Climate Change, Sustainable Design, Construction and Energy SPD 2020

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Foreword

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Lead Councillor for Climate Change

On July 23 2019, Guildford Borough Council voted to recognise that climate change has already led to a rise in global temperatures of over 1° Celsius from pre-industrial levels and that the we have just 12 years to act on climate change in order to avoid serious, damaging and likely irreversible environmental, economic and social impacts, as set out by the Intergovernmental Panel on Climate Change in 2018. It further voted to recognise that all governments - national, regional and local - have a duty to act.

As a result of this, the Council formally declared a climate emergency and set a goal for the borough to reach net zero emissions by 2030.

Tackling climate change is crucial for the long-term welfare of the borough and its residents, and the Council will champion the movement towards zero-carbon communities.

Sustainable, low carbon development must be a core principle in future development in our borough, with an aspiration that all development will be net-zero carbon at the earliest opportunity. The Council intends to take a lead on this by delivering the borough's first homes that are built to Passivhaus standards, with carbon emissions that are considerably lower than homes built to national standards. Alongside this, the Council is committed to progressively decarbonising its own energy supply by upscaling its investment in renewable electricity and heat, and plans to develop and deliver a 10-year programme for retrofitting its own estate and housing stock to improve energy performance.

Planning can and must play a key role. The Council adopted the Local Plan: Strategy and Sites 2015-2034 in April 2019. The plan contains several policies that raise standards in new development as a step towards net zero carbon development. This SPD provides detailed guidance on how those policies should be interpreted and implemented, and practical advice on how development can become more sustainable. The Council will review its policies and SPDs at appropriate intervals and when doing so will raise standards further where there is scope to do so. In the meantime, we will work with developers to get the best possible outcomes in new development and will continue to push for better development.

The climate has already changed, further change is inevitable, and there is uncertainty over the degree of change that we will experience in the longer term. The impacts of climate change are already being felt and we can expect greater challenges in the coming years and decades. As a result, this SPD provides guidance on how new developments can be adapted, and be made adaptable, to address those challenges.

The government is currently reviewing national standards and is proposing a new standard for housing called "Future Homes". The first stage of implementing this new standard may include more stringent standards for carbon emissions and/or energy use in new homes and changes to how compliance with the standards is assessed[1]. If and when these or any other relevant changes are made to legislation or national policy, we will review this SPD to ensure it remains up-to-date.

[1] The government consulted on these changes from October 2019 to February 2020 and is considering the next steps. See https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings

1. Introduction

The purpose of this SPD

1.1 The purpose of this Supplementary Planning Document ('SPD') is to provide guidance for the planning policies contained in the Guildford Borough Local Plan: Strategy and Sites 2015-2034 ('Local Plan') that deal with climate change and sustainable design, construction and energy. This SPD:

- summarises the policy within the Local Plan that is relevant,
- sets out the information that should be included within energy statements and sustainability statements for major developments,
- sets out the information that should be included within energy and sustainability information for non-major development
- provides a questionnaire that non-major developments can use instead of drafting energy and sustainability information,
- provides guidance on good practice in sustainable design, construction and energy and climate change adaptation, and
- sets out a methodology for calculating carbon emissions and savings for new buildings.

1.2 It is intended principally for applicants for planning permission and their agents, and for planning decision makers. It has been produced to ensure that applicants provide the right information so that planning decision makers can assess whether development proposals comply with Local Plan policies.

1.3 This SPD is a material consideration in planning decisions and decision makers will use it to help determine planning applications.

1.4 This SPD supersedes the Guildford Sustainable Design and Construction Supplementary Planning Document 2011

The structure of this SPD

1.5 **Section 2** sets out the Local Plan policies that are relevant for climate change and sustainable design, construction and energy.

1.6 **Section 3** summarises the requirements set out in the relevant policies and identifies the information that consequently must be submitted by applicants.

1.7 **Section 4** applies to major developments and sets out the information that must be included in energy statements and sets a methodology for calculating carbon emission savings in energy statements.

1.8 **Section 5** sets out the matters that must be covered by the sustainability statements submitted by major developments. It includes a sub-section that contains general guidance on sustainable design and construction and climate change adaptation that should be referred to by developments of all scales.

1.9 **Section 6** sets out the energy and sustainability information that must be submitted by non-major developments (minor and householder applications).

1.10 **Appendix 2** contains a questionnaire that can be submitted by non-major development as an alternative to preparing sustainability and energy information.

2. Relevant Local Plan policies

2.1 Development Plan policies are the starting point for planning decisions. Planning applications are determined against the policies of the Development Plan and other material considerations. The Development Plan currently consists of:

- The Local Plan: strategy and sites 2015-2034,
- the remaining policies of the Guildford Borough Local Plan 2003,
- policy NRM6 of the South East Plan[2],
- Surrey County Council's waste and minerals plans, and
- neighbourhood plans that have passed referendum.

2.2 This SPD provides guidance for three policies in the Local Plan:

- Policy D2: Climate change, sustainable design, construction and energy
- Policy D1: Place shaping, and
- Policy P4: Flooding, Flood Risk and Groundwater Protection Zones.

Policy D2: Climate change, sustainable design, construction and energy

2.3 Policy D2 sets policy requirements for climate change adaptation and mitigation, and for energy and resource efficiency, through sustainable design and construction practice and low and zero carbon energy measures. It also sets out the sustainability principles that must be followed when drafting development proposals. Policy D2 is reproduced below.

