THE CAMBRIDGE SUSTAINABLE HOUSING DESIGN GUIDE

CAMBRIDGE CITY COUNCIL

GREATER CAMBRIDGE HOUSING DEVELOPMENT AGENCY

February 2017

CONTENTS

SECTION ONE: INTRODUCTION

OBJECTIVE

The quality of new housing can play a significant role in helping residents out of fuel and water poverty, improving their health and wellbeing, as well as contributing to sustainable development and addressing the issue of affordability of housing. High quality development also contributes to place making, continuing the tradition of high quality architecture in Cambridge. The Cambridge Sustainable Housing Design Guide looks to promote the delivery of high quality new development, seeking to:

1) Address issues such as fuel and water poverty amongst our residents;
2) Build homes that have a positive impact on the health and wellbeing of our residents;
3) Build homes that are designed and built to high design and sustainability standards;
4) Ensure new homes are easy to maintain and are adaptable, both for residents and to future climate change.

This document sets out key design principles for the development of council owned land and new social housing delivered by/for the Greater Cambridge Housing Development Agency (HDA) in Cambridge. For some areas, such as energy, water and space, performance specifications and minimum requirements are included. Reference is also made to Local Plan policy requirements for issues such as car and cycle parking, residential space standards and accessibility standards, although it should be noted that this document is not formal planning guidance.

This design guide will form an integral part of any new designer's or developer's appointment. It will support and complement the written Design Brief provided for a particular project, together with our Standard Employer's Requirements, which provide more detailed technical specification. This guide sets out a clear statement of our aspiration for developing quality homes and new communities. It will form an important statement of intent in building partnerships when looking at future development opportunities. The principles set out in this guide are applicable to all housing developments not just those delivered by the HDA. As such, this guidance is freely available for anyone seeking to deliver high quality sustainable new homes to use, be that in Cambridge or more widely.

GOALS

Some of the key aims that form this design guide include:

- Using Code for Sustainable Homes Level 4 energy and water requirements as the minimum baseline building standard;
- Taking a fabric first approach to building well designed, energy efficient homes that are affordable to run, provide a healthy living environment for residents and that are easy to maintain with a focus on natural light, good air quality and efficient use of space;
- Utilising the new national space standard to ensure that new homes are easily adaptable to changing household circumstances;

- Promoting site-wide approaches to surface water drainage, landscaping and biodiversity to enhance the setting of new homes for the benefit not just of residents but the wider community, applicable at all scales of development;
- The need for ongoing monitoring of performance, which will enable the guidance to be continually refined to ensure the best long term outcome for our residents and for the city.

The table below outlines the baseline requirements included within this guidance and the scale of development to which the requirement applies. Major development is defined as ten or more dwellings or a site area of 0.5 hectares or more where the number of dwellings are unknown, or the provision of a building where the floorspace is 1,000 sqm or more, or where development is carried out on a site having an area of 1 hectare or more.

BASELINE REQUIREMENT	SCALE OF DEVELOPMENT TO WHICH REQUIREMENT APPLIES	
	Minor development	Major development
COMMUNITY		
COM01: External residential space standards	✓	✓
COM02: Residential space standards	✓	✓
COM03: Accessibility standards	✓[1]	✓
CONNECTIVITY		
CON01a: Cycle parking standards for developments in Cambridge	✓	✓
CON1b: Cycle parking standards for developments in South Cambridgeshire	✓	✓
CON02a: Car parking standards for developments in Cambridge	✓	✓
CON02b: Car parking standards for developments in South Cambridgeshire	✓	✓
CON03: Enabling smart homes	✓	✓
CHARACTER		
CTR01: Designing for waste management	✓	✓
CTR02: Sound insulation	✓	✓
CTR03: Internal finishes	✓	✓
CLIMATE		
CL01: Reduction of construction waste	✓	✓
CL02: Energy and carbon emissions	✓	✓
CL03: Water consumption	✓	✓
CL04: Climate change adaptation	✓	✓
CL05: Responsible sourcing of materials	✓	✓
POST CONSTRUCTION MONITORING AND MAINTENANCE		
PCMM01: Support for estates teams and residents	*	✓

[1] The requirement for M4(3): Category 3 – Wheelchair user dwellings only applies to developments providing or capable of acceptably providing 20 or more self-contained affordable homes

BASELINE REQUIREMENT	SCALE OF DEVELOPMENT TO WHICH REQUIREMENT APPLIES	
	Minor development	Major development
PCMM02: Minimising the performance gap	*	✓
PCMM03: Post construction monitoring and evaluation	*	✓

* For minor development, compliance with these minimum requirements will be dependent upon the nature of the proposed development, e.g. if new construction methods or technologies are to be utilised then these requirements will be sought.

In addition to the above baseline requirements, section four of this guidance sets out approaches to encourage the integration of innovative approaches to issues such as energy, water consumption and the delivery of healthy homes and communities. While such innovation is encouraged across all scales of development, for major developments in particular design teams will be expected to outline their approach to at least one of these key areas for innovation and how this will be monitored to ensure success and to inform future iterations of the design guide.

In order for the principles of the guidance to deliver successful new developments, they need to be integrated into the design process from the Strategic Definition Stage of the RIBA Plan of Work. For further guidance on the Plan of Work see https://www.ribaplanofwork.com/.

SECTION TWO: THE CAMBRIDGE SUSTAINABLE HOUSING DESIGN PRINCIPLES

INTRODUCTION

This section sets out each of the key design principles that will need to be integrated into the design of all housing schemes delivered on council land, including delivery of new social housing. These principles have evolved from the Cambridgeshire Quality Charter for Growth.

The Charter sets out the core principles of the level of quality to be expected in new developments in the Cambridge sub-region. It is formulated around the '4 Cs' of Community, Connectivity, Climate and Character. Adopted by Cambridge City Council, South Cambridgeshire District Council and Cambridgeshire County Council, the Charter is a sign of the councils' commitment to raising standards and inspiring innovation in housing design. It is, therefore, a natural starting point for the development of the Cambridge Sustainable Housing Design Principles, with the addition of a fifth principle, that of post construction monitoring and maintenance. These five key principles are illustrated in Figure 1 below.

For each of the five key principles and associated development objectives, a series of approaches for achieve higher quality are suggested, although it is not the intention of this document for these to be slavishly followed for each development proposal. The approach taken will vary dependent on the nature, scale, location and context of each proposal. Instead, these approaches are included to inspire innovation and the pursuit of higher standards by providing examples of how the key principles can be addressed. These approaches are all underpinned by national and local planning and environment policies, and seek to interpret these rather than to repeat them. Where relevant, links are given to the relevant parts of the baseline specification as set out in Section 3 of this document, denoted by the following symbol:

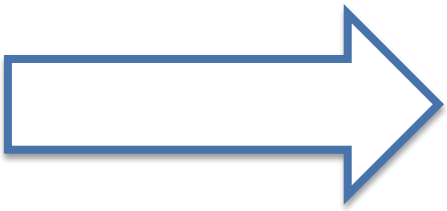


Figure 1: The Cambridge Sustainable Housing Design Principles

COMMUNITY

Places where people live out of choice, creating healthy, inclusive communities with a good quality of life.

A key objective of all development should be to ensure that proposals create places that are active, inclusive, safe and fair to everyone. Central to this is the creation of a better balance of housing types and tenures and recognition that successful communities are made up of people from many different backgrounds who benefit from the 'social capital' and sense of wellbeing created through positive interaction. There are many ways in which this can be achieved, but some of the key elements to consider include:

OBJECTIVE 1: INCLUSIVE DEVELOPMENTS THAT ARE WELL INTEGRATED INTO THE EXISTING COMMUNITY

Design response: Inclusion within an existing community is vital to ensuring the health of those that will be living in new developments. Our built environment plays a significant role in whether or not a person becomes socially isolated. Physical access to friends and family, health services, community centres and shops, open spaces and other places and spaces enable individuals to build and maintain their social relationships. Poor transport links create barriers to social inclusion, whereas effective transport links benefit social cohesion, enabling individuals to play a more active role in their community. In designing new developments, we need to be aware of the elements that can create barriers to social inclusion and maximise opportunities for people to build social relationships to create healthy neighbourhoods, as illustrated in Figure 2 below. This can include:

- Designing the built environment to make streets conducive to walking and cycling, whilst also ensuring that those with limited mobility are catered for, to help encourage social connectivity;
- Engaging with the local community in the design of public spaces to ensure that they meet the needs of residents is important in building a sense of ownership and belonging;
- Designing the public realm for safety with consideration given to natural surveillance, appropriate lighting and good visibility of key routes so that users of spaces feel safe (see objective 4);
- Giving consideration to the role that community development officers can play in helping to assist with community development, particularly in large new developments.

Figure 2: What makes a healthy neighbourhood (Infographic developed by PRP for UK-GBC)

Where new communities are being built, facilities and amenities need to be in place to support new residents early on in the development, as well as enabling surrounding communities to access facilities. However, planning for new infrastructure alone will not build a community and new residents need to be supported to ensure they are able to integrate well to create a sustainable community.

OBJECTIVE 2: A MIX OF PRIVATE AMENITY SPACE AND COMMUNAL OPEN SPACE

Design response: Access to a range of open spaces, both private and communal, is an important element of well-designed new developments that help to create healthy communities with a good quality of life. It is well documented that people's experience of their local green space can affect their physical, mental and social health. All scales of development present opportunities to create and improve the public realm, open space and landscaped areas that respond to their context and the development as a whole and are designed as an integral part of the scheme. These spaces can take many forms, including:

- Private amenity spaces – gardens, balconies, terraces and roof terraces/gardens;
- Formal and informal space, with consideration given to these spaces being multifunctional, seeking not just to provide residential amenity but also biodiversity enhancement and the integration of sustainable drainage;
- Spaces that can become a focal point for communities that encourage social interaction and recreation, for example shared spaces and play areas. Consideration should be given to ways in which residents can be engaged in the upkeep of communal green spaces, for example areas that are set aside for food growing.

The distinction between the public and private realms should be clear, with careful consideration to boundary treatments and the role of materials and landscape features in delineating these spaces e.g. the use of Sustainable Drainage Systems (SuDS) such as rills to mark the boundary between the public and private realm.

In flatted schemes, the aim should be to ensure that all flats have access to communal space that:

- Is overlooked by surrounding development;
- Is accessible to all residents of the block;
- Is designed to take advantage of direct sunlight;
- Has suitable management in place.

