevant works include conservatories, side or rear extensions and garden sheds and the intention is that the information required with this type of application is simplified. The design will still be expected to be of high quality and appropriate for the context of the building.

LISTED BUILDINGS

Criteria

7.46   Special consideration must be given when considering alterations, extensions and other development affecting Listed Buildings, curtilage Listed structures, and their settings. There must be a reasoned justification for the size, use, form, materials and details employed. The character, setting and particular interest of a Listed Building must always be respected and the impact on the historic fabric will be assessed on a case-by-case basis. More detail is contained in the Council's Listed Buildings SPD.

Extended listed building, Little Abington. The existing cottage (a former public house) was extended to provide a new hall and kitchen/dining room. An existing flint wall was extended on the street front, with a mainly glazed aspect to the rear garden (Snell David Architects).

CONSERVATION AREAS

Criteria

7.47   The character of a Conservation Area may be assessed in the relevant Conservation Area Appraisal, or in the absence of an Appraisal, an analysis of the special interests of the Conservation Area should be made at an early stage to inform the design.

7.48   The impact of proposed development within a Conservation Area, or within its setting, should be considered prior to making any application, and its special interest should be respected and preserved in any proposals.

7.49   Specific guidance relating to Conservation Areas is contained in the Council's Conservation Areas SPD.

CHAPTER 8

ENVIRONMENTAL SUSTAINABILITY

8.1   Sustainability should be at the heart of good design within the creative process of developing or reshaping our built environment (structures and infrastructure). In the fullest sense this embodies the three principles of:

   i. Concurrency – meeting current needs;
   ii. Resilience – lasting in the face of change, and;
   iii. Adaptability – being able to adjust to future needs.

8.2   Underlying each of these is the need to effectively and fairly manage our use of the Earth's resources so that present and future generations can live within the planet's capacity to support us all. This approach lies at the heart of what is termed 'environmental sustainability' and is perhaps most easily communicated through the concept of 'one-planet living'. We are currently exceeding this threshold. If everyone in the world lived as we do in the United Kingdom we would require the natural resources of at least three planet Earths. This relationship between the productive land area required to support our lifestyles and the amount of productive land that could be evenly allocated to each man, woman and child on the earth is referred to as our ecological or environmental footprint. In South Cambridgeshire the average ecological footprint per resident is 5.3 global hectares (this is 'actual' hectares adjusted for land type and quality), a figure which very seriously exceeds the average 'earthshare' of 1.8 global hectares per person. This is clearly unsustainable in the broadest sense of the word.

8.3   Apart from eroding the Earth's natural capital we have also, through the extensive and almost exclusive use of fossil fuels to power our lives, released (and continue to release) excessive quantities of carbon dioxide (CO_2) and other greenhouse gases into our atmosphere. This is enhancing the global greenhouse effect to the point where our climate is destabilising and changing in increasingly threatening ways. This parameter is often referred to as our 'carbon footprint' and can be expressed in tons of CO_2 per capita of population. In terms of local emissions in South Cambridgeshire, Central Government has calculated the average figure as 10.2 tons CO_2/person/year (2006). To meet Local Area Agreement targets this must be 9 tons by 2011 and to meet Central Government targets we would be looking at 6-7 tons by 2020 and no more than 2 tons by 2050.

8.4   The gravity of the over-exploitation of environmental resources and climate change – and its implications – is now accepted by most scientists and politicians. Together they dominate, and will continue to dominate, the twenty-first century concept of environmental sustainability. Many of the technological solutions to mitigate the situation already exist. The challenge for sustainable design and construction professionals (and the institutions

that support them) is to ensure that this crucial sector does not fail in its responsibilities of ensuring that the transition to low carbon sustainable living is made within the pressing timeframes required (CO_2 emissions must peak by around 2016 and then decrease year on year by at least 3-4%).

8.5   The understanding and sphere of influence of both of these components has swollen dramatically over the past five years, as the planning system has found it necessary to re-evaluate what it means to protect and enhance the environment and to use natural resources prudently.

8.6   The rapidity with which the imperatives of environmental sustainability have impacted on the world of design and construction presents a new challenge to architects, urban designers, quantity surveyors, policy makers, developers and builders to keep up in terms of skills, knowledge, budget and management.

8.7   Sustainable design and construction are now a key concern of the planning system. The environmental sustainability design criteria raised and discussed within the following text are fundamental to twenty-first century design and must be included from the outset of any development and planning application process.

THE DEVELOPING POLICY CONTEXT

8.8   As the extent and urgency of the environmental sustainability agenda has been recognised, so planning policy has developed by way of response. The relevant principles behind South Cambridgeshire's Local Development Framework (LDF) current Core and Development Control Policies have hardened nationally and regionally since they were adopted – especially in terms of target setting and how they should be delivered in practice.

8.9   The fundamental sustainable design and construction parameters of planning for a lasting built environment still hold, but the context and pressure has changed with a new and urgent focus on reducing carbon emissions, decentralised energy, water conservation and climate change adaptation. Since the adoption of the Development Control Policies DPD in July 2007, new important drivers have subsequently been formally brought forward. These stand to strengthen the role and relevance of environmental sustainability in land-use decision making. As additional or revised accountabilities they reflect the priority and urgency that is now attached to tackling the imperatives of the climate change agenda. Of these the following have been specifically taken account of in subsequent sections of this guidance:

        • Planning and Climate Change Supplement to Planning Policy
           Statement 1 (December 2007)

- Government policy commitment to modify the Building Regulations to achieve zero carbon homes by 2016 and zero carbon buildings by 2019 (Building a Greener Future, July 2007)

- Definition of zero carbon homes (consultation closed March 2009)

- UK Renewable Energy Strategy (July 2009)

- Heat and Energy Saving Strategy (consultation closed May 2009)

- UK Low Carbon Transition Plan (July 2009)

- Code for Sustainable Homes: Technical Guide (May 2009)

- EU Energy Performance of Buildings Directive (October 2008)

- Cambridgeshire Together Local Area Agreement Targets on climate change (2008-2011)

- Flood and Water Management Bill (draft April 2009)

SUSTAINABLE DESIGN AND CONSTRUCTION

8.10   Elements of the built environment are designed and constructed at any one time to meet a set of specific needs. These needs will focus upon occupational requirements, with space, amenity and access functions designed around them. These requirements are generally immediate, i.e. 'we need this building here and now because…'

8.11   Environmental sustainability demands that these requirements are placed within a wider context. One that encompasses more than the present needs of the initial occupier. As the pressures of population, household numbers and conventional economic growth continue, so to do the pressures upon land, natural resources, energy and water supply and waste management: meaning that the cumulative impact of development becomes greater. This impact builds in a way which is not always apparent or immediately relevant to the developers of a single site and is likely, where recognised, to be traded off against what seem more immediate and relevant matters. This gap between the individual benefit and the long term broader social, and even global, benefit is where the parameters of sustainable design and construction step in to unite the two. Sustainable design and construction recognises that underlying the ebb and flow of social and commercial activity driving our everyday lives that there is an imperative to look after the environmental capital upon which this socio-economic activity is essentially built. Compromise the environment in a world where natural resources are stretched up to and beyond their capacity to last indefinitely, and the social and economic activities that define our way of life will contract, decline or collapse. The 2006 Stern

Report made it clear that steps taken today to mitigate climate change will be far more cost effective than trying to manage unmitigated consequences in the future.