Policy D2: Climate change, sustainable design, construction and energy

Sustainable design and construction

(1) Proposals for zero carbon development are strongly supported. Applications for development, including refurbishment, conversion and extensions to existing buildings should include information setting out how sustainable design and construction practice will be incorporated including (where applicable):

- (a) the efficient use of mineral resources and the incorporation of a proportion of recycled and/or secondary aggregates
- (b) waste minimisation and reusing material derived from excavation and demolition
- (c) the use of landform, layout, building orientation, massing and landscaping to reduce energy consumption
- (d) water efficiency that meets the highest national standard and
- (e) measures that enable sustainable lifestyles for the occupants of the buildings

(2) When meeting these requirements, the energy and waste hierarchies should be followed except where it can be demonstrated that greater sustainability can be achieved by utilising measures further down the hierarchy.

(3) Major development should include a sustainability statement setting out how the matters in this policy have been addressed. Smaller developments should include information proportionate to the size of the development in the planning application.

Climate Change Adaptation

[2] See Appendix 2 of the Guildford Thames Basin Heath Special Protection Area Avoidance Strategy SPD

(4) All developments should be fit for purpose and remain so into the future. Proposals for major development are required to set out in a sustainability statement how they have incorporated adaptations for a changing climate and changing weather patterns in order to avoid increased vulnerability and offer high levels of resilience to the full range of expected impacts.

Climate change mitigation, decentralised, renewable and low carbon energy

(5) The development of low and zero carbon and decentralised energy, including (C)CHP* distribution networks, is strongly supported and encouraged.

(6) Where (C)CHP distribution networks already exist, new developments are required to connect to them or be connection-ready unless it can be clearly demonstrated that utilizing a different energy supply would be more sustainable or connection is not feasible.

(7) Proposals for development within Heat Priority Areas as shown on the Policies Map and all sufficiently large or intensive developments must demonstrate that (C)CHP has been given adequate consideration as the primary source of energy.

(8) All (C)CHP systems are required to be scaled and operated in order to maximise the potential for carbon reduction.

(9) New buildings must achieve a reasonable reduction in carbon emissions of at least 20 per cent measured against the relevant Target Emission Rate (TER) set out in the Building Regulations 2010 (as amended) (Part L). This should be achieved through the provision of appropriate renewable and low carbon energy technologies in the locality of the development and improvements to the energy performance of the building. Where it can clearly be shown that this is not possible, offsite offsetting measures in line with the energy hierarchy should be delivered.

(10) Retail units falling within Use Classes A1, A2, A3 and A4 in Guildford Town Centre are not subject to the carbon reduction requirement at paragraph (9).

(11) Planning applications must include adequate information to demonstrate and quantify how proposals comply with the energy requirements at paragraphs 5-10 of this policy. For major development, this should take the form of an energy statement.

*(C)CHP refers to both combined cooling heating and power (CCHP) and combined heating and power (CHP).

2.4 Zero carbon, for the purposes of the policy and this SPD, means that all regulated emissions are eliminated or offset. Regulated emissions are those emissions from buildings that are regulated under Part L of the Building Regulations (emissions from the energy consumed by building services for space heating/cooling and hot-water systems, ventilation and internal lighting). Unregulated emissions are those arising from energy use other than for building services, such as appliances, cooking and IT equipment.

2.5 The energy and waste hierarchies (see Figure 1) set out the steps that should be followed to make development more sustainable. The key principle in both hierarchies is that consumption/demand should first be eliminated wherever possible, and then reduced, before sustainable sources are used to meet any remaining need.

The energy hierarchy	The waste hierarchy
Step 1: Eliminate energy need Developments should be designed to eliminate the need for energy through measures including: • design of the scheme layout • thermally efficient construction methods and materials • design features that eliminate the need for appliances • making optimal use of passive heating and cooling systems **Step 2: Use energy efficiently** Developments should incorporate energy efficient systems, equipment and appliances to reduce the remaining energy demand. Energy storage devices may improve efficiency. **Step 3: Supply energy from renewable and low carbon sources** The remaining energy need should be met from renewable and low carbon sources. **Step 4: Offset carbon emissions** As a final step, remaining emissions should be offset, for example through off-site measures that reduce carbon emissions or remove carbon from the atmosphere.	**Step 1: Eliminate waste** Construction practice and design should reduce waste wherever possible through measures including: • efficient procurement avoiding over-supply and excessive packaging • eliminating waste at the design stage. **Step 2: Reuse waste materials** Reuse waste materials, ideally in its current location, avoiding the energy costs associated with transport and recycling. **Step 3: Recycle/compost waste materials** Recover materials through recycling and substitute for primary materials. Compost organic material to produce rich soils that replace fertilisers, ideally in a closed system to avoid the emissions released by organic material in landfill. **Step 4: Recover energy** If it cannot be reused or recycled, use waste instead of fossil fuels in energy generation to recover embodied energy. **Step 5: Disposal to landfill** Usually the last resort. Disposal to landfill wastes materials and embodied energy.

Figure 1: Energy and waste hierarchies

2.6 Sufficiently large or intensive developments (referenced in paragraph 6 of policy D2) are defined as any of the following at paragraph 4.5.35 of the Local Plan:

- residential only developments of at least 50 dwellings per hectare and/or at least 300 dwellings,
- residential only developments of 50 dwellings or more that are located near a significant source of heat, or
- mixed developments of 50 dwellings or more that include either two or more non-residential uses or a single use that would generate significant amounts of heat or heat demand.