SEE COM01: EXTERNAL RESIDENTIAL SPACE STANDARDS

Figure 3: Communal landscape at the Novo development, Cambridge

Figure 4: High Quality landscape design at the Abode development, Cambridge (image courtesy of Countryside Properties)

OBJECTIVE 3: PLACES THAT CAN ADAPT TO CHANGING NEEDS AND LIFESTYLES

Design response: Housing in all tenures should allow for changes in needs and lifestyles so that as people's circumstances and age change, they can remain fully included in their neighbourhood. This can include homes that are easily adapted to changes in a person's mobility. The Happi Housing Principles[2] take into account a range of considerations when designing homes for older people, many of which are sound principles of good design the benefits of which will be felt across all age groups:

1. New retirement homes should have generous internal space standards with the potential for three habitable rooms and designed to accommodate flexible layouts;
2. Care is taken in the design of homes and shared spaces, with the placement, size and detail of windows to ensure plenty of natural light to circulation spaces;
3. Building layouts maximise natural light and ventilation by avoiding internal corridors and single aspect flats, and apartments have balconies, patios or terraces with enough space for tables and chairs as well as plants;
4. In the implementation of measures to ensure adaptability, homes are designed to be 'care ready' so that new and emerging technologies such as telecare and community equipment can be readily installed;
5. Building layouts promote circulation areas as shared spaces that offer connections to the wider context, encouraging interaction, supporting interdependence and avoiding an 'institutional feel', including the imaginative use of shared balcony access to front doors and thresholds, promoting natural surveillance and providing for 'defensible space';
6. In all but the smallest developments (or those very close to existing community facilities), multipurpose space is available for residents to meet, with facilities

[2] Housing our Ageing Population: Panel for Innovation (2009)

designed to support an appropriate range of activities – perhaps serving the wider neighbourhood as a community 'hub', as well as guest rooms for visiting friends and family;

7. In giving thought to the public realm, design measures ensure that homes engage positively with the street, and that the natural environment is nurtured through new trees and hedges and the preservation of mature planting, and providing wildlife habitats as well as colour, shade and shelter;
8. Homes are energy efficient and well insulated but also well ventilated and able to avoid overheating by, for example, passive solar design, the use of native deciduous planting supplemented by external blinds or shutters, easily operated awnings over balconies, green roofs and cooling chimneys;
9. Adequate storage is available outside the home together with provision for cycles and mobility aids, and that storage meets the needs of the occupier;
10. Shared external surfaces such as 'home zones', that give priority to pedestrians rather than cars and which are proving successful in other countries, becomes more common, with due regard to the kinds of navigation difficulties that some visually impaired people may experience in such environments.

SEE COM02: RESIDENTIAL SPACE STANDARDS

SEE COM03: ACCESSIBILITY STANDARDS

SEE CL02: ENERGY AND CARBON EMISSIONS

SEE CL04: CLIMATE CHANGE ADAPTATION

OBJECTIVE 4: PLACES THAT PROVIDE A SAFE ENVIRONMENT FOR ALL

Design response: In designing new developments, care should be taken to 'design out' features and areas that may contribute to crime or a fear of crime. All streets should have active frontages with frequent entrances, windows and habitable rooms at street level while also allowing for privacy. When designing the provision of open spaces within developments consideration should be given to the following:

- Has the location and design of the space been selected and planned to take advantage of surrounding land uses? ;
- Is the space located in the line of sight of nearby houses, apartments and other areas of activity to ensure visibility? ;
- Could activity areas be clustered to provide greater informal surveillance within and between areas? ;
- Is appropriate lighting of routes and spaces provided?

CONNECTIVITY

Places that are well-connected both physically and virtually, enabling easy access for all to work and services using sustainable modes.

New communities should be well linked to their surroundings so that residents are able to lead more active lifestyles with associated benefits in both physical and mental health. Connectivity is also about the consideration of measures that enable residents to work more flexibly through the principles of 'smart' or 'connected' homes. There are many ways in which this principle can be achieved, and some of the elements to consider include:

OBJECTIVE 5: REDUCING THE NEED FOR TRAVEL BY PRIVATE CAR

Design response: There are many methods that can be employed to reduce the need for people to travel by private car thereby reducing the impact of car journeys. This can include mixed use developments; complimentary uses within the surrounding area; walkable neighbourhoods; car club provision; travel plans for new developments; provision of electric vehicle charging points; provision of travel information packs for new residents and ensuring that schemes are served by high quality public transport and cycle networks to allow for a reduction in reliance on private cars. Smart Homes can also help with encouraging the use of public transport through provision of public transport information.

OBJECTIVE 6: PRIORITISING WALKING AND CYCLING

Design response: In all developments the aim should be to maximise opportunities for people to meet their day to day needs using sustainable modes of transport. Some of the key elements to consider include:

- Designing footpaths and cycle paths along 'desire lines' to key destinations both in the vicinity of the area and in the wider community;
- Locating cycle parking for maximum convenience of access;
- Ensuring cycle parking is safe and secure; ensuring paths are safe and appropriately lit while minimising light pollution, with natural surveillance from adjacent buildings;
- Minimising disruption of pedestrian and cycle routes from the road network and car parking layout;
- Incorporating traffic calming measures; ensuring that there are good walking and cycling routes to and from key bus routes and that sufficient cycle parking is provided at bus stops;
- Consideration should be given to the need for high quality cycle parking from the outset of the design process so that provision can be fully integrated into the development (see objective 7 below).

Part of the contextual analysis for proposals should include consideration of the location of existing pedestrian and cycle networks so that these can provide a starting point for design. Where possible, existing networks should be integrated into new developments, with improvements and/or enhancements provided where required. This could include minor upgrading of junctions, signage and/or pavements and cycle paths; re-routing sections of cycle paths where necessary. Consideration should also be given to planned improvements to pedestrian and cycle networks in the vicinity of new developments and whether there is potential for schemes to link in with these. During the construction phase, appropriate measures should be implemented to ensure that construction works do not obstruct routes. In order for the use of sustainable modes of transport to become part of residents normal routine, it is vital that these networks are in place and fully functional prior to first occupation.

OBJECTIVE 7: DEVELOPING AN APPROPRIATE CYCLE AND CAR PARKING STRATEGY

Design response: It is important for cycle and car parking provision to be integrated into the design of new developments from the outset, in order for high quality developments to be realised. Providing enough convenient and secure cycle parking at people's homes and other locations, for both residents and visitors, is critical to increasing the use of cycles. In residential developments, designers should aim to make access to cycle storage at least as convenient as access to car parking. Best practice residential cycle parking should be:

- Conveniently sited;
- Accessible and easy to use;
- Safe and secure;
- Covered;
- Fit for purpose;
- Well managed and maintained;
- Attractive

A further consideration when designing space for cycle parking is the increasing use of off-gauge cycles, for example cycle trailers. Providing adequate space for such bikes, while important for all schemes, will be of particular importance when considering car free developments, as the use of such bikes can replace cars for many local trips, for example school/nursery drop offs and the weekly shop.

The visual impact of all forms of parking should be mitigated through a comprehensive landscape strategy to ensure that buildings and car parking respond to one another. Parking should not be seen to dominate the street scene. Recent examples have included cycle shelters covered with sedum/green roofs and the use of rain gardens and tree planting in car parking areas (see figure 5).

Figure 5: Rain gardens within car parking areas, Abode Development, Cambridge

SEE CON1: CYCLE PARKING STANDARDS

SEE CON2: CAR PARKING STANDARDS

OBJECTIVE 8: ENSURING ACCESSIBILITY FOR ALL

Design response: While it is important to ensure that the use of sustainable modes is maximised, it is also important to recognise that not everyone is able to utilise these modes, for example people with impaired mobility. Some of the key elements to consider include:

- Locating disabled parking spaces close to entrances of buildings;
- Ensuring that spaces and routes are not obstructed;
- Provision of dropped kerbs, shallow inclines and cambers and flat thresholds;
- Where possible, locating housing within 400m of high quality public transport routes;
- Provision of seats along footpaths leading to services and facilities;

- Allowing space for the storage of mobility aids, including provision for charging mobility scooters.

OBJECTIVE 9: MINIMISING THE IMPACT OF TRANSPORT INFRASTRUCTURE ON PEOPLE, WILDLIFE, LANDSCAPE AND AMENITY

Design response: It is important when designing the transport infrastructure needed to accompany development that careful consideration is given to minimising its impact on people, wildlife, landscape and amenity. Some key elements to consider include:

- Use of SuDS to reduce and improve the quality of surface water run-off;
- Use of landscaping to reduce long distance views of transport infrastructure and green the environment, with a focus on the use of native species;
- The use of 'home zones' to slow traffic speeds and enhance residential amenity;
- Traffic calming measures;
- The use of appropriate levels of street lighting designed with careful consideration of the impact on wildlife, particularly protected species.

Where home zones are to be used, consideration will need to be given to the navigation difficulties that some visually impaired people may experience in such environments.

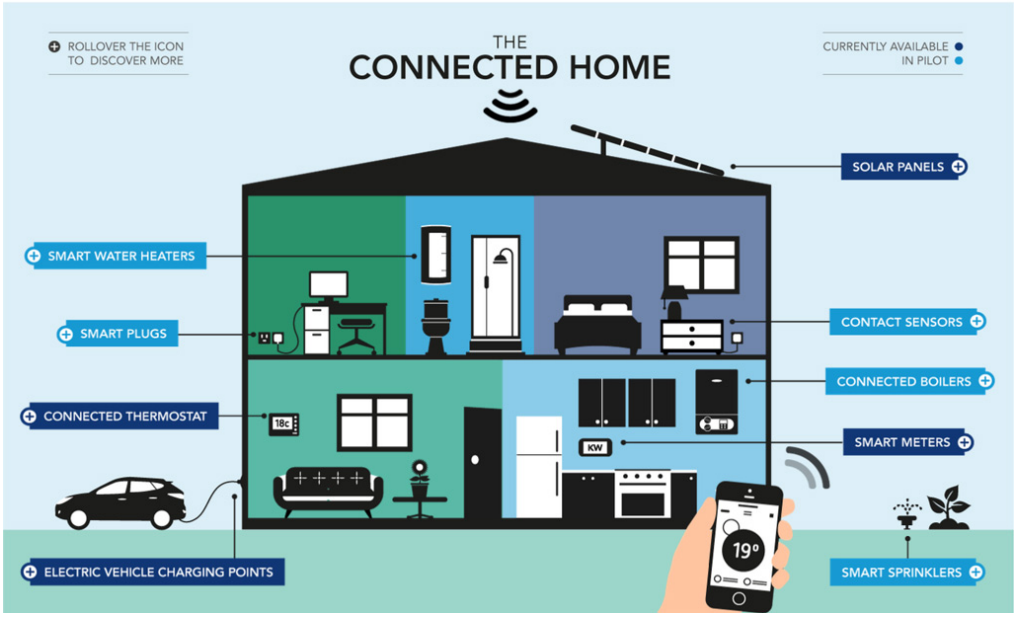
OBJECTIVE 10: PLACES THAT EMBRACE THE IDEA OF 'SMART' OR 'CONNECTED' HOMES

Design response: The homes that are built today should enable their residents to make the most of the benefits that a 'smart' or 'connected' home can bring. This can range from enabling more flexible patterns of working, remotely accessing home systems such as central heating and renewable energy storage; through to helping an elderly relative to live independently in their own home for longer. A 'smart' or 'connected' home is best thought of as a spectrum of electrical and digital applications. At the heart of this spectrum are some basic requirements:

- A home network;
- A good quality broadband connection; and
- Devices that can communicate across that network to support the needs of users.

SEE CON03: ENABLING SMART HOMES

Figure 6: A ‘smart’ or ‘connected’ home. (Image courtesy of Centrica)



CHARACTER

Places that make a positive and lasting contribution to the local area, where architectural design meets resident's fundamental needs and creates pride of place.