8.12   The purpose of this Sustainable Development section of the District Design Guide is therefore to ensure that the development of our built environment, from the extensive growth areas to the single home extension, actively incorporate measures that will not undermine the local and global environment for the wider use of present and future generations.

8.13   It is important to remember that sustainable design and construction in itself does not have to follow any particular 'look' or 'style' and often does not necessarily need to be more costly or complicated than more traditional means. As an approach it should therefore be sufficiently flexible to accommodate the other design criteria, parameters and guidance presented throughout this document.

POLICY CRITERIA

8.14   South Cambridgeshire's planning policy direction, as expressed through the LDF, is very clear as to the environmental sustainability criteria that it expects applicants for planning permission to take account of within their proposals:

- Minimise the use of energy and resources.
- Reduce carbon emissions.
- Maximise the use of renewable energy sources.
- Incorporate water conservation measures.
- Use sustainable drainage systems.
- Adaptation to the impacts of climate change.
- Use sustainable building methods and materials.
- Recycle construction waste.

8.15   The above policy criteria will raise a series of questions in the minds of applicants as they draft or assess their proposals. The following text has been designed to support applicants when considering their answers to these questions.

ENVIRONMENTALLY SUSTAINABLE DESIGN AND CHOICE

8.16   In taking account of each of the above policy criteria during the design process various choices will have to be made. These relate to:

- Layout and orientation.
- Building form and structure.
- Technology availability and suitability.
- Occupancy behaviour.

8.17   The choices made will either enlarge, reduce or contain the ecological and carbon footprints of any proposed development. It is therefore crucial that each is dealt with transparently so that the reasoning behind each choice is clear for all to see.

8.18   The sustainability elements of this District Design Guide will inevitably have an impact upon the more physical and tangible elements of layout, orientation, building form and structure. Managing the use of energy and resources, meeting carbon reduction targets and adapting to climate change will, however, extend beyond installation on the ground. The majority of measures will quite likely bring future residents and occupants into contact with some degree of unfamiliar technology, equipment, operation and maintenance. Unless the rationale and benefits behind such measures are specifically introduced to and understood by those that will be living with, using and maintaining them, then their full potential will almost certainly be compromised. As a matter of good practice therefore, all applicants should look to ensure that fully accessible user guidance and technical information is directly passed on to future occupants so that they are able to make the very most of all the sustainable design and construction features included within the new development.

ESSENTIAL CONSIDERATIONS AND OPTIONS

8.19   The following sections are intended to provide guidance on fulfilling the local planning authority's policies as they relate to sustainable design and construction as presented within the Development Control Policies DPD of the South Cambridgeshire LDF, alongside subsequent drivers such as the Planning Policy Statement 1 Climate Change Supplement and issues around behaviour and occupier engagement. All policies should be taken account of and if a compromise is proposed then it should be fully validated – cost on its own is not grounds for compromise.

8.20   Sustainable design and construction is a tremendously creative, expanding and developing field. Guides such as these are very readily overtaken by events and technical advances. The advice and guidance offered should therefore be seen as a flexible framework. A framework in which there is room for creativity, new approaches and the finer details (that only come from thorough site appraisal) in meeting the authority's adopted policies.

8.21   'Major development' (over 1,000m^2 or 10 dwellings) applications require the submission of a Sustainability Statement to demonstrate how the sustainability criteria have been fulfilled (alongside the submission of a Water Conservation Strategy and a Resource Re-use and Recycling Scheme).

8.22   In considering each of the following elements it is important to remember that they do not stand alone from each other. They all contribute to the integrated design of a whole project – from the ground up and from 'cradle

to grave' every element has an effect on every other. This complexity means that it is very difficult to set out a definitive approach. In tying together location, orientation, structure, infrastructure, adaptability, construction and materials so some degree of trade-off is inevitable. There is no exact science to help, but what is essential is that any compromises are clearly described and the decision-making process succinctly explained.

SITE APPRAISAL

8.23   There remains a prevalence amongst developers, architects and builders to view environmental sustainability options as post hoc 'bolt-ons' to site and building design. This frequently means that new development is unable to take full advantage of its site's potential, especially in terms of layout and orientation to best facilitate sustainable energy and resource use (e.g. solar gain, shading, drainage, access etc.). Therefore, in order to make the most of a site it is necessary to get a full understanding of its opportunities and constraints from this perspective. In a nutshell, an effective site appraisal should ensure that:

- Sustainability proposals are working with a site rather than being imposed upon it;

- The opportunity to develop the best site-specific solution is more likely to be realised, and

- Environmental sustainability lies at the heart of a site's functionality.

8.24   The extent of such an appraisal would depend upon the size of the development – a small application, such as a home extension, would only require a brief statement and/or annotated plans.

8.25   The principal environmental sustainability issues to be covered by the site appraisal would include:

- Movement and accessibility.
- Water and biodiversity.
- Sunlight.
- Wind speed and direction.
- Microclimate, soil, drainage and water table.
- Existing buildings and potential for re-use.
- Levels of atmospheric and noise pollution.
- The potential for a combined heat and power scheme.
- Site stability and contamination.

8.26   The above should be set alongside more conventional issues such as the character of the area, historic interest and building features.

8.27   The importance of establishing the site's intrinsic sustainability potential is an invaluable first step in meeting the authority's policy requirements in the most effective and economically viable way possible. At the end of the appraisal process, detailed information should be held on previous use, layout, building orientation, solar energy potential, vegetation, wind energy potential, landscaping, movement and transport, and water.

Minimise the Use of Energy and Resources

8.28   <u>Desired outcome</u>: consideration of this over-arching criteria at the outset of the design process is crucial to realising the full environmental sustainability potential of any proposed development. A comprehensive review of the environmental implications and interrelationships of design choices relating to layout and orientation, building form and structure, materials, adaptation to future conditions and occupancy behaviour should be carried out in the round. The integral and systemic nature of many measures to minimise the use of energy and resources make it hard to over-emphasise the importance of including these issues within the early feasibility stages of examining alternative design and construction approaches and cost implications.

8.29   <u>Principles</u>: The concept of 'one-planet living' is useful in understanding the goals of environmental sustainability. However, when it comes to developing the working principles for development proposals its relevance fades as the need for realistic quantification in assessment and accounting processes comes to the fore.