2.7 Major development for the purposes of policy D2 is defined at paragraph 4.5.26 of the Local Plan as:

- residential development of 10 dwellings (gross) or more, and
- non-residential development of 1,000sqm gross new floorspace or more.

2.8 In addition to the above, the Council will consider mixed use developments to be major developments where:

- either of the thresholds for major development are met, or

- where the total amount of residential and commercial development is equivalent to either of the thresholds based on one gross residential unit being equivalent to 100sqm of gross new non-residential floorspace. For example, a development of five gross residential units plus 500sqm of non-residential gross new floorspace, or a development of three gross residential units plus 700sqm of non-residential gross new floorspace, will be considered major developments.

2.9 Where this SPD refers to non-major development, it means any development of a smaller scale than major development, including minor and householder development.

2.10 Retail units falling within Use Classes A1, A2, A3 and A4 in Guildford town centre are not subject to the minimum 20 per cent carbon reduction requirement applied to new buildings by paragraph 9 of policy D2, but must still seek to be energy efficient and reduce carbon emissions as far as possible in line with the principles set out in Policy D2. As a result, they must still provide an energy statement (major development) or energy information (non-major development) that sets out the measures used and the carbon emissions reductions that have been achieved. The town centre boundary is established through Local Plan policy E7 and shown on the Local Plan policies map.

2.11 Where Guildford town centre developments are mixed use and include retail units, the non-retail units are subject to the minimum 20 per cent carbon reduction target and must demonstrate that the target has been met within the energy statement or energy information.

2.12 The emissions covered by paragraph 9 of policy D2 are regulated emissions (see 2.4).

Policy D1: Place shaping

2.13 Policy D1 provides guidance on design. It expects new development to perform positively against Building for Life guidance and requires it to be designed with regard to efficient use of natural resources and the use of passive solar gain. The relevant paragraphs are reproduced below.

Policy D1: Place shaping

[…]

(2) All new development is expected to have regard to and perform positively against the recommendations set out in the latest Building for Life guidance and conform to the nationally described space standards as set out by the Ministry of Housing, Communities and Local Government (MHCLG).

[…]

(10) All new development will be designed with regard to efficient use of natural resources including passive solar gain to maximise the use of the sun's energy for heating and cooling.

[…]

Policy P4: Flooding, Flood Risk and Groundwater Protection Zones

2.14 Policy P4 provides guidance on flooding and groundwater matters. It requires new developments to incorporate Sustainable Drainage Systems (SuDS) to manage surface water drainage unless it would be inappropriate. The relevant paragraph is reproduced below.

Policy P4: Flooding, Flood Risk and Groundwater Protection Zones

[…]

(5) All development proposals are required to demonstrate that land drainage will be adequate and that they will not result in an increase in surface water run-off. Proposals should have regard to appropriate mitigation measures identifies in the Guildford Surface Water Management Plan or Ash Surface Water Study. Priority will be given to incorporating SuDS (Sustainable Drainage Systems) to manage surface water drainage, unless it can be demonstrated that they are not appropriate. Where SuDS are provided, arrangement must be put in place for their management and maintenance over their full lifetime.

[…]

3. Overview of the information required by decision makers

3.1 This section sets out the information that applicants must provide in order for planning decision makers to assess whether the requirements of the planning policies listed in section 2 have been met.

What information is required?

3.2 Policy D2 requires the following documents or information to be submitted to support an application:

(1) Applications for major development must provide:
- a sustainability statement, and
- an energy statement.

(2) Applications for non-major development must include:
- sustainability information proportionate to the size of the development, and
- adequate information to show how the energy and carbon requirements have been met

3.3 The requirements for non-major development set out in (2) above can be satisfied through submission of a completed Climate Change, Energy and Sustainable Development questionnaire – see section 6.

3.4 The following table sets out the information that decision makers need to see in order to assess whether a scheme complies with Local Plan policy regarding climate change, sustainable design, construction and energy.

Table 1 Summary of policy requirements and submission documents required

Summary of policy requirement	Submission document
Policies D2 (1) and (3) Applications should include information setting out how sustainable design and construction practice will be incorporated. Major developments should provide a sustainability statement. Non-major development should include information proportionate to the size of the development. **Policy D2 (1)** Proposals for zero carbon development are strongly supported. **Policy D2 (1a)** Mineral resources should be used efficiently and incorporate a proportion of recycled and/or secondary aggregates. **Policy D2 (1b)** Construction and demolition waste should be minimised. Waste should be reused and recycled at source or separated and collected for recycling in line with the waste hierarchy. **Policies D2 (1c), D2 (2) and D1 (10)** Schemes should be designed to reduce energy use in line with the energy hierarchy, including through landform, layout, orientation, massing and landscaping, with regard to the efficient use of natural resources and to maximise the use of the sun's energy for heating and cooling. **Policy D2 1(d)** New developments should meet the highest national standards of water efficiency. Residential developments of one or more gross units should	**All major development:** Sustainability statement See section 5 **All non-major development:** Sustainability information proportionate to the size of the development May be satisfied through