Cambridge is renowned for its architecture and quality of place, and many new developments have continued this tradition, with a range of design awards, including the first housing development to win the RIBA Stirling Prize at the Accordia development in Cambridge. New development should seek to continue this tradition, recognising the role that good quality design, not just in terms of architecture, but also landscaping and highways design, has to play in people's health and wellbeing and the creation of 'pride of place'. Some of the key principles to consider as part of all new development proposals include:

OBJECTIVE 11: RESPONDING TO CONTEXT

Design response: An understanding of context is a vital first step in delivering high quality development. The context of a development describes the setting of a site or area including land uses, open spaces, the built and natural environment and social and physical characteristics. Proposals for new development should create a scale and form that is appropriate to existing buildings, the public realm and open spaces, which complement the local identity of an area. It is essential that the context of a proposal is considered early on as part of the design process. A development that responds positively to its context is one that will either enhance areas of existing high quality, or will seek to introduce distinctiveness to areas of weaker character. The outcome of this thorough understanding and well considered response should be the successful integration of new development into the natural, built and historic environment.

OBJECTIVE 12: ADAPTABILITY OF DESIGN

Design response: One of the fundamental ingredients of a sustainable place is the ability to accommodate change over time and so reduce the need for demolition and rebuilding. When looking at the issue of adaptability of design, consideration needs to be given to different scales, from the large-scale such as the overall layout and size of development blocks, through to the small-scale which considers building depths and the internal layout of homes. It is important that buildings are capable of reuse and conversion to meet the changing social and technological needs of communities as they grow and develop over the coming years and as places respond to changing market and economic conditions. Some of the key elements to consider include:

- Building depth and width;
- Increased floor to ceiling heights at ground floor level;
- Adaptable internal space.

OBJECTIVE 13: MULTIFUNCTIONAL SPACES

Design response: In many new developments, competing demands for the use of land mean that green and open space has to be increasingly multifunctional. This should not be looked at negatively as there are many benefits to multifunctional design including:

- Making a positive contribution to climate change by helping new developments adapt to and mitigate it's impact, for example through promoting the greening of new developments;
- Improving water quality, flood mitigation and reduced flood risk through the use of SuDS;
- Promoting walking and cycling;
- Creating a sense of place and opportunities for greater appreciation of the landscape and cultural heritage;
- Providing space for local food production;
- Providing space for outdoor education and children's play;
- Protection and enhancement of biodiversity;
- Increasing recreational opportunities and access to open space to promote healthy living.

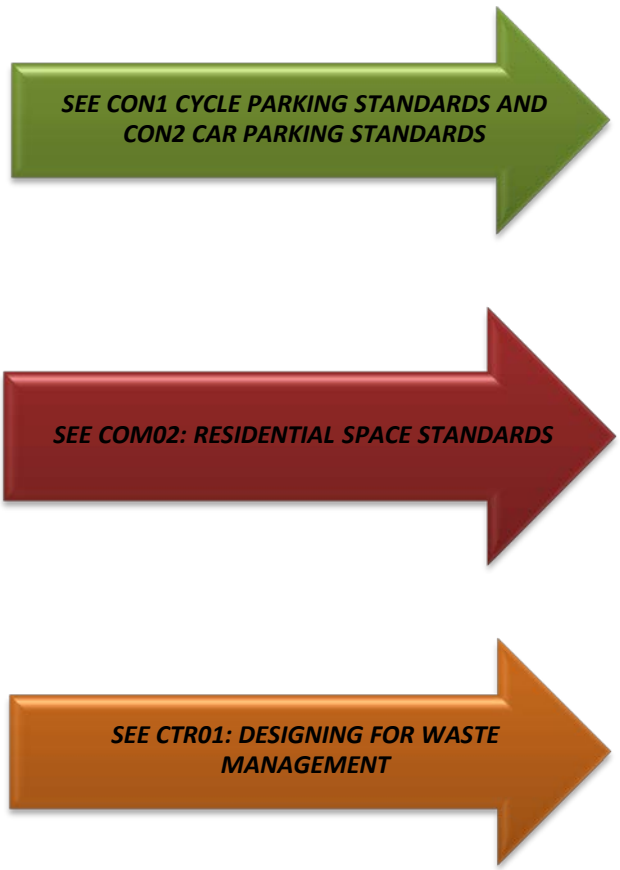
Such multifunctionality needs to be integrated into the design from the outset so as to maximise opportunities and reduce costs and should be considered for all scales of development.

Figure 7: Multifunctional landscape design, with a dry retention basin integrated into wider landscape design at Nine Wells, Cambridge (image courtesy of Simon Bunn)

OBJECTIVE 14: FUNCTIONAL DESIGN

Design response: Another important element in delivering successful high quality new development is ensuring that sufficient space is provided for things like cycle and car parking, bins and internal storage. By integrating such requirements from the outset, street clutter can be reduced, enhancing people's sense of 'pride of place'. Functional design is important not just from a design quality perspective. Space is an important factor when people choose a new home and has a significant impact on quality of life. As noted by the

RIBA, lack of space can compromise basic lifestyle needs that people take for granted, for example having enough space to store possessions, play, exercise and entertain friends. It can also have more profound knock-on effects on health, educational attainment, family relationships and even social cohesion. The importance of functional design therefore cannot be understated.



OBJECTIVE 15: HEALTHY HOMES

Design response: The role that the built environment has to play in enhancing our health and wellbeing is a theme that runs throughout this document and the impact of our homes on our health should not be underestimated. We spend around 65% of our time at home[3] and yet many of us are unaware of how the internal environment in our homes can have a significant impact on health and wellbeing. A recent report by the UK Green Building Council highlights that not only should a home provide an indoor environment which enables physical wellbeing, it should also promote mental wellbeing, providing residents with a general feeling of happiness and empowerment. Figure 8 below provides an illustration of the various factors that go into making a healthy homes, considerations which all design teams should factor into the design of new homes.

[3] https://www.ashrae.org/resources-publications/free-resources/10-tips-for-home-indoor-air-quality

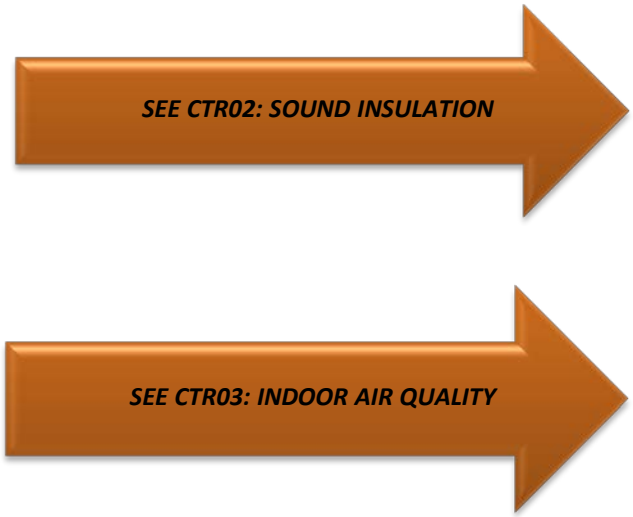
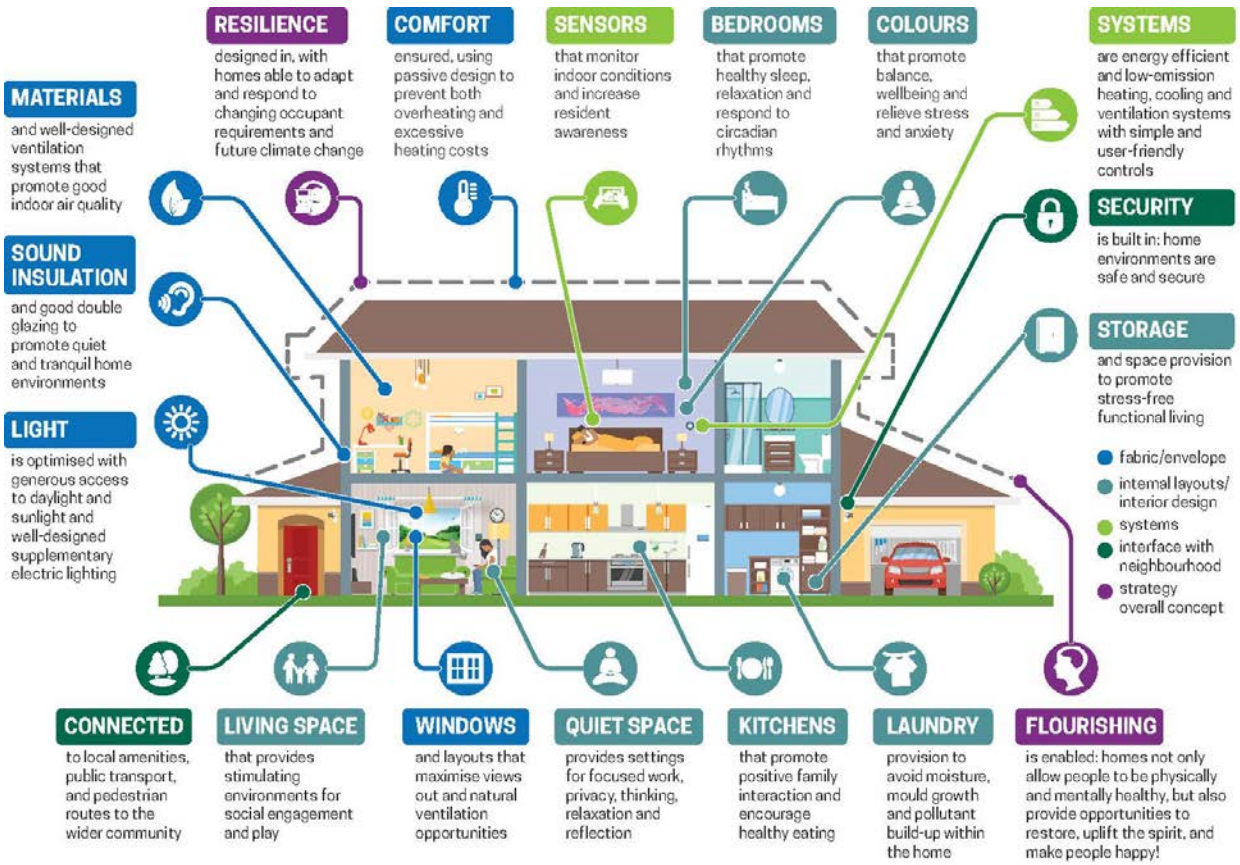


Figure 8: What makes a healthy home (infographic developed by PRP for UK-GBC)



OBJECTIVE 16: DESIGN THAT DELIVERS 'PRIDE OF PLACE'

Design response: There are many aspects that come together to help deliver pride of place: delivering a feeling of belonging and regarding a place as home. In creating new developments that help to bring about 'pride of place' there is a role for developers and their design teams in engaging with the community in the development of schemes and in the long term support that is offered to residents in these new developments.