8.30   It is more useful to breakdown the energy and resource flows that are likely to emanate from proposals and then understand how they can be worked up within the new development in such a way that they will contribute to closing the energy and resource 'loops' of which they are inseparably a part of. On-site renewable energy generation, rainwater harvesting, grey-water recycling, passive solar gain, natural ventilation, use of thermal mass, composting and space for growing food are all examples of measures which can subsequently minimise energy and resource use through employing thoughtful, creative and innovative approaches to design and construction.
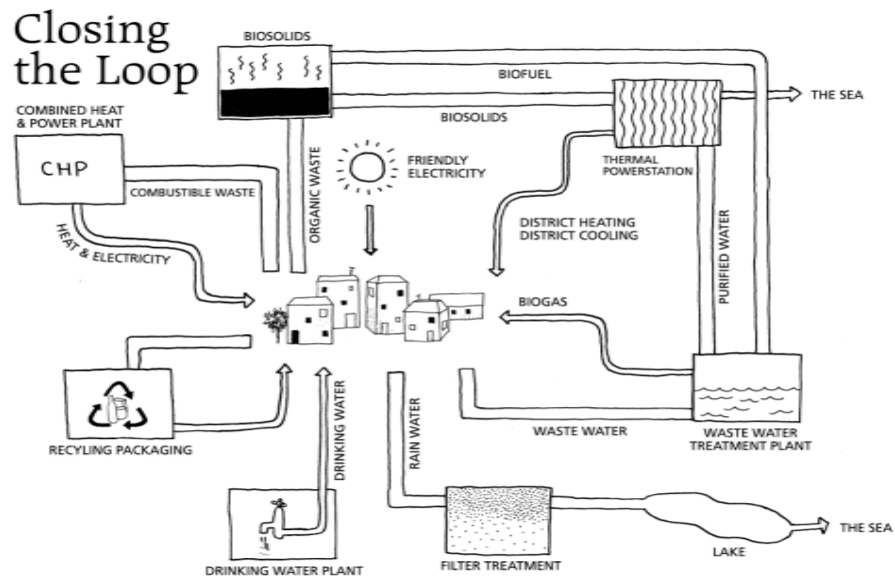
Closing the loop.

8.31   <u>Essential requirements</u>: all schemes, whatever their size, will benefit from the inclusion of a sustainability statement, or similar document, that clearly illustrates the environmental sustainability choices that have been made in relation to the development's: orientation and layout; building form and structure; materials to be used; ability to adapt to future conditions, and; the behaviour of the envisaged occupants.

8.32   <u>Delivery options</u>: there are a range of baseline assessment tools available that will facilitate the bringing forward of environmental sustainability choices, from carbon and ecological foot-printing to baseline energy analysis, formal pre-construction assessments and comprehensive checklists.

Reduce Carbon Dioxide Emissions

8.33   <u>Desired outcome</u>: new development, specifically where it does not replace previous development, will in almost every case increase carbon dioxide concentrations in the atmosphere: attracting new emission sources through the running of building services, transport to and from, and the consumption patterns of its occupants. Sensitive, yet practical, design can have a tremendous influence upon reducing these emissions through measures that reduce demand and improve the efficiency of heat and power usage. Applicants should demonstrate how their proposals will maximise the incorporation of energy conservation and efficiency measures – aiming for a minimum 10% reduction in $CO_2/m^2/year$ compared to the current (2006)

Building Regulations (Policy NE/1 of the Development Control Policies DPD). Specified levels for carbon reduction are increasingly being tied to the Code for Sustainable Homes (to be extended to cover other premises through the Code for Sustainable Buildings). All new dwellings will be expected to achieve a 25% reduction in CO_2 emissions over the 2006 Building Regulations by 2010, 44% by 2013 and achieve a zero carbon emissions figure by 2016 (for other buildings this is likely to be 2019). The zero-carbon emissions target includes the non-regulated energy used within homes – the Code Level 6 figure for carbon emissions is therefore in excess of the 100% at Code Level 5 that is only for regulated energy supplies. The development and implementation of the Code for Sustainable Homes (/Buildings) is unifying the standards for sustainable design and construction and the technical guidance available will increasingly prove a useful reference document. Applicants are encouraged to realise as high a
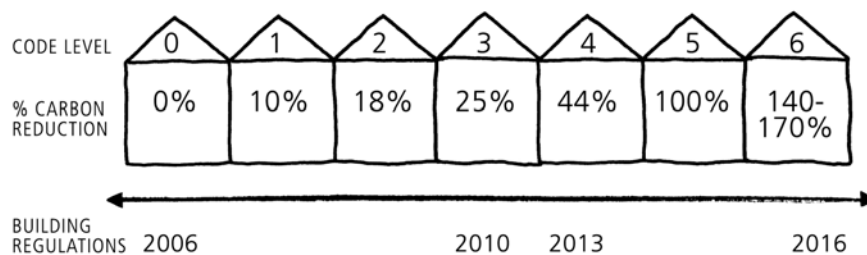
Specified levels for Carbon reduction

8.34   Principles: by far the greatest release of carbon emissions into the atmosphere is tied to energy generation from fossil fuels (other relevant sources that may need to considered include some specific chemical processes, land use change and influences upon certain 'natural' processes). For the purposes of this guide the overriding principle is to apply sustainable design and construction techniques to significantly reduce, and where possible break, the functional link between the needs of a building and its use of fossil fuels to meet those needs.

8.35   BREEAM (the Building Research Establishment's Environmental Assessment Method) is regarded by the UK's construction and property sectors as the measure of best practice in environmental design and management for non-residential buildings. The methodology defines the level of performance of a particular building type on a scale from pass to excellent and consideration should be given to achieving a BREEAM rating of at least good for all new commercial structures within South Cambridgeshire.

8.36   Essential requirements: this reduction and disconnection in the use of fossil fuels will require that all new developments, renovations and extensions make assessments of building, transport and occupancy energy needs. Such assessments should take the form of a tabulated calculation covering each potential energy use for residential and/or non-residential purposes – showing the baseline figures and the figures that will be achieved after the proposed energy conservation / efficiency measures have been applied (see Appendix 10).

8.37   Energy consumption for the proposals should be calculated using SAP or SBEM methodologies (for non-regulated domestic-type uses BREDEM-12 should be used). Calculations should include all end uses / private infrastructure (e.g. communal areas and car parks lighting/heating) and process loads. All energy values should be converted using the carbon emission factors set out in the current version of the Building Regulations. Alternatively the benchmarks set out in the London Renewable Toolkit may be used (converted into $kgCO_2/year/m^2$).

8.38   Delivery options: the importance of determining the optimum layout, orientation and overall landscape parameters to improve the energy conservation and efficiency functions of a development cannot be overstated (the implications for maximising sustainable energy generation will also be a part of this process).