Summary of policy requirement	Submission document
achieve a water efficiency standard of a maximum of 110 litres per occupant per day. **Policy D1 (2)** New development is expected to perform positively against the recommendations in Building for Life guidance. **Policy D2 1(e)** Schemes should incorporate measures that enable sustainable lifestyles for building occupants **Policy D2 (4)** Developments are required to be resilient to a changing climate and changing weather patterns, incorporating adaptations that reduce vulnerability. **Policy P4 (5)** New developments will prioritise SuDS to manage surface water drainage	submission of a completed questionnaire See section 6
Policy D2 (5-8) Where (C)CHP distribution networks already exist, new developments must connect to them or be connection-ready unless it can be clearly demonstrated that utilizing a different energy supply would be more sustainable or connection is not feasible. Proposals for development within Heat Priority Areas and all sufficiently large or intensive developments must demonstrate that (C)CHP has been given adequate consideration as the primary source of energy. (C)CHP systems must be scaled and operated in order to maximise the potential for carbon reduction. **Policy D2 (11)** Major development must provide an Energy Statement. Non-major development must include adequate information to demonstrate that energy and carbon requirements have been met. **Policy D2 (9-10)** New buildings, except retail only developments within Guildford town centre, must achieve a reduction in carbon emissions of at least 20 per cent against the relevant Target Emission Rate set out in the Building Regulations 2010 (as amended) through provision of appropriate renewable and low carbon energy technologies in the locality of the development and improvements to the energy performance of the building.	**All major development:** Energy statement See section 4 **All non-major development:** Adequate energy information May be satisfied through submission of a completed questionnaire See section 6

When should information be submitted?

3.5 For **full plans** applications, the information referred to in 3.2 covering the matters listed in Table 1 should be provided with the planning application at the point of submission. The process of producing the information should inform emerging proposals and help to steer them towards sustainable outcomes, so it is necessary that the information is produced at an early stage, before the planning application is submitted.

3.6 For **outline planning** applications, the information submitted with the application should cover any matters covered by the outline plan. For example, if an outline plan includes a site layout, it should be accompanied by information setting out how the layout complies with the matters set out in policy and this SPD (e.g. how the layout is designed to reduce energy consumption, adapt to climate change, etc.) The level of detail within submitted information should be proportionate to the level of detail within the application.

3.7 For **reserved matters** planning applications, the information submitted with the application should cover any matters covered by the reserved matters application. For example, if an application includes details of the buildings that will be constructed, it should be accompanied by information showing how the construction will comply with the matters that relate to buildings (e.g. energy and carbon performance, water efficiency, construction and demolition waste management etc.).

3.8 The local validation list will be updated to reflect these timings in due course. The local validation list can be found here:

https://www.guildford.gov.uk/article/22693/Local-Validation-List-

What happens if information is not provided?

3.9 The information described in paragraph 3.2 and in Table 1 is required in order for decision makers to assess whether the climate change and sustainable development requirements set out in planning policy have been met. If the required information is not provided at the right time, it is likely that decision makers will be unable to conclude that the proposal is compliant with planning policy and planning permission will be refused.

Alternative submission documents

3.10 Where accreditation is achieved in any of the following schemes, the energy and sustainability requirements of policy D2 will be deemed to have been met. As a result, sustainability and energy statements (for major developments) and sustainability and energy information (for minor developments) will not be required:

- for commercial schemes: BREEAM New Construction 'Outstanding' or 'Excellent'
- for refurbishments: BREEAM refurbishment 'Outstanding' or 'Excellent'

3.11 Where the following accreditation is achieved, the energy requirements of policy D2 (paragraphs 5-11 only), but not the other sustainability requirements identified in this SPD, will be considered met, and further energy information will not be required:

- for any new buildings: PassivHaus
- for building retrofit schemes: PassivHaus EnerPhit

3.12 For the accreditation schemes mentioned above, the Council will need to see information that demonstrates that the accreditation can be achieved on the proposed scheme, and will need to see proof that it has been achieved once the development has been completed (i.e. through submission of certification).

Other matters

3.13 When granting planning permission, the Council will apply a condition requiring work to be carried out in accordance with the proposals and measures set out in the submitted energy and sustainability statements/information.

3.14 Any documents submitted to support a planning application should have text that can be highlighted and copied throughout (i.e. the text should not be an image of a page, and the file should not be restricted or encrypted to prevent the copying of text). This is because decision makers may need to copy information from the document (e.g. to check calculations) or to search the document for specific references.

4. Energy statements

4.1 Energy statements must be provided for **major development**. They must demonstrate how reductions in carbon emissions will be achieved and quantify the total reduction. They must also demonstrate that the approach to energy complies with the energy hierarchy, and that any energy measures proposed are appropriate and will be effective[3]. This section sets out the information that needs to be included. In line with usual practice, the name and position/job title of the person producing the statement should be included within the document.

4.2 **Non-major developments** do not need to submit an energy statement but are instead required to submit "adequate information" that shows the energy requirements of policy D2 have been met – see section 6 for more information about non-major development.

What do energy statements need to cover?

4.3 There is a large amount of detailed guidance covering the preparation of energy statements available; for example, the guidance provided by the Greater London Authority:

https://www.london.gov.uk/what-we-do/planning/planning-applications-and-decisions/pre-planning-application-meeting-service-0).

4.4 This SPD is not intended to replace other guidance, and anyone preparing an energy statement should follow established best practice. However, alongside this it is important that the following information is included in the energy statement in order for decision makers to be able to assess whether proposals are compliant with Local Plan policy.