Consideration needs to be given to the quality of the built environment, coherent architecture, high quality landscaping and open space. These aspects all need to come together to deliver a built environment that local residents will take pride in. Some of the aspects that should be taken into consideration include:

- The role of quality of finish and the interplay between homes and the spaces around those homes in delivering schemes in which residents have a sense of 'pride of place' and contribute to the upkeep of those places.
- Landscape design should be an integral element of all proposals, with a multifunctional approach taken to landscape design taken wherever possible. Landscape design should not be seen as an issue for the reserved matters stages of the planning process at the planning stage. On larger sites, a landscape strategy should be devised that includes plans for implementation, management and maintenance.
- Tree planting should be utilised wherever possible in order to lend character, ambience and shade. Trees can soften the impact of parking, help enhance biodiversity (if the right species are chosen), absorb CO_2, improve air quality and provide evaporative cooling. To be sustainable over time, trees must be carefully specified, located and planted within tree pits, taking account of their eventual size and being kept clear of underground services, with coordination between the landscape architect and services consultant. Consideration should be given to the use of mature trees appropriate to the scale and massing of nearby buildings in order to give developments an established landscape structure from the outset.
- Public open spaces should be used to give schemes an identity, ensuring that spaces are designed for everyone and are multifunctional.
- Long-term management plans should be provided for all communal spaces and public open spaces.

OBJECTIVE 17:THE IMPORTANCE OF BIODIVERSITY AND ECOLOGY IN HIGH QUALITY NEW DEVELOPMENT

Design response: Access to nature has an important role to play in promoting the health and wellbeing of residents. All scales of development offer opportunities for the protection and enhancement of biodiversity. On smaller sites this can include the use of biodiverse roofs, the design of SuDS features to enhance biodiversity, the role of native planting schemes and the integration of nesting opportunities into the architectural design of buildings. Larger sites perhaps offer the greatest opportunities for biodiversity in terms of the creation of a network of connected green spaces that offer safe cover for the movement of species as part of a coherent landscape strategy with a range of habitats. Consideration should also be given to the wider context of sites and the potential to connect with existing habitats. Some of the key elements to consider are:

- Ensuring that site appraisal includes a habitat survey that extends beyond the site boundaries and leads to mitigation and enhancement measures as part of the landscape and drainage strategies;
- Identifying ways in which biodiversity enhancement can be integrated into the design of schemes, including the role of landscape and drainage strategies, as well as consideration of measures integrated into building design;

- Identify opportunities to engage with the community in installing nest boxes and monitoring the biodiversity enhancement of the scheme.

Figure 9: Swift Tower at Logan's Meadow, Cambridge

Figure 10: The use of SuDS to enhance biodiversity, Cambourne (Image courtesy of Simon Bunn).

CLIMATE

Places that anticipate climate change in ways that enhance the desirability and long term livability of the development and minimise environmental impact.

All developments should contribute to ensuring that Cambridge develops in the most sustainable way possible. This means delivering our social and economic aspirations without compromising the environmental limits of the area for current and future generations, so that Cambridge becomes a low carbon, water sensitive city with a thriving economy. For this to be achieved, a holistic approach to sustainable development and reducing the environmental impact of development should be embedded within all development proposals from the outset.

It is important that development addresses the challenge of both climate change mitigation and adaptation, as well as giving consideration to other resource management issues. Climate change mitigation focuses on designing new communities and buildings to be energy and resource efficient, using renewable and low carbon energy generation and promoting environmentally friendly modes of transport. With new housing, this also means addressing issues such as fuel and water poverty amongst our residents by building thermally efficient homes which integrate measures to reduce water consumption. At the same time, it is important to ensure that in seeking to reduce energy demand in buildings, we also ensure that measures do not inadvertently impact on the health of residents by compromising indoor air quality and thermal comfort.

Climate change adaptation on the other hand focuses on ensuring that new developments and the wider community are adaptable to our changing climate. For Cambridge, this is likely to involve an increase in the Urban Heat Island Effect (UHI) due to increasing temperatures, and an increase in flooding, both from rivers and other watercourses and from surface water runoff after periods of intense rain.

Cambridge already has a legacy of environmentally sustainable housing design. Future developments should continue this legacy, looking to new and innovative forms of development. This will be achieved by the consideration of the following design principles:

OBJECTIVE 18: CONTRIBUTING TO WIDER ENVIRONMENTAL GOALS

Design response: All scales of development should consider opportunities to contribute to the achievement of wider environmental goals including:

- Enhancement of biodiversity and wider habitats with reference to Nature Conservation Strategies, Biodiversity Action Plans and Habitat Action Plans;
- Tackling fuel poverty;
- Involvement in wider environmental and social initiatives, such as Cambridge Sustainable Food and South Cambridgeshire Sustainable Parish Energy Partnership.

OBJECTIVE 19: RESOURCE EFFICIENCY AT ALL STAGES

Design response: All developments should consider opportunities to achieve resource efficiency at all stages of the development process. There are many ways in which this can be achieved, including:

- Responsible sourcing of materials, with consideration given to materials with low embodied energy, local sourcing and materials made from renewable or waste resources;
- Implementation of the design for deconstruction principle, to enable resources to be reused at the end of a buildings lifetime;
- Modern methods of construction including offsite modular construction, which helps to reduce construction waste;
- Careful monitoring of construction processes to ensure goals for waste minimisation are achieved, for example through the use of the BRE's SMARTWaste initiative or other similar approaches;
- Implementation of Building Information Modelling (BIM) to ensure collaboration across all disciplines to further maximise resource efficiency.

SEE CL01: REDUCTION OF CONSTRUCTION WASTE

SEE CL05: RESPONSIBLE SOURCING OF MATERIALS

OBJECTIVE 20: PLACES THAT PROMOTE SUSTAINABLE LIFESTYLES

Design response: New developments should enable residents to adopt sustainable lifestyles and minimise the use of energy and other resources. Education and guidance are a vital part of helping people to live sustainably in new homes and there are many ways in which this can be achieved, including:

- Reduced car use by promoting sustainable modes of transport and ensuring links with surrounding services and facilities such as local shops and schools;

- Integrating food growing opportunities into the design of new developments, including the role of landscaping and the innovative use of spaces such as roof terraces and rooftop allotments;
- The design of inclusive developments that help foster a sense of community and belonging helping to combat social isolation and its associated mental health impacts;
- The integration of formal and informal open spaces into developments that help residents live more active lifestyles;
- Giving consideration to the ongoing support that residents will require post occupancy to help them gain the most benefit from their new home, with consideration to the role of smart/connected home provision in facilitating this.

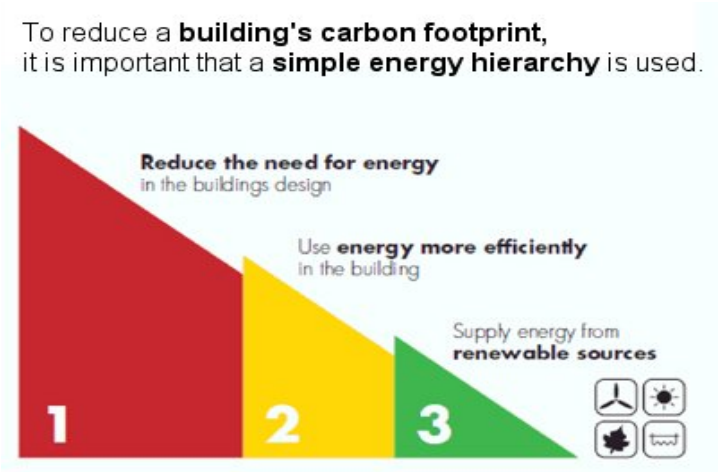
SEE PCMM01: SUPPORT FOR ESTATES TEAMS AND RESIDENTS

OBJECTIVE 21: PLACES THAT SEEK TO REDUCE CARBON EMISSIONS ASSOCIATED WITH ENERGY USE

Design response: Providing homes that residents can afford to heat and power is a priority for the Council. All designs should follow the hierarchical approach to reducing energy demand and associated carbon emissions (see figure 11 below), with the role of passive design at the top of the energy hierarchy. The reduction of carbon emissions associated with energy use should not just be seen as a role for the M&E consultant, but should be embedded into the architectural design of new homes and the wider built environment. While it is important that the building envelope be designed to maximise insulation performance and be as airtight as possible, care must be taken to ensure that good levels of ventilation are maintained to provide good internal air quality and a healthy indoor environment. Natural ventilation strategies should be adopted for all homes, unless there are clear reasons for the need for an alternative approach.

SEE CL02: ENERGY AND CARBON EMISSIONS

Figure 11: The energy hierarchy



OBJECTIVE 22: PLACES THAT SEEK TO REDUCE WATER CONSUMPTION

Design response: Cambridge is an area of water stress and as such it is important that all new developments include measures to reduce potable water consumption. As well as helping to conserve water resources, reduction of water consumption will help our residents reduce their water bills, an approach of increasing importance for those residents already facing fuel poverty. Integrating measures into new homes is far more cost effective than retrofitting measures at a later date. New developments also offer opportunities to take innovative approaches to reducing water consumption, with consideration given to water re-use as part of new developments.

It is also important that water efficiency beyond homes is considered. Irrigation of communal landscaping and private gardens must also be taken into consideration, with priority given to the use of rainwater for irrigation. For homes with private gardens, careful consideration should be given to the location of down pipes so that each property can utilise water butts without, for example, impeding access to rear gardens as well as giving consideration to the potential for underground water storage with reuse.

SEE CL03: WATER CONSUMPTION

OBJECTIVE 23: PLACES THAT ARE RESILIENT TO OUR CHANGING CLIMATE

Design response: Our climate is changing and as a result it is important that all developments give consideration to climate risks and design in measures to enable new homes and their residents to adapt to this risk. The key principle should be to ensure that adaptability is designed into schemes, so that residents do not have to rely on complex technologies that are expensive to maintain. It is also important to look to measures

beyond new homes themselves, seeking opportunities within the landscape setting of developments for adaptation. This will often require a multidisciplinary approach to design in order to maximise benefits, recognising the role of all members of the design team in responding to climate change.

Adaptation measures can be implemented at a variety of scales, and consideration should be given to the following measures:

- The use of SuDS and flood resilient architecture;
- Taking architectural approaches to design out issues such as overheating;
- Greening the environment to provide evaporative cooling and to help shade buildings;
- Implementing resilient architecture and construction to minimise impacts.

When considering adaptation strategies, it will be important to ensure that they are appropriate for the context in which the development sits and that they do not conflict with other strategies. For example, in areas of poor air quality, careful consideration will need to be given to ventilation strategies to ensure that buildings do not overheat and that good levels of indoor air quality and thermal comfort are maintained. In such circumstances, the importance of designing out issues such as overheating, for example through the use of building overhangs or external shading, becomes even more important.

SEE CL04: CLIMATE CHANGE ADAPTATION

POST CONSTRUCTION MONITORING AND MAINTENANCE

Places where performance and maintenance issues are 'designed out', informed by integrated monitoring and evaluation, and where architectural design and embedded technology is easy to understand, use and maintain.

For this guidance to be a success, it is important that it is informed by ongoing monitoring of performance of schemes so that lessons can be learnt in terms of what works well and what elements are not so successful. This approach will allow for continuous improvement of both the guidance and the delivery of good homes. The 'performance gap' between as-designed and actual/in-use performance is well documented. A result of a number of factors, from discrepancies between design specification and what is constructed and installed on site, through to inadequate handover and aftercare for residents, this performance gap can lead to higher energy bills for residents and/or uncomfortable and unhealthy living environments, resulting in complaints and costly maintenance calls. It is also important that our maintenance teams are involved early on in the design process so that they understand the maintenance requirements of key systems and are able to access professional aftercare support where required.