8.39   Energy efficiency in design is tied to identifying natural orientation factors (e.g. topography and tree cover) to harness solar gain and associated benefits such as thermal mass (balancing day and night heat storage) and natural day lighting. The design will also need to incorporate passive shading features to curtail summertime over-heating.
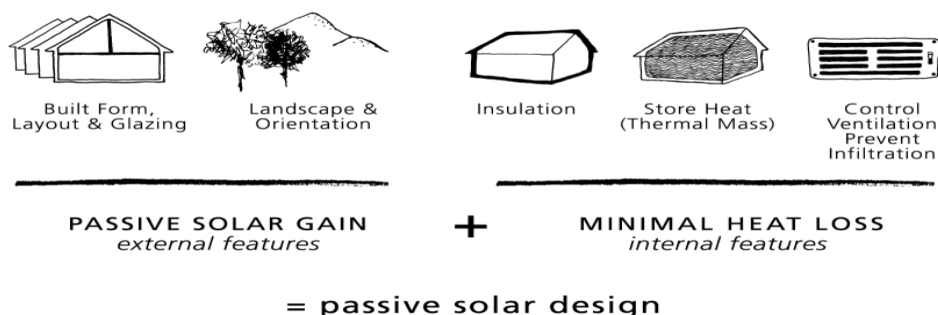
Passive Solar Design

8.40   Designing to conserve heat is the other parallel consideration through good insulation, attention to window size and placement, draught management and ventilation. Examples of how these issue can be taken to fully integrated delivery can be found in "Passive House" standards where conservation and efficiency measure are taken sufficiently seriously that a

conventional central heating system is no longer required. Low energy lighting and appliances, alongside the use of energy management systems, are all other important measures that should be taken account of when developing proposals.

Maximise the Use of Renewable Energy Sources
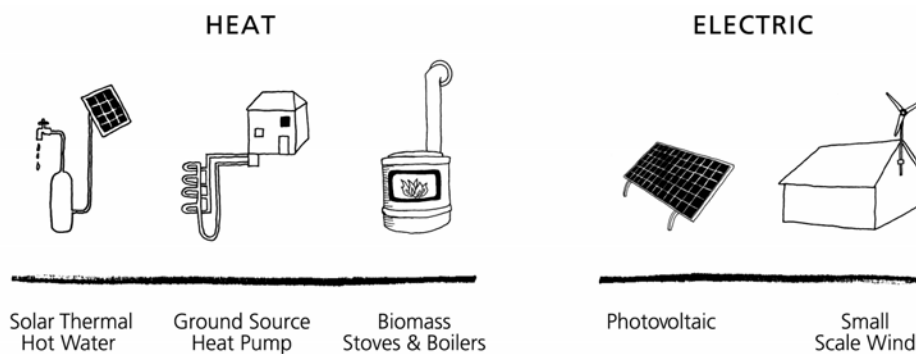
8.41 <u>Desired outcome</u>: the incorporation of renewable energy sources within building designs permits the further reduction of carbon emissions beyond that which can be achieved by conservation and efficiency measures alone.

8.42 Serious consideration should also be given to the potential of exporting excess or supplementary heat and power to either the national grid or nearby properties as a means of increasing viability and allowing the development to offset other related carbon emissions (e.g. transport) or become a site of net carbon reduction. These opportunities are only likely to become more accessible as less flexible means of remuneration are superseded or supplemented by schemes such as 'feed-in tariffs' and 'renewable heat incentives'.

8.43 <u>Principles</u>: in order to save unnecessary cost and capacity in renewable energy installations it is essential that all of a development's potential energy conservation and efficiency measures have been utilised.

8.44 A careful and rigorous assessment procedure will need to be carried out early in the design process in order to determine the effective technology, or mix of technologies, that can be incorporated within the development site to meet as great a proportion as possible of heating, cooling and electricity needs.


Efficiency Measures

8.45 In terms of carbon reduction, it is important to recognise that carbon emission factors vary depending upon the fossil fuel source that is being replaced – for example the current Building Regulations (2006) state that a kWh of electricity accounts for the emission of 0.42kg of CO_2, whereas a kWh of gas accounts for 0.19kg of CO_2. These emission factors also highlight the differences between heat (e.g. for space and water) and power (e.g. to run electrical appliances) and why it is therefore so important to use $kgCO_2/year/m^2$ as opposed to $kWh/year/m^2$ when assessing carbon

reduction through energy conservation, efficiency and renewable energy generation measures.

HEAT	ELECTRIC

Solar Thermal Hot Water   Ground Source Heat Pump   Biomass Stoves & Boilers   Photovoltaic   Small Scale Wind

Building integrated renewables

8.46   <u>Essential requirements</u>: applicants with proposals greater than 1,000m^2 or 10 dwellings will be expected to ensure that 10% of their predicted energy requirements are met through the inclusion of on-site renewable energy technologies (Policy NE/3 in the Development Control Policies DPD). Some areas of the district have higher standards (see the relevant Area Action Plans for details). This requirement should be calculated in kgCO$_2$ not kWh for the reasons outlined above (see Appendix 10).

8.47   In order to bring forward the most appropriate renewable energy solutions for such a development, applicants should include (at the outline submission stage) a feasibility assessment of the options that have been considered. This assessment, when combined with baseline data on predicted energy use, target emissions and measures to improve conservation and efficiency (refer to previous sections) will comprise the Energy Statement that must accompany the application.

8.48   For major developments, applicants are strongly encouraged to consider options for site-wide solutions as early as possible in the development process. Such options have the potential to deliver major cost, energy and carbon savings but will almost certainly need to be integrated within development plans from the outset.
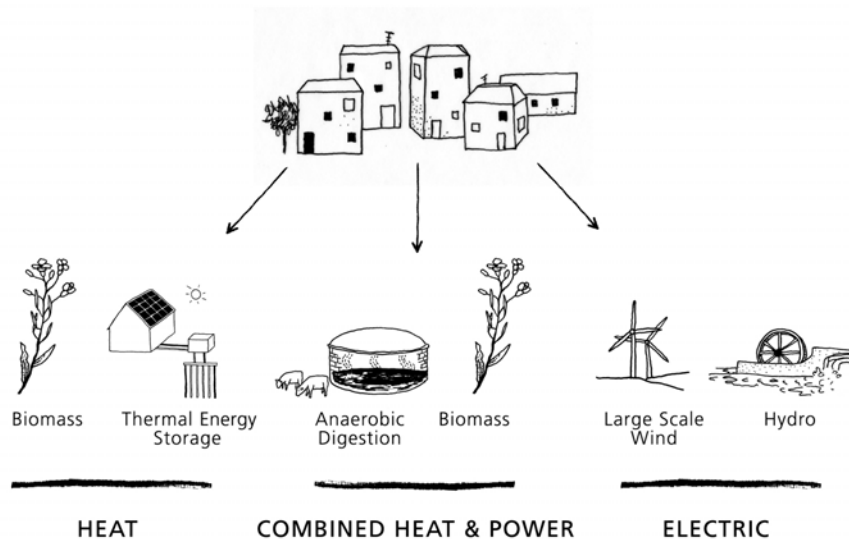
Area wide renewables

8.49   <u>Delivery options</u>: in considering their feasibility assessment it can be useful for applicants to present the options in a hierarchy of suitability and viability. Selection of the most appropriate technology, or mix of technologies, is at the applicants discretion with the following as a guiding list of those that may be considered:

- Solar thermal hot water systems.
- Solar photo voltaic (PV) cells/panels.
- Ground, air or water source heat pumps.
- Wind turbines.
- Geothermal.
- Biomass (boilers, stoves and combined heat and power).
- Anaerobic digestion.