1. A non-technical summary
2. A Combined Cooling Heating and Power (C)CHP appraisal or connection strategy.
3. An appraisal of energy technologies (if the scheme proposes provision of low or zero carbon energy).
4. A carbon reduction calculation for each building or type of building supported by modelling outputs.

The Non-technical Summary

4.5 A non-technical summary should be included at the front of the energy statement to provide key information for planning decision makers. The summary must include the following information.

1. A description of the scheme including:
    - the number of each different type of residential unit (i.e. number of flats, number of terraced houses, number of detached houses etc. and number of bedrooms in each unit or type),
    - a summary of the floor area (m^2) proposed for each type of non-residential use.
2. A summary of the heat network appraisal (see below) or connection strategy
3. A summary of the low and zero carbon energy appraisal (if the scheme proposes provision of low or zero carbon energy), and

[3] Paragraph 4.5.39 of the Local Plan: Strategy and Sites states that for energy technologies to be considered appropriate, they must be effective.

4. A table showing the carbon reduction calculation(s) for each building or type of building that follows the methodology set out later in this section (see 'Carbon emissions reduction calculation' on page 17) and a statement of which emission factors have been used.

Heat networks and Combined Cooling Heating and Power ((C)CHP) appraisal

4.6 Policy D2 states that the development of low and zero carbon and decentralised energy, including (C)CHP distribution networks, is strongly supported and encouraged. The policy also places requirements for developments to connect to (C)CHP networks where they exist and for developments within heat priority areas[4] or that are "sufficiently large or intensive" to give (C)CHP networks adequate consideration as the primary source of energy.

4.7 Policy D2 was developed during a period when heat networks specifically powered by (C)CHP enjoyed strong support within national policy and energy strategies produced by the then Department of Energy and Climate Change (DECC). In recent years, national policy and guidance has broadened that support to include low carbon heat networks in general. The use of renewable energy technologies to power heat networks has become more common and, at the same time, the decarbonisation of the national electricity grid means that the carbon savings that result from using electrically powered heat-producing technologies, such as heat pumps, have increased dramatically while the carbon savings that result from the use of highly efficient gas CHP engines remain largely the same. The government is proposing to change the emission factors (see 4.47) that are applied to mains gas and grid electricity for Building Regulations purposes, which will mean that the reality of the decarbonising electricity grid and the benefit of electric technologies will be reflected in the technical assessments that are used to assess different forms of energy in the Building Control process.

4.8 In view of these changes, and in order to comply with principle of low carbon development enshrined in Policy D2, policy support for (C)CHP heat networks should be interpreted as support for low carbon heat networks in general. The heat networks that result in the lowest carbon emissions will receive the strongest support in line with this principle, whether driven by (C)CHP or other low or zero carbon technologies.

4.9 In order to show that the requirements of policy D2 have been met, the energy statement should include an appraisal of the feasibility of provision or connection to low carbon heat networks. The content of the appraisal depends on the characteristics of the development and/or where it is located, as set out below.

Developments within the vicinity of existing heat networks

4.10 Policy D2 (6) requires all new developments to connect, or be connection ready, where a heat distribution network already exists.

4.11 The energy statement must set out the actions taken in order to investigate whether heat networks exist within the vicinity of the site and the results of the investigation. Where Policy D2 refers to heat distribution networks, it covers a broad range of scales from small scale systems that distribute cooling and/or heating to a number of dwellings or units within one building up to district scale systems that serve entire neighbourhoods (district heating systems). The investigation of opportunities should cover all scales and should not be limited to district heating systems.

[4] Heat Priority Areas have been established through the Guildford Renewable Energy Mapping Study available at https://www.guildford.gov.uk/article/22866/Guildford-Renewable-Energy-Mapping-Study

4.12 Where such networks exist and developments propose to connect to them, the energy statement should set out details showing how connection will occur (a connection strategy).

4.13 Where such networks exist, and developments do not propose to connect to them, the energy statement must set out clear reasons as to why the connection is not feasible, or why an alternative source of energy would be more sustainable.

4.14 Where a development proposes not to connect to an existing network that is within the vicinity, it must still be connection-ready and the energy statement must set out how this is the case. Developments will be considered to be connection-ready if they use a centralised communal wet heating system and comply with the minimum requirements outlined in the Chartered Institute of Building Services Engineers (CIBSE) Heat Networks Code of Practice, and this should be reflected in the evidence provided in the energy statement.

Developments within heat priority areas and "sufficiently large or intensive developments"

4.15 Policy D2 requires developments within heat priority areas (see Appendix 2 for a map of the heat priority areas) and all "sufficiently large or intensive developments" (see paragraph 2.6 for the definition of this term) to give adequate consideration to heat distribution networks as the primary source of energy. The energy statement for such developments will therefore need to include an appraisal that either sets out that a heat network will provide the primary source of energy for the development or clear evidence that it is not feasible and/or that an alternative would be more sustainable.

4.16 Where a heat distribution network is not suitable for the whole of a site, it should be implemented on any part of the site that is suitable; for example, on the area with the highest density of buildings and/or in the vicinity of a source of heat or a baseload of heat demand. The appraisal therefore will need to assess the potential for heat networks on different parts of the site if it is not feasible for the whole of the site.