A further area of importance in bringing forward the delivery of new homes is the importance of taking a long-term view and designing for low management and maintenance where possible. This of particular importance to the HDA both in terms of our role as part of a local authority and in our role as a manager of social housing stock. The principle of life-cycle costing is important here; an approach where long-term value is considered more important than initial cost. For example, when considering material specification the selection of a low cost option over a more durable but higher cost option as part of a value engineering approach could ultimately result in greater long term costs in terms of maintenance, and may also have a detrimental impact on the quality of the built environment and pride of place. The low cost option is not always the best long term option.

In order to ensure that development is informed by long term monitoring of performance, that maintenance issues are 'designed out' and where architectural design and embedded technology is easy to use and understand, the following design principles should be followed:

OBJECTIVE 24: PLACES THAT ARE DESGINED WITH A LONG TERMS VIEW, THAT ARE SIMPLE AND COST EFFECTIVE TO RUN AND MAINTAIN AND WHERE MAINTENANCE ISSUES ARE 'DESIGNED OUT' AS FAR AS PRACTICABLE

Design response:

- Collaborative working between all disciplines should be at the heart of all schemes to enable issues to be designed out as early as possible;

- Schemes should demonstrate high quality, timeless, contemporary design, with attention paid to finish and detailing during construction. On larger schemes, consideration should be given to the appointment of a Clerk of Works to oversee the construction process and ensure that all aspects of the design specification are adhered to;
- The use of high quality, durable materials and careful detailing is essential, not only to reduce long-term maintenance costs, but to promote pride of place amongst residents, who will ensure that their homes look good into the future. Where practicable, materials choice should be informed by lifecycle costing, taking into consideration long-term costs such as maintenance, costs of replacement and lifespan of materials;
- Where available, maintenance/estates and facilities teams should be involved in the design process so that they are familiar with systems being proposed, and training can be provided prior to installation of unfamiliar systems so that they can be effectively operated and maintained post construction.

SEE PCMM01: SUPPORT FOR ESTATES TEAMS AND RESIDENTS

OBJECTIVE 25: PLACES WHERE RESIDENTS ARE SUPPORTED AND CAN UNDERSTAND HOW TO RUN THEIR HOME COST EFFECTIVELY AND EFFICIENTLY

Design response: In order for residents to fully realise the benefits of living in sustainable, energy efficient new homes, it is important that they understand how the systems in their new home work so that they can operate them effectively. Evidence shows that where systems, including controls, are overly complex, residents often feel that they have little control over the environment in which they live. At worst, this can lead to higher energy bills for residents and a poor internal living environment with subsequent health impacts. The following principles should be followed:

- User friendly design of building systems/controls, for example heating and ventilation controls, to ensure that they are easy to understand and work effectively;
- Consideration given to new ways of delivering simple home user guides, with consideration given to the role of 'smart' or 'connected' homes in providing guidance. Homeowners should not just be given paper manuals, as these often do not get used;

- Provision of smart meters to make energy and water consumption highly visible. This could also extent to renewable energy systems where provided, so residents can see how much energy they are generating;
- For major developments, support in the form of schemes such as BSRIA's Soft Landings Framework should be utilised to ensure that residents have access to professional post occupancy aftercare and support.

OBJECTIVE 26: ENVIRONMENTAL STRATEGIES THAT ARE INFORMED BY AN EVIDENCE BASED APPROACH TO PERFORMANCE GAP RISKS AND UTILISE POST CONSTRUCTION MONITORING AND EVALUATION

Design response: As mentioned above, if the performance gap is to be closed, then tools to identify and help resolve performance gap risks should be utilised from concept through to handover. In addition, post evaluation monitoring and evaluation is important so that we can learn from what has worked well and what has not worked so well. When designing new developments, consideration should be given to the monitoring of key performance criteria, such as energy use, carbon reduction, water use, indoor air quality, internal temperatures and performance of renewable/low carbon energy. This will enable the specification to evolve, taking into account the performance of recently completed projects.

A further important element that will help determine the success of the specification is feedback from residents through the use of resident satisfaction surveys. These should be specifically tailored to understand residents experience of living in new homes; for example how they rate the quality and performance of their new homes and how they view the quality of the context within which the development sits. This is information that is rarely collected from residents in new developments but is vital in furthering our understanding of the role of the built environment in improving people's health and wellbeing.

Also not to be overlooked, is the importance of monitoring the construction process so that performance can be continually improved, for example in relation to the minimisation of construction waste.

SEE PCMM02: MINIMISING THE PERFORMANCE GAP

SEE PCMM03: POST CONSTRUCTION MONITORING AND EVALUATION

SECTION THREE: THE CAMBRIDGE SUSTAINABLE HOUSING BASELINE SPECIFICATION

This section sets out the baseline specification that all developments using this guide will be expected to meet. In some cases, the specification will only apply to certain scales of scheme, as clarified in the table below.

BASELINE REQUIREMENT	SCALE OF DEVELOPMENT TO WHICH REQUIREMENT APPLIES	
	Minor development	Major development
COMMUNITY		
COM01: External residential space standards	✓	✓
COM02: Residential space standards	✓	✓
COM03: Accessibility standards	✓[4]	✓
CONNECTIVITY		
CON01a: Cycle parking standards for developments in Cambridge	✓	✓
CON1b: Cycle parking standards for developments in South Cambridgeshire	✓	✓
CON02a: Car parking standards for developments in Cambridge	✓	✓
CON02b: Car parking standards for developments in South Cambridgeshire	✓	✓
CON03: Enabling smart homes	✓	✓
CHARACTER		
CTR01: Designing for waste management	✓	✓
CTR02: Sound insulation	✓	✓
CTR03: Internal finishes	✓	✓
CLIMATE		
CL01: Reduction of construction waste	✓	✓
CL02: Energy and carbon emissions	✓	✓
CL03: Water consumption	✓	✓
CL04: Climate change adaptation	✓	✓
CL05: Responsible sourcing of materials	✓	✓
POST CONSTRUCTION MONITORING AND MAINTENANCE		
PCMM01: Support for estates teams and residents	*	✓
PCMM02: Minimising the performance gap	*	✓
PCMM03: Post construction monitoring and evaluation	*	✓

[4] The requirement for M4(3): Category 3 – Wheelchair user dwellings only applies to developments providing or capable of acceptably providing 20 or more self-contained affordable homes

* For minor development, compliance with these minimum requirements will be dependent upon the nature of the proposed development, e.g. if new construction methods or technologies are to be utilised then these requirements will be sought.

COMMUNITY

COM01 – EXTERNAL RESIDENTIAL SPACE STANDARDS

Private amenity space makes an important contribution in improving the quality of life of residents and supporting other objectives such as the enhancement of biodiversity. It is important to ensure that all new development secures high quality design and a good standard of amenity for all existing and future occupants of land and buildings. As such, all new developments using this specification will be expected to meet the following requirements:

All new residential units will be expected to have direct access to an area of private amenity space. The form of the amenity space will be dependent upon the form of housing, and could include a private garden, roof garden, balcony, glazed winter garden or ground-level patio with defensible space from any shared amenity areas. In providing appropriate amenity space, development should:

- Consider the location and context of the development, including the character of the surrounding area;
- Take into account the orientation of the amenity space in relation to the sun at different times of the year;
- Address issues of overlooking and enclosure, which might otherwise impact detrimentally on the proposed dwelling and any neighbouring dwelling; and
- Design the amenity space to be a shape, size and location to allow effective and practical use of the space by residents.

COM02 – RESIDENTIAL SPACE STANDARDS

The provision of sufficient space within new homes is an important element of good residential design and new homes should provide sufficient space for basic daily activities and needs. Government has introduced an Optional Technical Standard for internal space standards, which is the minimum standard that will be applied to all new social housing and development on Council owned land. This standard is set out below:

The internal design standard requires that:

a. The dwelling provides at least the gross internal floor area and built-in storage area set out in Table 1 below;
b. A dwelling with two or more bed spaces has at least one double (or twin) bedroom;
c. In order to provide one bed space, a single bedroom has a floor area of at least $7.5m^2$ and is at least 2.15m wide;
d. In order to provide two bed spaces, a double (or twin) bedroom has a floor area of at least $11.5m^2$;
e. One double (or twin) bedroom is at least 2.75m wide and every other double (or twin) bedroom is at least 2.55m wide;
f. Any area with a headroom of less than 1.5m is not counted within the Gross Internal Area unless solely used for storage (if the area under the stairs is to be used for storage, assume a general floor area of $1m^2$ within the Gross Internal Area);

g. Any other area that is used solely for storage and has a headroom of 900-1500mm (such as under eaves) is counted at 50% of its floor area, and any area lower than 900mm is not counted at all;
h. A built-in wardrobe counts towards the Gross Internal Area and bedroom floor area requirements, but should not reduce the effective width of the room below the minimum widths set out above. The built-in area in excess of 0.72m^2 in a double bedroom and 0.36m^2 in a single bedroom counts towards the built-in storage requirement;
i. The minimum floor to ceiling height is 2.3m for at least 75% of the Gross Internal Area.

Table 1: Minimum gross internal floor areas and storage (m^2) number of bedrooms (b)

NUMBER OF BEDROOMS (b)	NUMBER OF BED SPACES (PERSONS)	1 STOREY DWELLINGS	2 STOREY DWELLINGS	3 STOREY DWELLINGS	BUILT-IN STORAGE
1b	1p	39 (37)[5]			1.0
	2p	50	58		1.5
2b	3p	61	70		2.0
	4p	70	79		
3b	4p	74	84	90	2.5
	5p	86	93	99	
	6p	95	102	108	
4b	5p	90	97	103	3.0
	6p	99	106	112	
	7p	108	115	121	
	8p	117	124	130	
5b	6p	103	110	116	3.5
	7p	112	119	125	
	8p	121	128	134	
6b	7p	116	123	129	4.0
	8p	125	132	138	

Further detail on how to apply this standard can be found by referring to the technical housing standards – nationally described space standard (2015). The Gross Internal Areas in the above table will not be adequate for wheelchair housing (see COM03 Accessibility Standards below) where additional internal area is required to accommodate increased circulation and functionality to meet the needs of wheelchair households.