8.50   Should the applicant have any queries regarding suitability then they should contact the Council's Strategic Sustainability Officer in advance of submission.

8.51   The delivery scale of all the above technologies may in theory be varied to lesser or greater extents for different scales of development from single buildings to community or district schemes: bringing varying benefits in terms of cost per unit and user interaction.
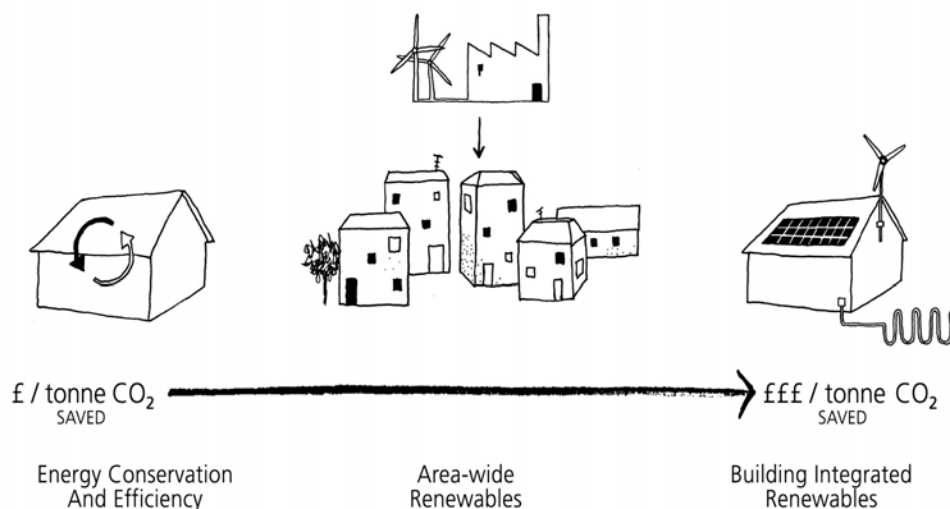
Towards zero carbon

8.52   Currently biomass, anaerobic digestion and geothermal technologies have the greatest potential to be scaled up to provide district/community level heating schemes. Typically within the UK, the former two are also used to generate electricity. When used for both applications they are known as combined heat and power (CHP) systems (they may even incorporate a cooling function and are then known as CCHP systems). Scaling up to the district / community level can greatly improve the viability of multi-unit development schemes seeking to achieve the higher levels of carbon reduction (50% plus).

8.53   Clearly if a CHP system uses fossil fuels it cannot be regarded as renewably powered. It can however, with the correct infrastructure, still bring significant carbon savings through cutting electricity transmission losses and using 'waste' heat. If applicants are considering such an approach, they should contact the Strategic Sustainability Officer as early as possible in the application process to discuss their proposals in relation to the authority's renewable energy policies.

**Incorporate Water Conservation Measures**

8.54   <u>Desired outcome</u>: alongside energy, responding to the sustainable supply and use of water within the design and construction process is almost certainly the most pressing resource management issue that new development must tackle and lead on. This is especially the case in the East of England where rainfall is the lowest in the country (South Cambridgeshire averages less than 50mm per month). As with energy, consumption has increased dramatically in recent decades. At the domestic scale, each of us now averages a daily consumption in excess of

150litres of water – almost all of which is delivered to premises as a drinking standard (with not insignificant carbon emission implications) even though the vast majority is used for washing, toilet flushing and watering the garden.
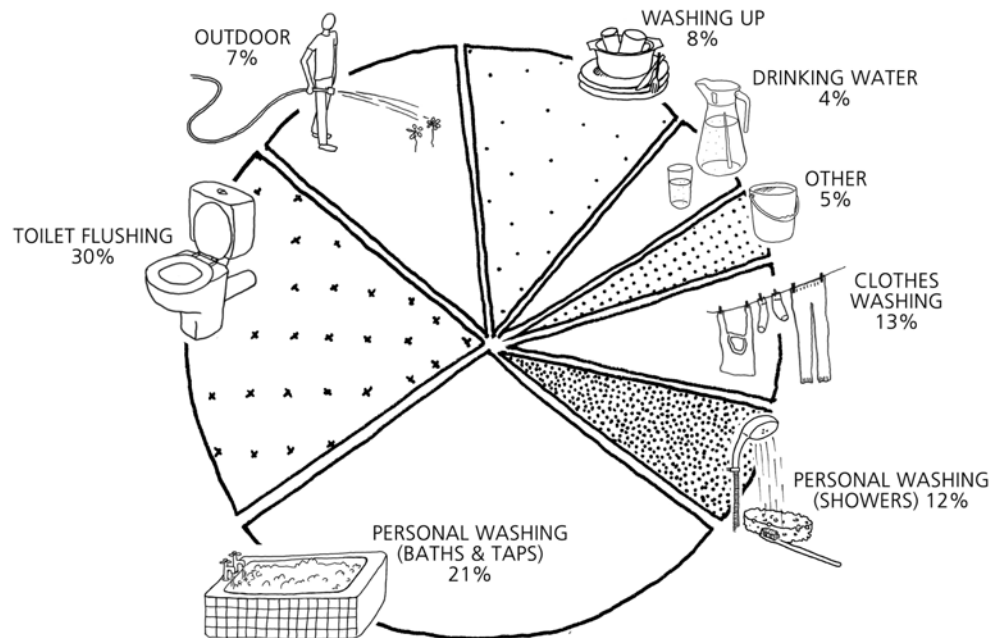
Water use in home

8.55   Again as with energy, new development will, unless very tightly accounted for, increase gross water resource usage. Reducing 'mains' water consumption is thus considered a priority outcome in the consideration of planning applications.

8.56   The importance of reducing consumption is recognised within the Code for Sustainable Homes where water usage is set as a mandatory standard for Levels 1 and 2 at 120 ltrs/person/day, Levels 3 and 4 at 105ltrs/person/day, and Levels 5 and 6 at 80 ltrs/person/day.

8.57   Principles: As with most sustainable resource management issues, the design principles for reducing water usage are held within a hierarchical framework. The first level, as always, involves reducing need or demand for water in domestic, business and industrial activities attached to the development. The second level is to intercept and use rainwater before returning it to mains, or ideally a sustainable, drainage system. The third level involves a more concerted interception of water already used within a residential or commercial process for a lower grade use such as waste removal (e.g. toilet flushing) or municipal or domestic irrigation.

| Water Conservation | Rainwater Harvesting | Greywater Recycling |
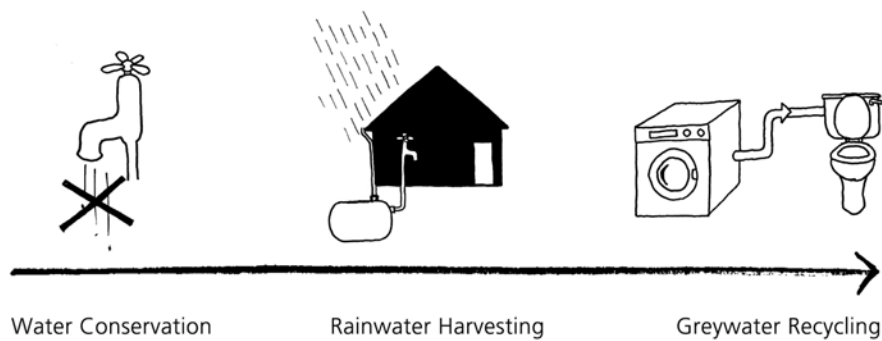
Water saving hierarchy

8.58   For the hierarchy to generate maximum and lasting returns, the behaviour of the building occupants will play a vital role. As with energy, applicants should take specific steps to raise awareness of the problem of profligate consumption and the importance of personal responsibility in minimising waste and improving efficiency in use.