Scale and design of heat networks

4.17 Policy D2 requires (C)CHP systems to be scaled and operated in order to maximise the potential for carbon reduction. This same principle should be applied to all heat networks. In order to meet this requirement, the energy statement should set out how a proposal for a network complies with the CIBSE Heat Networks Code of Practice.

4.18 For CHP based heat networks, carbon and financial savings will only be generated when it is running so it will be more energy efficient and cost-effective the more it runs. As a result, a new CHP system will likely only be appropriate where there is a high and constant demand for heat. A recommended rule of thumb is at least 4,500 – 5,000 hours per year, depending on the application. The scale of the system should be determined by the heat load and demand profile. If there is a high demand for cooling then CCHP, which also provides cooling, may also be environmentally and economically viable. (C)CHP systems should be designed and operated to be energy efficient, with the selection of optimum operating temperatures and measures to minimise heat losses. The energy statement should set out consideration of these issues in order to demonstrate that the scaling and operation maximises carbon reduction.

4.19 In order to facilitate connection from other developments, new heat networks, including building level systems, should be designed to be able to expand to connect with future systems. The energy statement should set out how this will be facilitated.

4.20 New heat networks should be smart, incorporating data collection, monitoring and performance management into the design.

4.21 Proposals for new heat networks should show that the chosen technology, or mix of technologies, will deliver the greatest carbon saving.

CHP/(C)CHP heat networks

4.22 CHP engines can be powered by a number of fuels. When a CHP engine is powered by natural gas, it can be considered a low carbon technology because it operates at very high efficiency resulting in low carbon heat and power. The efficiency is increased if the system also provides cooling (CCHP). National emission factors are likely to be updated in 2020 (see 4.47) and this change will mean that gas technologies will compare less favourably with electric technologies than at present, and consequently the benefits of gas CHP in the assessment will reduce. This change should be taken into account when selecting a CHP technology alongside the continuing decarbonisation of grid electricity.

4.23 Zero carbon fuels should be favoured, taking into account potential impacts on air quality. Where gas engines are proposed, the distribution network should be designed to facilitate the replacement of the gas engine with a zero-carbon alternative once the gas engine reaches the end of its life[5]. Where biomass engines are proposed, the Council will take into account the short to medium term impact on carbon emissions that results from burning wood. See the section 'Biomass' on page 16 for more information on this issue.

4.24 It can be expensive and difficult to convert high temperature heat networks powered by gas boilers or gas (C)CHP engines to low carbon/renewable sources such as heat pumps and waste heat because heat networks that use these sources typically operate at lower temperatures than those fuelled by gas. Therefore, in order to facilitate a future shift to zero carbon energy, the system should be designed to be able to operate at lower temperatures suitable to very low carbon heat sources (fifth generation networks run at a temperature close to ambient ground temperature). This should not compromise the ability of the system to run at the optimal temperature for the energy source used at the outset.

4.25 Heat networks based on natural gas CHP systems should be supplemented by heat from renewable sources wherever feasible. Integrating heat pumps into district heating can deliver large CO_2 emissions reductions[6].

4.26 CHP heat networks run at higher temperatures than heat networks powered by renewable heat technologies and can present an overheating risk for the building in which it is installed. Overheating is a key consideration in climate change adaptation. Heat networks should be designed to prevent overheating, including through the choice of heat technology.

Significant sources of heat

4.27 The definition of "sufficiently large or intensive developments" includes residential developments of 50 dwellings or more that are either located near a significant source of heat or would include two or more non-residential uses that would generate significant amount of heat or heat demand.

4.28 Significant sources of heat include buildings and land uses that produce waste heat in a quantity large enough to be captured for use in a heat network. This can include industrial buildings, incinerators and large infrastructure facilities. Some environmental features should also be considered significant sources of heat, such rivers and lakes, the heat from which can be captured using water source heat pumps.

[5] Zero carbon fuels for CHP include biomass, biomethane and, in the longer term, hydrogen.
[6] See Heat Pumps in District Heating (DECC, 2016) at https://www.gov.uk/government/publications/heat-pumps-in-district-heating

Low and zero carbon energy appraisal

4.29 There are a number of low and zero carbon energy technologies available on the market that can supply electricity and/or heat to residential and commercial buildings. These include (but are not limited to):

- ground, air and water source heat pumps,
- solar photovoltaic (electricity),
- solar thermal (heat),
- small scale wind turbines,
- standalone wind turbines,
- biomass power and heat,
- small scale hydro power,
- geothermal energy,
- micro CHP, and
- Combined Heat and Power (CHP) systems.

4.30 Where the minimum 20 per cent carbon reduction required under Policy D2 (9) is achieved wholly or in part through the provision of low and zero carbon energy, the policy requires the selected technologies to be "appropriate". Paragraph 4.5.39 of Policy D2 defines "appropriate" technologies as those that would be effective. Therefore, the energy statement should demonstrate that the most effective technology or mix of technologies has been selected. The energy statement should quantify the carbon reduction that will be achieved, supporting the figure with calculations.

4.31 In order to be sure that proposed energy technologies will be effective, decision makers will need to be sure that the building occupants will use them to meet all or most of their energy needs. As a result, technologies that may be used sporadically (including fireplaces and log burners) will not be accepted as low carbon energy technologies for the purposes of policy D2. This is not the case for biomass heating technologies, which are usually primary sources of heat and/or power for the building in which they are installed (however, see 'Biomass' later in this section for further information about how wood fuels should be considered).