COM03 – ACCESSIBILITY STANDARDS

Disabled people, not only wheelchair users, are already excluded from homes built to poor design standards. Demographic reality is that many of us are now living longer, and even

[5] Where a one person flat has a shower room rather than a bathroom, the floor area may be reduced from 39m^2 to 37m^2

with improved levels of health, this means that people are living with impairments and life-limiting conditions. It is important that new homes are built to enable people to continue living in their home even if their circumstances change. In designing new developments, the focus should be on place making for everyone, creating environments and housing that meet people's needs over the long term. Central to this is the concept of accessible housing. In order to ensure good levels of accessibility, the following standards should be applied to all social housing and development on Council owned land:

STANDARD	REQUIREMENT	EVIDENCE OF COMPLIANCE
Requirement M4(2): Category 2 – Accessible and adaptable dwellings Requirements will be met where a new dwelling makes reasonable provision for most people to access the dwellings and incorporates features that make it potentially suitable for a wide range of occupants, including older people, those with reduced mobility and some wheelchair users.	Required for all units	Compliance should be demonstrated in design reports and in the design and access statement submitted with the planning application for schemes.
Requirements M4(3): Category 3 – Wheelchair user dwellings Requirement will be met where a new dwelling makes reasonable provision, either at completion or at a point following completion, for a wheelchair user to live in the dwelling and use any associated private outdoor space, parking and communal facilities that may be provided for use of the occupants.	5 %[6] of the affordable housing component of every housing development providing or capable of acceptably providing 20 or more self-contained affordable homes should meet Building Regulations requirement M4 (3) 'wheelchair user dwellings' to be wheelchair accessible or be easily adapted for residents who are wheelchair users.	Compliance should be demonstrated in design reports and in the design and access statement submitted with the planning application for schemes.

Further detail on how to apply these standards can be found in Building Regulations 2010, Approved Document M Volume 1: Access to and use of dwellings (2015 edition).

[6] Rounded up to the nearest whole unit

CONNECTIVITY

CON01a – CYCLE PARKING STANDARDS FOR DEVELOPMENTS IN CAMBRIDGE

For developments in Cambridge, the following minimum standards are required:

As well as according with the standards set out in table 2 below, residential cycle parking should be designed in accordance with the Council's Cycle Parking Guide for New Residential Developments. It should:

- Be located in a purpose-built area at the front of the house or within a garage (appropriate garage dimensions are shown in this appendix);
- Only be located within a rear garden if locating it at the front of the house is shown to not be in keeping with the character of the surrounding area, and there is no garage provision; and
- Be at least as convenient as the car parking provided.

Cycle parking should:

- Avoid being located in basements unless it can be shown to be convenient and easy to use, with ramps of a gradients of no more than 1 in 4 on both sides of any stepped access. Any basement cycle parking must also provide alternative parking on the ground floor for less able users and those with non-standard cycles.

All cycle parking should minimise conflicts between cycles, motor vehicles and pedestrians. Short-stay cycle parking, e.g. for visitors, should be located as close as possible to the main entrance of buildings (no more than 10 metres) and should be subject to natural surveillance. For larger developments, covered cycle parking should be considered.

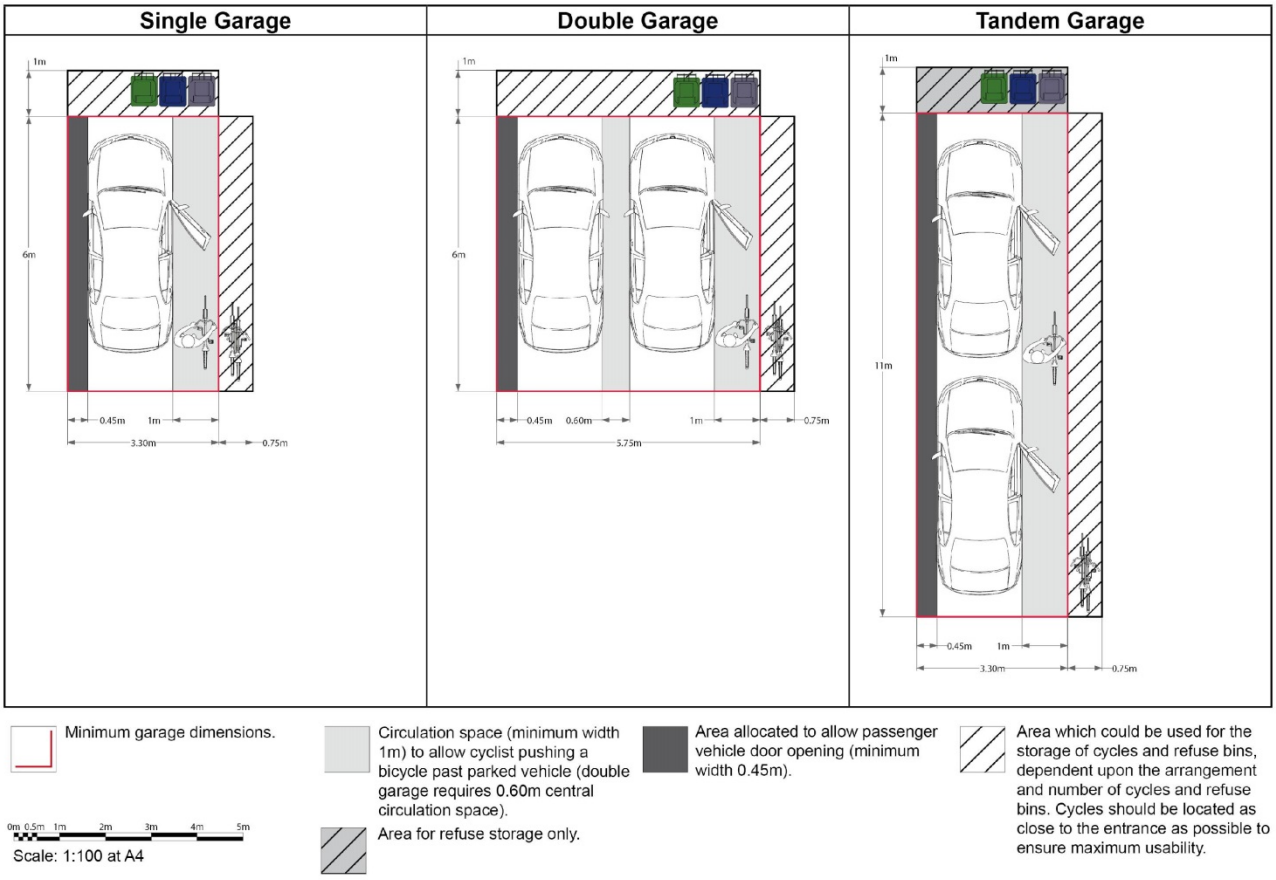
Table 2: Residential cycle parking standards for development in Cambridge

USE	MINIMUM STANDARD
Residential dwellings	1 space per bedroom up to 3 bedroom dwellings. The 3 spaces for 4 bedroom dwellings, 4 spaces for 5 bedroom dwellings etc. Visitor cycle parking next to main entrances to blocks of flats Visitor cycle parking in the form of a wall ring/bar or Sheffield stands at the front of individual houses must be provided where cycle provision is located in the back garden.
Nursing homes	2 spaces for every 5 members of staff 1 visitor space for every 6 residents (minimum 2 spaces)
Retirement homes/sheltered housing	2 spaces for every 5 members of staff

	1 space for every 6 residents. 1 visitor space for every 6 residents (minimum 2 spaces)

Where car and cycle parking (and bin storage) at new residential developments is proposed to be provided in garages, the dimensions of the garages must accord with the dimensions set out in figure 12 below.

Figure 12: Garage dimensions



CON1b – CYCLE PARKING STANDARDS FOR DEVELOPMENTS IN SOUTH CAMBRIDGESHIRE

Cycle parking provision should be provided through a design-led approach. Provision of cycle parking to at least the minimum standards in table 3 below will be required. Cycle parking should be within a covered, lockable enclosure; for houses this could be in the form of a shed or garage, for flats either individual lockers or cycle standards within a lockable, covered enclosure are required. Visitor parking should be located as near as possible to the main entrance of buildings. All cycle parking should be designed and located to minimise conflict between cycles, pedestrians and vehicles. Residential garages (or car ports) will only be counted towards car and cycle parking provision where the meet a minimum size requirement of 3.3m x 6m for a car with an additional 1m at the end and/or 650-750mm at the side of a garage to park cycles.

Table 3: Residential cycle parking standards for South Cambridgeshire

USE	MINIMUM CYCLE PARKING PROVISION (gross floor area)
C3: Residential dwellings	1 space per bedroom Note: additional provision may be needed for visitors.
C2: Residential Institution (nursing/convalescent homes)	1 space per 2 staff working at the same time.

CON02a - CAR PARKING STANDARDS FOR DEVELOPMENTS IN CAMBRIDGE

The standards set in tables 4 and 5 below define the maximum levels (referred to as 'no more than') of car parking that will be permitted for residential developments in Cambridge. These levels should not be exceeded by may be reduced where lower car use can reasonably be expected. The exception is parking for disabled people, which is a minimum standard. Under the Disability Discrimination Act, it is the responsibility of site occupiers to ensure that adequate provision is made for the needs of disabled people.

Table 4: Maximum parking standards for residential development in Cambridge (Use Class C3)

DWELLING SIZE	INSIDE CONTROLLED PARKING ZONE	OUTSIDE CONTROLLED PARKING ZONE
Up to 2 bedrooms	No more than 1 space per dwelling	No more than a mean of 1.5 spaces per dwelling
3 or more bedrooms	No more than 1 space per dwelling	No less than a mean of 0.5 spaces per dwelling, up to a maximum of 2 spaces per dwelling

Table 5: Maximum parking standards for specialist housing development in Cambridge

TYPE OF DEVELOPMENT	INSIDE CONTROLLED PARKING ZONE	OUTSIDE CONTROLLED PARKING ZONE
Nursing homes	1 space for every 10 residents, 1 space for every 2 members of staff	1 space for every 8 residents, 1 space for every 2 members of staff
Retirement homes/sheltered housing	1 space for every 6 units, 1 space for every 2 members of staff	1 space for every 4 units, 1 space for every 2 members of staff

In addition to the parking ratios set out above, provision should be made for visitors at a ratio of one space for every four units. Overall parking should be a mixture, with some parking allocated (to specific dwellings) and some parking provided as unallocated – particularly visitor parking and any parking above one space per dwelling (see Manual for Streets for advice on design). Allocated parking should be marked appropriately.

COND02b – CAR PARKING STANDARDS FOR DEVELOPMENT IN SOUTH CAMBRIDGESHIRE

Car parking provision should be provided through a design-led approach in accordance with the standards set out in table 6 below. Provision will take into consideration the site location, type and mix of uses, car ownership levels, availability of local services, facilities and public transport and highway and user safety issues, as well as ensuring appropriate parking for people with impaired mobility. Innovative solutions to car parking should be encouraged, including car clubs and electric charging points. Residential garages (or car ports) will only be counted towards car and cycle parking provision where the meet a minimum size requirement of 3.3m x 6m for a car with an additional 1m at the end and/or 650-750mm at the side of a garage to park cycles.