8.59   Essential requirements: planning policy within South Cambridgeshire requires that new development incorporate all practicable water conservation measures and that for development over 1,000m^2 or 10 dwellings a Water Conservation Strategy be submitted to demonstrate how such measures will be brought forward and implemented. Some areas of the district have higher standards (see the relevant Area Action Plans for details).

8.60   For larger developments, the interception of surface water run-off for domestic or commercial purposes may have implications for local water courses and water tables. In such instances a careful balance must be struck between rainwater harvesting and the release to surface run-off.

8.61   Delivery options: behaviour change and the reshaping of commercial processes to bring down demand is clearly a crucial element of water conservation. Thoughtful design may be used to encourage this change. For example, through incorporating smaller baths and the more accessible location of water meters (along with home information packs or building user guides) or use of sub-metering to enable effective water management by the occupants. Attention should also be given to landscape and garden planting that does not require supplemental watering (xeriscaping).

8.62   Other more technical responses to maximise water efficiency should be specified as a matter of course, e.g. aerated taps and shower heads, low flush toilets and water efficient appliances. Basic rainwater harvesting using water butts should also be included as a standard where the opportunity exists. For industrial and office units, that often have significant roof areas, rainwater collection should similarly be the norm (where uses can run from commercial processes to toilet flushing). Greywater recycling is a more sophisticated approach and will almost certainly be required for

level 5 and 6 of the Code for Sustainable Homes (where the standard required is 80 litres/person/day). Community scale schemes are now coming forward and have the very real potential to enhance financial viability for multi-user developments.
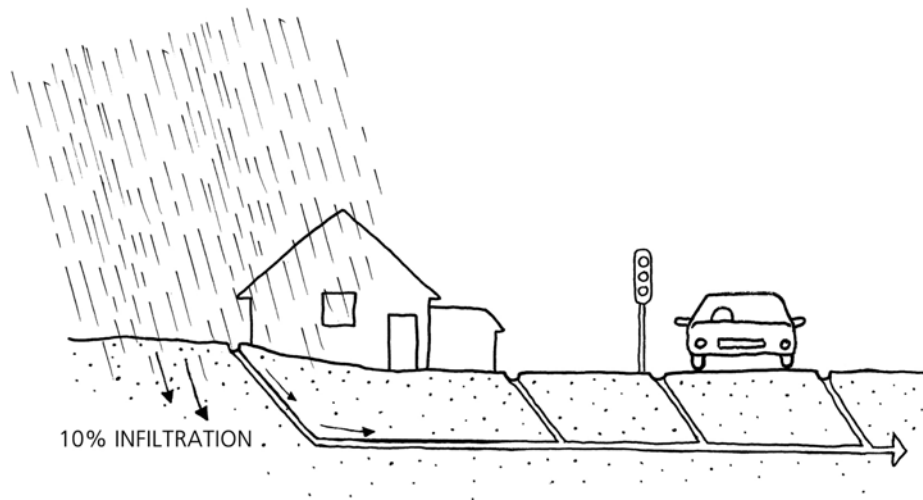
Use Sustainable Drainage Systems

8.63   Desired outcome: the essential purpose of a sustainable drainage system (SuDS) is to manage the precipitation falling upon a development in such a way that it mimics the natural drainage of the undeveloped site.
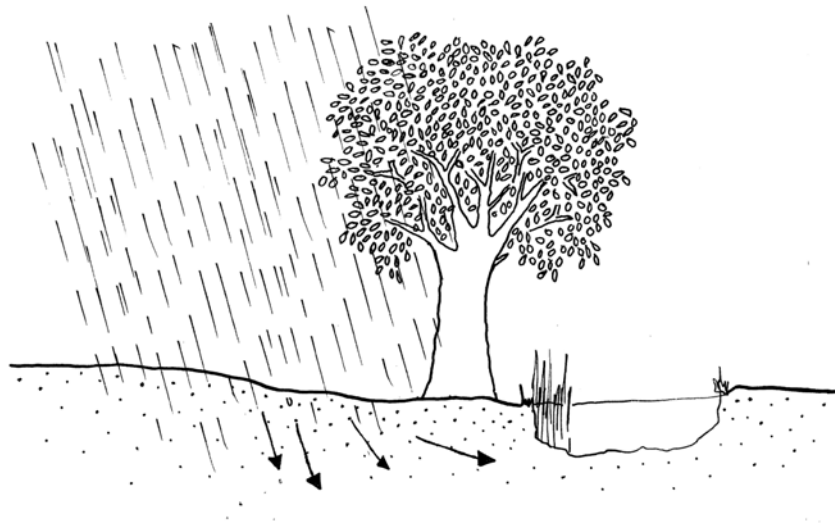
90% infiltration to water table and water courses
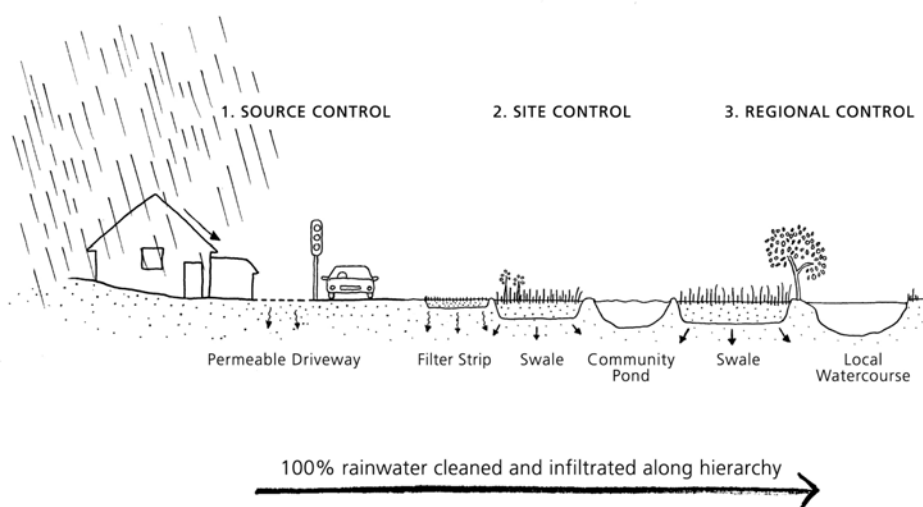
SuDS pre-development conditions

10% INFILTRATION

90% by pipe, mixed with pollution from roads, and leading to sewer or water course

Typical post-development drainage

8.64   SuDS offer a more environmentally, socially and frequently economically sustainable alternative to conventional underground piped systems with street level grates or storm drains.