4.32 The appraisal should consider all reasonable options for renewable and low carbon energy, assessing the feasibility and benefits of each in turn. Decision makers will need this information in order to confirm that the most effective and appropriate energy technology has been selected. The appraisal should reflect current costs and up-to-date technology specifications alongside local factors. In particular, where the Energy Statement assesses the carbon saving potential of energy technologies, it should use real-world performance and take into account the future decarbonisation of the national grid, rather than relying on the emission factors used in the Building Control system which are updated infrequently (see 'Emission factors' on page 17).

4.33 Where schemes propose a mix of renewable energy technologies, it will be important to demonstrate how they will work in tandem and, where applicable, how they will be integrated into a heat network (for heat generating technologies) and, again where applicable, also how they will integrate with a cooling system/strategy.

Heat pumps

4.34 The government envisages that heat pumps (alongside heat distribution networks) will be the principal means of providing heat for buildings once the new "Future Homes" standard is fully

implemented[7], and expects the supply chain for these technologies to develop rapidly in the next few years. When appraising heat pump technologies, at least two heat sources (from air, water and ground) should be considered and a separate appraisal of each presented.

4.35 Appraisals of heat pumps should take account of the high efficiencies (expressed as the Coefficient of Performance, or COP) at which heat pumps provide useful heat when calculating the carbon emissions they would produce when running on grid electricity. The carbon intensity per kWh of energy output should be the prime concern, as opposed to the carbon intensity of the energy input which, although important, is not the decisive factor in energy appraisals. The reason for this is that while gas has a lower carbon intensity than electricity under SAP 2012 emission factors[8], domestic heat pumps are typically over three times more efficient than gas boilers (e.g. a COP of around 300 per cent or higher), so the projected amount of carbon per unit of heat produced will be lower than with a domestic gas boiler that has an efficiency of c. 90%, even if SAP 2012 emission factors for grid electricity and mains gas are used. The calculated carbon emissions for heat pumps running on grid electricity will be considerably lower than gas boilers if up-to-date emission factors are used[9].

4.36 Heat pumps work best when producing heat at a lower temperature than traditional boilers. As a result, it is essential that buildings that rely on heat pumps are built to high levels of energy efficiency (well insulated and draught-proof) in order for the heating system to be efficient, both in terms of cost and energy use. They generally perform better with underfloor heating systems, but if radiators are used, they should be larger than with traditional gas-fed or electric systems to increase the area of heat emitting surfaces.

Biomass

4.37 Energy and heating systems that are powered by biomass (such as wood chips, wood pellets and organically derived fuels like biomethane) are usually considered to be zero carbon in operation in the long term because while burning the biomass (or digesting it in the case of biomethane) releases carbon dioxide, this carbon dioxide was originally extracted from the atmosphere when the energy crop grew, and will be removed again when the crop is replaced, adding no new carbon to the carbon cycle. This analysis does not take into account the energy required to harvest/extract, process and transport the fuel, as well as carbon that may be released from the soil in the process of planting.

4.38 Additionally, biomass sourced from forestry results in a negative impact on the climate in the short and medium term because burning wood releases carbon quickly but growing trees to a size at which they can be harvested can take several decades. As a result, burning wood results in a sharp spike in atmospheric carbon that takes decades to fall. This is not the case for quick-growing energy crops; for example, any carbon released when burning annual crops like straw will be removed from the atmosphere within a year as the next crop grows. Additionally, wood chips and wood pellets are often sourced abroad and imported over long distances resulting in large transport emissions. Where wood fuelled energy systems are proposed, the energy statement should take into account both the impact of burning on atmospheric carbon levels in the short to medium term and the potential embodied carbon emissions that result from harvesting, extraction, processing transport of the fuel.

[7] See the government's Future Homes consultation at https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings

[8] The SAP 2012 carbon emission factors are 519g CO_2 per kWh for grid electricity and 216 for mains gas

[9] The proposed changes to SAP emission factors (SAP 10.1) would reduce emissions from grid electricity to 136g CO_2 per kWh and mains gas to 210g CO_2 per kWh

4.39 Biomass energy can have negative impacts on local air quality which should also be taken into account.

Wind turbines

4.40 The borough is within the 30km wind turbine consultation zone for Gatwick Airport. Where free standing wind turbines are proposed, the Council will consult with the aerodrome operator and/or the operator of technical sites (e.g. radar stations) regarding the safety of air traffic. The Council will also consult with NATS (National Air Traffic Control) and review its standing advice.

Carbon emissions reduction calculation

4.41 All new buildings, except retail-only developments in Guildford town centre, must achieve a carbon emissions rate that is 20 per cent lower than the relevant maximum emission rate set out in UK Building Regulations 2010. The carbon emission standards in the 2010 regulations were improved through an amendment in 2013. Therefore, the baseline for the 20 per cent improvement are the standards in the 2010 regulations as amended in 2013.

4.42 This section sets out a methodology that should be followed when calculating carbon savings, and guidance on how to present the results clearly within the energy statement.

Building regulations

4.43 The national mandatory standards for construction are set out in the building regulations. They cover all aspects of construction and set minimum Target Fabric Energy Efficiency (TFEE) rates as well as overall maximum carbon emissions rates for new buildings. The maximum carbon emissions rate for a building is referred to as the Target Emission Rate (TER). The TER differs for different types buildings (e.g. flats, detached dwellings, offices) and is expressed in annual kilograms of carbon dioxide per square metre.