Table 6: Car parking standards for developments in South Cambridgeshire

TYPE OF DEVELOPMENT	INDICATIVE CAR PARKING PROVISION (gross floor area)
C3: Residential dwellings	2 spaces per dwelling – 1 space to be allocated within the curtilage Note: Additional provision may be needed for visitors, service vehicles, salesmen.
C2: Residential institutions (e.g. nursing/convalescent homes)	1 space per residential staff plus 1 per 3 bed spaces

CON03 – ENABLING 'SMART' OR 'CONNECTED' HOMES

In order to promote the development of 'smart' or 'connected' homes, the following should be provided as part of all developments[7]:

Essential Requirements:

- Ensure good wireless coverage within homes, the Wi-Fi router/hub should be positioned centrally within the home. As such, the network terminating equipment (NTE or 'master phone socket') should be positioned centrally rather than in the hall or an under-stairs cupboard, to enable the router to be centrally positioned. A switched mains outlet should also be provided in the same location.
- Provision of some wired connections, including the following three elements:
    - Cables for incoming services (broadband, telephone, digital terrestrial tv, satellite or cable tv);
    - A wiring hub where incoming services meet;
    - Cables from the wiring hub to distribute services around the home. The cables from the wiring hub should include the following to each principal room:
        - Two coaxial cables for tv/radio; and
        - Two data cables (to 'Cat5e' or 'Cat6/6a')

  The mains outlets should be positioned adjacent to the coaxial and data outlets in each room.

[7] Requirements taken from NHBC Foundation "The connected home – Designing and building new technology into today's new homes" NF67 (January 2016)

Additional considerations:

- Where a dedicated home office space is provided, ensure that it contains two double power sockets, a telephone point and a wired network point;
- Consider installing combined 230V/USB electrical faceplates in a couple of key locations in the home;
- Consider using specialist installers such as 'home technology integrators' who are registered under the Electrotechnical Certification Scheme[8];
- If installing IoT technology from day one, provide power and a wired network point where each connected device is likely to be situated (for example, adjacent to every external door with a smart lock security system);
- Ensure that the Home User Guide includes information on the hub and wiring arrangement, with evidence that the installation has been tested and certified.

[8] https://www.ecscard.org.uk

CHARACTER

CTR01 – DESIGNING FOR WASTE MANAGEMENT

STANDARD	EVIDENCE OF COMPLIANCE
All developments will make provision for waste management in line with the requirements of the RECAP Waste Management Design Guide	Completion of the Design Standards Checklist from the RECAP Waste Management Design Guide.

CTR02 – SOUND INSULATION

To ensure positive impacts on residents' health and wellbeing, all dwellings should be designed and constructed to ensure good acoustic separation between neighbours and other sources of noise. The standard below should be applied to party walls and floors between dwellings but should also be considered for separating walls between flats and communal spaces including corridors, stairs, lifts, bin stores and bike stores. Consideration should also be given to sound insulation levels within homes to ensure residents have access to a quieter space for activities such as study and working from home.

STANDARD	EVIDENCE OF COMPLIANCE
All development should achieve airborne sound insulation values that are at least 5 dB better than (above) Approved Document Part E, and impact sound insulation values that are at least 5 dB better (lower)	Where pre-completion testing has been carried out: • Copies of the sound insulation field test results and/or a letter of confirmation that the required sound insulation performance standards have been achieved. • Evidence that the tests have been carried out by a Compliant Test Body Where Robust Details have been used: • Completed Robust Details Ltd Compliance Certificate signed by the developer for all relevant constructions relating to the plots being assessed.
Ensure that separating walls between flats and corridors/stairwells/lifts/bin stores/bike stores receive additional sound insulation in line with the party wall requirement	A specification demonstrating that materials that will provide additional sound insulation have been specified and detail on construction drawings to ensure that the correct specification gets constructed onsite.

CTR03 – INDOOR AIR QUALITY

The materials used to construct our homes have the potential to have significant adverse impacts on indoor air quality through the emission of pollutants such as formaldehyde and

volatile organic compounds (VOCs). A wide range of products from building materials through to coatings and furnishings emit a wide range of VOCs, especially in the first two years of a buildings life. With the current focus on increasing the air tightness of homes in order to enhance their energy performance, ensuring good levels of ventilation to maintain healthy indoor air quality and prevent the build-up of VOCs and other pollutants must not be overlooked. We need to ensure that new homes are not only energy efficient but also provide optimal ventilation rates for good internal air quality. Natural ventilation is the HDA's preferred choice as it provides residents with an easy to operate, maintenance free system which has no associated energy costs and can be extremely effective at improving indoor air quality, as well as removing heat in line with the requirements set out in requirement CL05: Climate Change Adaptation (Overheating).

STANDARD	EVIDENCE OF COMPLIANCE
New homes should be designed and constructed to minimise the internal build-up of pollutants through the specification of construction materials, fittings and finishes with a low air quality impact.	Evidence of compliance could include: • Use of British and European Standards regarding VOC and formaldehyde emissions from products; • Use of certification schemes such as Natureplus®, the Living Buildings Challenge, HQM and standards included within ASHRAE guidance.
For homes where mechanical ventilation systems are required, air intakes should be located as far as possible from sources of external air pollution, and from exhaust points, to avoid recirculation.	Drawings showing the location of building services including air intakes in relation to external sources of air pollution.
Installation of ventilation systems must be carried out by BPEC (or equivalent) Accredited Installer.	Evidence of accreditation (BPEC certification or equivalent).

CLIMATE

CL01 – MINIMISATION OF CONSTRUCTION WASTE

STANDARD	EVIDENCE OF COMPLIANCE
At least 85% of all non-hazardous construction waste (by volume) should be diverted from landfill	Compliance can be demonstrated through the use of reporting tools for monitoring the environmental impact of the construction process and sharing reports with the Council to ensure that projects have a baseline for improvement to work from – e.g. BRE's SMARTWaste programme or other similar tools.

CL02 – ENERGY AND CARBON EMISSIONS

STANDARD	EVIDENCE OF COMPLIANCE
19% improvement in Dwelling Emission Rate/Target Emission Rate (DER/TER) over Part L 2013	Detailed documentary evidence confirming the TER, DER and percentage improvement of DER over TER based on design stage SAP outputs. This information should be presented in the form of a carbon reduction report outlining the hierarchical approach to meeting the standard.

CL03 – WATER CONSUMPTION

STANDARD	EVIDENCE OF COMPLIANCE
110 litres/person/day	A water efficiency specification for each dwelling type, based on the Water Efficiency Calculator Methodology or the Fitting Approach sets out in Part G of the Building Regulations 2010 (2015 edition).
In addition to the minimum standard set out above, all major developments should investigate and, where feasible and viable, implement rainwater harvesting systems to further reduce potable water consumption. A preference would be for the use of communal systems rather than individual dwelling systems.	

CL04 – CLIMATE CHANGE ADAPTATION

ISSUE	MINIMUM REQUIREMENT	EVIDENCE OF COMPLIANCE
Drainage and flood risk	• Surface water drainage must be designed as sustainable drainage systems; • All modelling should include (at least) a 40% allowance for climate change in rainfall figures and a 25% allowance for climate change in river	• Surface Water Drainage Strategy including drainage calculations; • Management and Maintenance Plan for proposed sustainable drainage systems including details of adoption; • Combined landscape and drainage plans; • Where attenuation tanks are to be

ISSUE	MINIMUM REQUIREMENT	EVIDENCE OF COMPLIANCE
	flows; • Discharge rates for all sites must be back to greenfield run-off rates; • All non-adoptable hard landscaped areas are to be permeable; • A multidisciplinary approach to sustainable drainage design must be taken with sustainable drainage systems designed to be part of a multifunctional approach to landscape and open space provision; • All sustainable drainage systems should be designed to the standards set out in Cambridge City Council's "Sustainable Drainage, Cambridge Design and Adoption Guide", even where systems are not being adopted by the Council. • Where attenuation tanks are to be located beneath areas of landscaping, drawings showing construction details should be provided, including details of the planting medium to be provided on top of the tanks to ensure that the landscaping above tanks will establish successfully.	located beneath landscaping the following details should be provided: a) **Method statement /specification** – to be included on the drawing /section: ➢ tank to be installed with a slight fall on the top of the tank to aid drainage with the direction and gradient annotated, ➢ specification of how the granular fill is spread including compaction tolerances so that it remains permeable but stable, ➢ subsoil to BS 8601:2013 should be loose tipped and lightly compacted in layers of 150mm at a time. ➢ topsoil to BS3882:2015 should be loose tipped and lightly compacted in layers of 150mm at a time. b) **Graphic information** - an Engineer's to scale, dimensioned section to show: ➢ Invert level, ➢ Top of tank levels, ➢ Finished ground level, ➢ Depth of granular fill surround, ➢ Depth of growing medium above tank (n.b. we would expect to achieve a minimum of 350mm of topsoil. If levels need to be made up between tank and topsoil, it would be with good quality, free draining subsoil).
Overheating	Proposals should reduce potential overheating by following the cooling hierarchy: 1. **Passive Design:** Minimise	Design reports should include a section on climate change adaptation setting out the approach to 'designing out' the risks presented from our changing climate.

ISSUE	MINIMUM REQUIREMENT	EVIDENCE OF COMPLIANCE
	internal heat generation through energy efficient design and reduction of the amount of heat entering the building in the summer and shoulder months through consideration of orientation, overhangs and shading, albedo, fenestration, insulation and green roofs. Where heat is to be managed within the building through exposed internal mass and high ceilings, provision must be made for secure night time ventilation to enable night purge to take place; 2. **Passive/natural cooling:** use of outside air, where possible pre cooled by soft landscaping, a green roof or by passing it underground to ventilate and cool a building without the use of a powered system. This includes maximising cross ventilation, passive stack and wind-driven ventilation and enabling night purge ventilation. Single aspect dwellings should be avoided for all schemes as effective passive ventilation can be difficult or impossible to achieve. Windows and/or ventilation panels should be designed to allow effective and secure ventilation. 3. **Mixed mode cooling:** with local mechanical ventilation/cooling provided where required to supplement the above measures using (in order of preference):	Any specific measures to prevent overheating, including overhangs, external shading and specific ventilation systems (e.g. wind cowls to assist stack ventilation) should be clearly shown on all drawings and information on specification and maintenance requirements provided.

ISSUE	MINIMUM REQUIREMENT	EVIDENCE OF COMPLIANCE
	i) low energy mechanical cooling (e.g. fan powered ventilation with/without evaporative cooling or ground coupled cooling); ii) air conditioning – not a preferred approach as these systems are energy intensive; 4. **Full building mechanical ventilation/cooling system**, ensuring the lowest carbon/energy options and are only considered after all other elements of the hierarchy have been utilised. All buildings should be designed and built to meet CIBSE's latest overheating standards[9] and give consideration to the impact of future climate scenarios. Overheating calculations should make realistic assumptions regarding window opening, particularly for units where restricted opening will be required (e.g. ground floor units). Contractors must ensure that insulation of communal heating pipework and all other primary heating pipework takes place to minimise unwanted internal heat gains; Where Mechanical Ventilation with Heat Recovery (MVHR) is to be used, the system specified and installed must include a summer bypass mode. Installation must be carried out by an approved installer (e.g.	

[9] See GVA/15 CIBSE Guide A: Environmental Design (2015) and CIBSE TM52: The Limits of Thermal Comfort: Avoiding Overheating in European Buildings (2013)

ISSUE	MINIMUM REQUIREMENT	EVIDENCE OF COMPLIANCE
	BPEC approved).	