8.65   High quality SuDS can reduce flood risk, provide community amenity value (e.g. ponds) and promote biodiversity through the creation of new or improved wildlife habitats.

8.66   Principles: a well designed SuDS will consist of a series of infiltrating water transport features known as the 'management train'. This promotes evaporation and infiltration as close to the point of precipitation as possible, with the balance being progressively cleaned / filtered in its journey to the nearest watercourse.

1. SOURCE CONTROL   2. SITE CONTROL   3. REGIONAL CONTROL

Permeable Driveway   Filter Strip   Swale   Community   Swale   Local
                                                  Pond   Watercourse

100% rainwater cleaned and infiltrated along hierarchy

SuDS hierarchy

8.67   Essential requirements: the extent of a SuDS scheme will depend upon the size of the proposed development and the extent of open space available. Even in the smallest development, however, valuable elements and features should be considered for incorporation. Good quality SuDS will require careful design consideration to ensure that they are straightforward to maintain whilst, primarily, ensuring that the scheme satisfactorily fulfils its drainage role and, secondarily, maximises its landscape, amenity and biodiversity value. The authority will be fully supportive of such schemes.

8.68   Long term adoption of larger schemes, extending beyond private property boundaries and into public open space, will be an important issue. In such cases, applicants should discuss appropriate arrangements with the authority.

8.69   Delivery options: the management train diagram above illustrates some of the elements that applicants may seek to include within a SuDS scheme. The scale of the development and inclusion of roads will be important factors in the design of delivery options.

8.70   Smaller scale schemes within the boundaries of private property could include: green roofs, permeable driveways and parking, soakaways, proprietary treatment systems, and, geocellular storage (preferably combined with rainwater harvesting).

8.71   SuDS in road transport corridors could include: filter strips, swales, rain gardens (bioretention), filter drains, and, canals and rills.

8.72   Larger scale SuDS incorporating significant open space could include any of the above plus ponds and wetland, and infiltration and retention basins. Where basins and ponds are to be incorporated, they should be designed to appear as natural as possible (with contours blending into the landscape, and with different margin depths and shelves to maximise opportunities for the enhancement of biodiversity) or form part of a wider landscape design strategy that may introduce alternative forms into the landscape depending upon the context. Well designed SuDS schemes also favour other multi-functional uses such as the provision of green infrastructure for public access.

SUSTAINABLE URBAN DRAINAGE SYSTEMS

8.73   Conventional drainage systems that pipe surface water run off away from hard paved areas, can cause problems elsewhere, especially following periods of intense, or prolonged rain. Opportunities to incorporate Sustainable Drainage Systems (SUDS) into the design of external areas should be explored. SUDS comprise a range of techniques that allow surface water to be managed in a more natural manner as close to its origin as possible, through the use of permeable surface treatments, filter strips

and swales and basins and ponds. As well as helping to lessen the risk from flooding, such techniques can also offer benefits in terms of pollution control (through improved filtration), habitat creation and visual amenity.

8.74   Applicants developing SuDS should be aware that certain conventional landscape design and planting practices may require modification to facilitate an effective management train, account for different soil / moisture profiles, reduce soil erosion, and promote nature conservation. Access to an appropriate degree of SuDS engineering expertise will be an important issue for applicants – especially for larger schemes.

Mitigate Against the Impacts of Climate Change

8.75   <u>Desired outcome</u>: there is scientific consensus that human induced climate change is almost certainly upon us today. Limiting the impact, by reducing emissions, is a priority issue. Adapting to the level of climate change to which we are already committed is also a matter of great importance and one in which sustainable design and construction stands to play a prolific role. Although some uncertainty remains as regards precise timings and the upper and lower levels of impact, there is agreement that we should expect greater seasonality with less stable weather patterns bringing more extreme weather events as long-term changes in climatic conditions begin to make themselves felt. All new development should therefore be proactively designed to mitigate against such impacts, which include:

- Increasing risk of heatwaves and extreme temperatures.
- Wetter winters, more intense downpours and drier summers (increasing seasonality).
- Greater risk of drought and flood.
- Higher potential for more intense and frequent storms.

8.76   The outcome should be a design process that ensures that development takes account of the expected changes over its envisaged lifetime or be readily capable of adaptation without compromising carbon reduction measures (e.g. avoiding the use of fossil-fuelled cooling equipment).

8.77   <u>Principles</u>: the longevity of the built environment renders adaptation a current rather than future issue. The driving principle is of designing in the capacity for resilience to the impacts of future climate change. This designing-in should seek to ensure that occupants do not become dependant on the high use or retrofitting of costly and resource intensive building services to maintain their wellbeing – e.g. cooling and water supply in the case of heatwaves and drought respectively. Thoughtful adaptation strategies will deliver multiple benefits: enhanced liveability and quality of life in communities of the future, protection of investment, reduced insurance costs and enhanced biodiversity.

8.78   Essential requirements: in order to satisfactorily fulfil the Council's policy on mitigating against the impacts of climate change within new development, applicants should demonstrate that their proposals deliver built-in resilience to such impacts: high temperatures, storm / flood risk (including strong winds), water stress, and earth movement in areas of subsidence risk.

8.79   Delivery options: the scale of a proposed development will influence the extent of the delivery options available to applicants. Designing for larger developments will permit the inclusion of a more comprehensive cascade of measures. For most scales, however, the options available generally share a similar approach.

8.80   Managing high temperatures:

- Promotion of evaporative cooling through the use of green open space, water bodies and features (e.g. SuDS).
- Provision of shading, to reduce excessive solar gain, through street and building orientation and structural features along with planting.
- Careful and creative design to maximise passive ventilation potential.
- Use of cool building materials, reflective surfaces and green roofs and walls to curtail heat penetration.
- Inclusion of thermal storage or mass – absorbing heat during hot periods which can be dissipated when it is cooler (ground coupled systems make use of sub-surface storage).

8.81   Managing flood risk:

- As a point of principle avoid developing on sites at high risk of flooding.

- Effective land management, SuDS features and planting to reduce the rate of surface run-off.

- Widening drains and drainage features.

- Removing pinch-points in flood pathways.

- Raising water sensitive services and equipment beyond potential flood-line.

- Use of specific flood resilient materials and building features.

- Managing water availability and quality risks.

- Collect and store rainwater (harvesting from roofs and SuDS).
- Incorporation of rainwater recycling.

- Installation of water efficient fixtures, fittings and appliances.

- Managing ground conditions.

- In areas of high risk take expert advice over structural reinforcing and retaining options.

Use Sustainable Building Methods and Material

8.82   Desired outcome: the use of sustainable building methods and materials is an area of huge creative expertise within design and construction. One that stands to significantly reduce the negative natural resource, energy and carbon emission implications of the building process. From the climate change perspective, conventional methods of construction and materials used will 'embody' within them a relatively high amount of fossil-fuel derived energy – the carbon emitted in the production of building materials and their bringing together in the completed building. Approximately 10% of national energy consumption is used in the production and transport of construction products and materials.