CL05 – RESPONSIBLE SOURCING OF MATERIALS

STANDARD	EVIDENCE OF COMPLIANCE
All timber[10] to be 100% certified (FSC or equivalent)	Evidence of compliance can include: • Copies of relevant certificates from certification schemes e.g. BES 6001 via www.greenbrooklive.com
80% by area of all major components to be A or B rated in BRE Green Guide.	
Blockwork – 100% BES 6001 Good	
Structural Steel – 100% ISO 14001, ISO 9001, OHAS 18001	
Reinforcing steel – 100% BES 6001 Good	
Glass – 100% ISO 14001, ISO 9001, OHAS 18001	
Plasterboard – 100% ISO 14001, ISO 9001, OHAS 18001	
Concrete – 100% BED 6001 Good	

[10] This applies to all timber used within the project (i.e. site timber used in the construction process and timber materials installed within the building elements).

POST CONSTRUCTION MONITORING AND MAINTENANCE

PCMM01 – SUPPORT FOR ESTATES TEAMS AND RESIDENTS

New development schemes should:

- Provide leadership for residents to help foster good sustainable behaviour/lifestyles. This could include input from a developer, housing association, managing agent or a community group;
- Provide aftercare and support for residents of all tenures, including those who rent properties from private landlords.
- Engage communities as a whole; information based on websites, handbooks and community noticeboards do not tend to be successful and so more constructive methods should be considered.

A post occupancy support statement will be required to demonstrate how residents and estates teams on a scheme will be supported. This will need to include detail relating to the green elements of buildings in particular and how people will be supported in using this technology, as 'fit and forget' technology still requires education.

For all major developments, the BSRIA Soft Landings Framework should be utilised to provide support from the design stage through to the post occupancy stage. This will require the development and implementation of a Soft Landings Plan and subsequent reporting through the provision of Soft Landings Reports.

PCMM02 – MINIMISING THE PERFORMANCE GAP

SCALE OF DEVELOPMENT	STANDARD/REQUIREMENT	EVIDENCE OF COMPLIANCE
All major developments and any scheme that proposes to use new and/or innovative construction methods or technologies	Assess all risks that could contribute to a potential energy performance gap between design aspiration and the completed development.	Evidence should be provided to demonstrate that a 'tested' performance gap/assured performance tool has been used to minimise the potential performance gap from design stage through to construction through to completion.

PCMM03 – POST CONSTRUCTION MONITORING AND EVALUATION

SCALE OF DEVELOPMENT	STANDARD/REQUIREMENT	EVIDENCE OF COMPLIANCE
All major	Provision of post occupancy data on key	Submission and

SCALE OF DEVELOPMENT	STANDARD/REQUIREMENT	EVIDENCE OF COMPLIANCE
developments and any scheme that proposes to use new and/or innovative construction methods or technologies	performance indicators for a sample of units across a development[11]. These indicators may include: • Energy use; • Water consumption; • Indoor air quality; • Temperature and humidity; • Performance of renewable and/or low carbon technologies; • Amount of construction waste generated, re-used and recycled. Post-occupancy evaluation should provide comparisons between a full year's operational resource consumption. If the evaluation highlights a significant discrepancy between design and operational performance, then recommendations should be made for further diagnosis and/or remedial work to resolve the issues and close the performance gap.	implementation of a Post Construction Monitoring and Evaluation Framework setting out which key performance indicators will be monitored and the mechanics of how this monitoring will be undertaken. Monitoring reports to be submitted for discussion and review following a year's post occupation monitoring.
All major developments and any scheme that proposes to use new and/or innovative construction methods or technologies	Occupant satisfaction surveys should be carried out across a sample of residents. Consideration should be given to the use of the BUS[12] methodology.	A methodology for undertaking occupant satisfaction surveys should be included within the Post Construction Monitoring and Evaluation Framework. Following analysis of survey responses, a report will be presented to the HDA with a diagnosis of outcomes and recommendations for remedial action where appropriate.

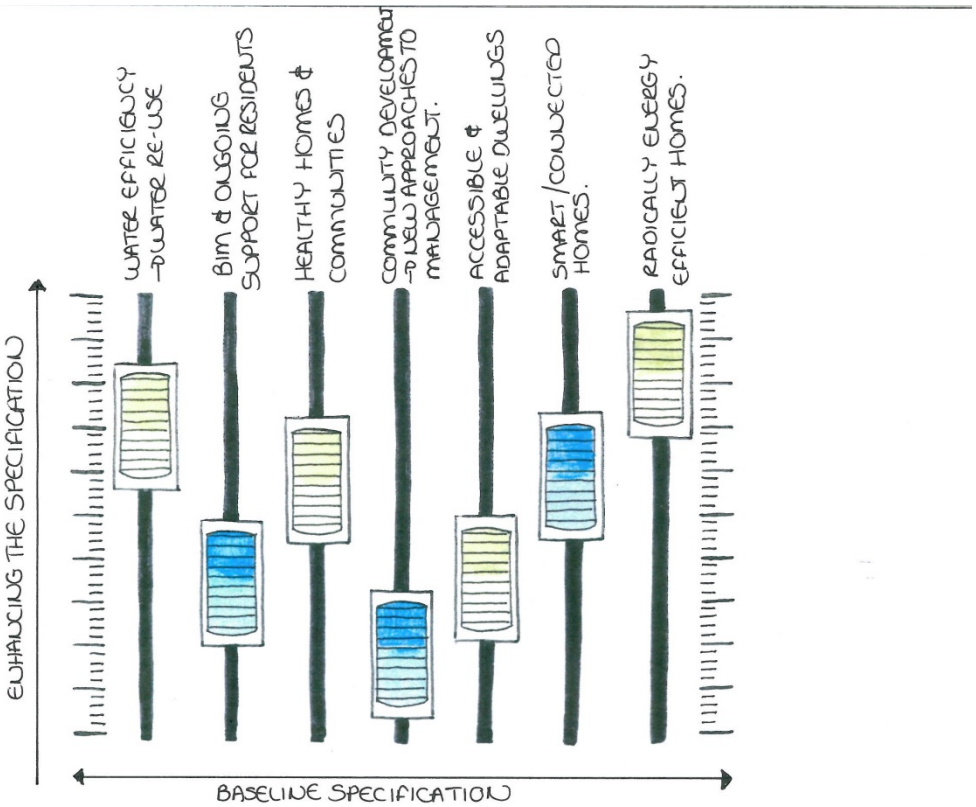
[11] Note that the number of units to be monitored/sample of residents to be surveyed will be agreed with the Housing Development Agency.

[12] The BUS (Buildings in Use Surveys) methodology was developed by the Usable Buildings Trust and is owned by Arup. It is available for other firms to use under licence www.busmethodology.org.uk

SECTION FOUR: ENCOURAGING INNOVATION – ENHANCING THE SPECIFICATION

The promotion of innovation in the delivery of new homes is a key priority and design teams should look to enhance the baseline specification in ways that benefit residents. Innovation is best achieved when all players in the construction process are open to new and innovative approaches without having to deliver against strict performance criteria. We want teams to be inspired to innovate, taking creative approaches to delivering good homes. To this end, we have developed the idea of an enhanced specification mixing desk, as illustrated in figure 13 below, which allows design teams to dial up certain aspects of the specification where they feel they can best deliver innovation. For example, a team may have particular expertise in delivering radically energy efficient buildings such as those built to the Passivhaus standard, use of standards related to health and wellbeing such as the WELL Standard, or may have experience in community development and engaging and supporting residents throughout the development process.

Figure 13: The enhanced specification mixing desk



The key areas where the main opportunities for innovation and enhancement lie are:

- Water efficiency and water sensitive urban design;
- Collaborative working through the use of BIM and support for residents;
- Healthy homes and communities;
- Community development;

- Accessible and adaptable buildings;
- Radically energy efficient homes; and
- Modern Methods of Construction and enabling resource efficiency.

As part of all major developments, design teams will be expected to outline their approach to at least one of these key areas for innovation and how this will be monitored to ensure success and to inform future iterations of the design guide.

Innovation can be achieved at all scales of development, and does not necessarily have to be applied to schemes as a whole. For example, a pilot project to test a certain area of innovation could be developed covering a proportion of homes being delivered as part of a wider scheme.

APPENDIX A: REFERENCES AND FURTHER SOURCES OF INFORMATION

1 ASHRAE: https://www.ashrae.org/

2 BRE SMARTWaste: http://www.smartwaste.co.uk/home

3 BSRIA Soft Landings Framework: https://www.bsria.co.uk/services/design/soft-landings/

4 Buildings in Use Surveys (BUS) methodology: http://www.busmethodology.org/

5 Cambridge City Council (2010): Cycle parking guide for new residential developments. Available online at: https://www.cambridge.gov.uk/sites/default/files/docs/CycleParkingGuide_std.pdf

6 Cambridge City Council (). Cambridge Sustainable Drainage Design and Adoption Guide. Available online at: https://www.cambridge.gov.uk/sites/default/files/docs/SUDS-Design-and-Adoption-Guide.pdf

7 Cambridgeshire County Council (2012). RECAP Waste Management Design Guide. Available online at: http://www4.cambridgeshire.gov.uk/info/20099/planning_and_development/49/water_minerals_and_waste/6

8 Cambridgeshire Horizons (2008). Cambridgeshire Quality Charter for Growth. Available online at: https://www.cambridge.gov.uk/sites/default/files/documents/cambridgeshire_quality_charter_2010.pdf

9 CIBSE (2013): CIBSE TM52: The Limits of Thermal Comfort: Avoiding Overheating in European Buildings . Available online at: http://www.cibse.org/Knowledge/knowledge-items/detail?id=a0q20000008I7f5AAC

10 DCLG (2016): Technical housing standards – nationally described space standard. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/524531/160519_Nationally_Described_Space_Standard____Final_Web_version.pdf

11 HCA et al (2009): HAPPI – Housing our Ageing Population: Panel for Innovation.

Available online at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/378171/happi_final_report_-_031209.pdf

12 Good Homes Alliance: http://www.goodhomes.org.uk/

13 CIBSE (2015): GVA/15 CIBSE Guide A: Environmental Design. Available online at: http://www.cibse.org/knowledge/knowledge-items/detail?id=a0q20000008I79JAAS

14 HM Government (2015): Building Regulations 2010, Approved Document M Volume 1: Access to and use of dwellings (2015 edition). Available online at: https://www.planningportal.co.uk/info/200135/approved_documents/80/part_m_-_access_to_and_use_of_buildings

15 Home Quality Mark: http://www.homequalitymark.com/

16 Living Buildings Challenge: https://living-future.org/lbc/

17 National Housing Federation (2016). Housing Standards Handbook: A good practice guide to design quality for affordable housing providers. Available online at: http://www.housing.org.uk/resource-library/browse/housing-standards-handbook/

18 Natureplus® standard: http://www.natureplus.org/

19 NHBC (January 2016): NF67 The connected home. Designing and building technology into today's new homes: Available online at: https://www.nhbcfoundation.org/publication/the-connected-home/

20 Passivhaus Standard: http://www.passivhaustrust.org.uk/

21 RIBA (2013): RIBA Plan of Works 2013. Available online at: https://www.ribaplanofwork.com/

22 UK Green Building Council (July 2016): Health and wellbeing in homes. Available online at: http://www.ukgbc.org/sites/default/files/08453%20UKGBC%20Healthy%20Homes%20Updated%2015%20Aug%20%28spreads%29.pdf

23 WELL Standard: https://www.wellcertified.com/