LOWER EMBODIED ENERGY → HIGHER EMBODIED ENERGY

= energy in sourcing + production + distance travelled
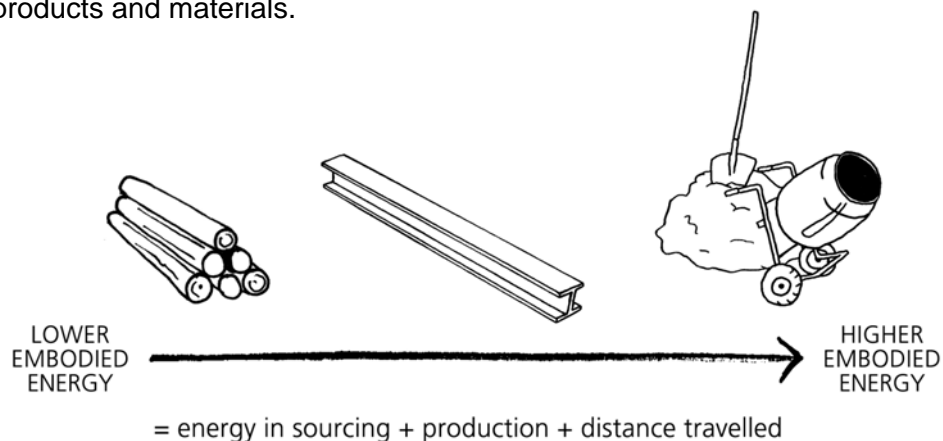
Embodied energy

8.83   Sustainable building methods and materials should be used to bring down this embodied figure whilst also sustaining the source of natural materials used without degrading habitats and the long-term wellbeing of indigenous populations (e.g. timber and aggregates).

8.84   Principles: materials such as concrete, UPVC, PVC and extruded polystyrene all require high volumes of energy and resources to make them. These, and others such as alkyd (oil-based) paints and phosphogypsum (used in plasterwork) also generate pollution and toxic compounds – dangerous to ecosystems and human wellbeing. To counter these, and other issues, the principles associated with the use of sustainable building materials should incorporate the following distinct procurement and quantity surveying elements:

- Employ re-used and recycled materials as a first course of action.

- Do not use or waste unnecessary materials.

- Where practicable, source materials that require the minimum energy use in their production.

- Where possible, source materials locally to reduce transportation impacts.

- Source materials that have been ethically harvested, processed or manufactured.

- Carefully monitor the use of materials during the construction process.

| USING LESS MATERIAL | LOW EMBODIED ENERGY | ETHICAL SOURCING | MONITORING MATERIALS DURING CONSTRUCTION |

= sustainable sourcing

Sustainable sourcing

8.85   In terms of construction methods, there is a marked division between those employing 'modern methods of construction' (pre-fabrication of industrially produced materials and partial off-site construction) and those wishing to utilise natural materials in an expressly ecologically sensitive manner in what is termed 'low impact construction' (these are the 'deep green' buildings typified by projects practised at a small scale and usually in rural areas ideally using locally sourced natural materials with very low embodied energy in their fabric e.g. cob, rammed earth, hemp, straw bale or green timber). Both of these strategies to sustainable construction share an approach founded upon drawing all of the above principles into an integrated design for the whole project.

8.86   Essential requirements: applicants should make an early assessment of their outline proposals in consideration of how they could practically incorporate sustainable building methods with verifiably sustainable materials (including recycled) that have, as far as possible been locally sourced.

8.87   Delivery options: this guide cannot provide comprehensive information on the sustainability of all building materials – other publications such as the BRE Green Guide to Specification are far better placed for this purpose. In making a choice, the applicant will need to find a balance which meets their sustainability priorities. This is an inevitably complex area and one in which the full lifecycle environmental implications of a material (from production to disposal / re-use / recycling) must also be taken account of. It is, however, an area that applicants should look to take account of.

8.88   As a preliminary primer, material specification should, where applicable, actively consider including the use of:

- Certified timber.
- Natural insulation products.
- Natural flooring material.
- Timber framed windows.
- Structural timber frame.
- Timber cladding.
- Natural paints.
- Products with a high recycled content and naturally sourced.

and, excluding the use of:

- Organic solvent based floor finishes, paint, glues, stains and adhesives.
- Energy intensive products (e.g. PVC, aluminium, copper and lead).
- Virgin aggregates.

Recycle Construction Waste

8.89   Desired outcome: approaches to recycling construction waste are closely tied to the use of sustainable building methods and materials as discussed in the previous section. It is a very significant issue, with construction and demolition waste representing 24% of total UK waste by weight. Development therefore adds significantly to the burden of existing waste that must be managed. Unfortunately a significant proportion of this waste is still disposed of to land fill. The recycling or reuse of this waste should therefore be a priority for all applicants and carefully planned to cover all waste arising during construction.

8.90   Principles: applicants are expected to ensure that their proposals incorporate the principles of the waste management hierarchy. The least preferred option is disposal to landfill and the most preferred option is, through careful design, to negate or reduce the demand for materials that more conventionally, or less thoughtfully, would otherwise have been required.
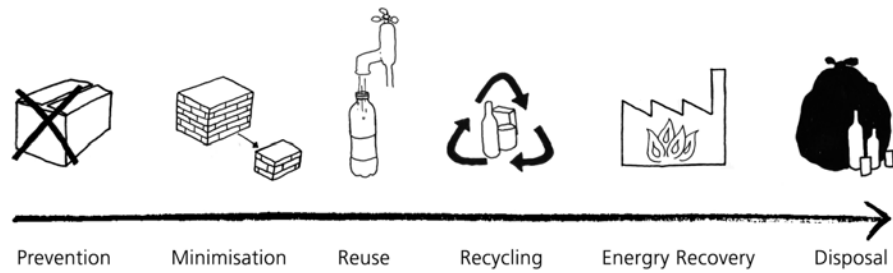
Waste hierarchy

8.91   <u>Essential requirements</u>: applicants should prepare a Resource Re-use and Recycling Scheme to cover all waste arising during the proposed construction and/or demolition. Where possible, this should include the appropriate accommodation of construction spoil within the development and maximising the re-use and recycling of any suitable raw materials currently available on site during construction, such as redundant buildings or infrastructure. The Site Waste Management Plans Regulation 2008 places a legal requirement upon applicants to have a Site Waste Management Plan (SWMP) for all new construction projects costing more than £300,000. A SWMP will need to forecast how much of each type of waste will be produced on site and how it will be managed.

8.92   <u>Delivery options</u>: applicants should demonstrate how they are planning to use recycled material, reduce waste and ensure that as much of this is re-used or recycled as possible. Acting upon these objectives will probably require that the site incorporates facilities for waste sorting and recycling alongside procedures to minimise waste and maximise recycling during construction and demolition.