4.44 The emission rate of a proposed building is based on its design specification and is expressed as:

- Dwelling Emission Rate (DER) for self-contained dwellings and individual flats (excluding common areas). The DER is the annual carbon dioxide emissions of the proposed dwelling expressed in kilograms per square meter.
- Building Emission Rate (BER) for buildings other than dwellings. The BER is the annual carbon dioxide emissions of the proposed building expressed in kilograms per square metre.

4.45 Under the building regulations, the DER or BER for the proposed building must not exceed the TER.

4.46 The DER or BER of a proposed building is established through modelling. The approved national calculation methods used in the building control system are the Standard Assessment Procedure (SAP) for dwellings and the Simplified Building Energy Model (SBEM) for commercial buildings. Other models are sometimes used to give more detailed and accurate information. The models make assumptions about the embodied carbon in different energy sources like grid electricity and mains gas, referred to as emission factors.

Emission factors

4.47 When undertaking modelling, applicants are strongly encouraged to use the SAP 10 emission factors as these reflect current, real-world emissions much more closely than the SAP 2012 emission factors (the emission factors in place at time of writing). After the SAP 10 emission factors are adopted nationally, emissions calculations based on the SAP 2012 emissions

factors will not be accepted. The SAP 10 emission factors are expected to be introduced in 2020 and as a result the period prior to introduction should be considered as a period of transition between the two. The energy statement should state clearly which emission factors have been used.

4.48 The key impact of the introduction of SAP 10 emissions factors will be a dramatic reduction in the carbon emissions rate for grid electricity, which reflects the continuing decarbonisation of the national grid through the increasing use of renewable energy. The electricity emission factor is proposed to change from 0.519 kg of CO_2 per kWh to 0.136 CO_2 per kWh[10]. As a result, electric technologies, such as heat pumps, will be considered to perform far better on carbon emissions under SAP 10 than under SAP 2012 in the Building Control system.

Guildford Local Plan carbon standards

4.49 Local Plan policy D2 requires each new building (except retail only developments in Guildford town centre; see 2.10) to achieve a reasonable reduction in regulated carbon emissions (the emissions covered by the Building Regulations) that is at least 20 per cent lower than the relevant TER in Building Regulations. Additionally, the carbon reduction must be achieved in a manner consistent with the energy hierarchy by prioritising demand reduction and efficiency measures before moving on to low carbon energy provision. The carbon reduction applies to each new building individually and not to the development as a whole.

4.50 When meeting the 20 per cent carbon reduction, policy D2 allows for the use of low carbon energy technologies "in the locality of the development", in line with the Planning and Energy Act 2008. This means that energy technologies do not necessarily need to be mounted on, or fall within the curtilage of, the new buildings. Low carbon energy located away from a building will count toward the carbon reduction of the building only where the low carbon energy is supplied directly to the building e.g. through a decentralised energy network. If the energy is exported to the national grid, it will not count towards the carbon reduction of the new building.

4.51 While retail only units in the town centre are not subject to the minimum 20 per cent carbon reduction, they are still subject to the energy hierarchy and the overarching requirement to deliver sustainable design and construction practice and therefore must still provide a carbon reduction calculation.

4.52 Larger residential schemes often use standard dwelling types across a site. Where this is the case, carbon reduction calculations will be necessary for each type of dwelling but not for each individual dwelling. However, care must be taken to ensure that the energy use and carbon emission data for a dwelling type is genuinely representative of the buildings within that type.

4.53 There may be instances where there are variations within a dwelling type. This may be because different dwellings of the same type would have different energy performance characteristics because they are in a different part of the site, or have a different orientation and so do not receive the same level of sunlight. There may also be variations within a type due to differential use of low and zero carbon technologies; for example, dwellings with south facing roofs may employ solar panels while other dwellings of the same type may employ different low carbon technologies. In instances where buildings within a type would have a different carbon emission performance, it will be necessary to provide calculations for each individual unit or group of identical units so decision makers can be certain that each dwelling will achieve the required carbon reduction.

[10] This is the proposed SAP 10.1 emission factor published alongside the Future Homes consultation in October 2019

4.54 In schemes where each dwelling is a bespoke design it is necessary to provide calculations for each individual dwelling.

Methodology for the carbon reduction calculation

4.55 In order to demonstrate that the energy hierarchy has been followed and that, accordingly, reduction in energy demand has been prioritised over the use of low and zero carbon energy, it is necessary to show the carbon reduction achieved both before and after the provision of low and zero carbon energy separately. The baseline for the carbon reduction should be the relevant TER.

4.56 The steps in the process can be seen in Table 2.

Table 2 Methodology for calculating carbon emissions at each stage of the energy hierarchy

	Stage	Emissions rate (DER or BER)	% Reduction from baseline
Step 1	Baseline: the relevant Part L TER for the proposed scheme	A	-
Step 2	Carbon emissions of the proposed building before low and zero carbon energy provision	B	(A-B)/A*100
Step 3	Carbon emissions of the proposed building after low and zero carbon energy provision	C	(B-C)/A*100
Step 4	**Total cumulative reductions from baseline**	**A-C=D**	**(A-C)/A*100**

Step 1

4.57 The energy statement must first establish the baseline(s) for carbon emissions reductions. The baseline for each building is the TER set out in Part L 2010 (as amended) of the Building Regulations. Building Regulations approved compliance software must be used to produce the TER. For building types that do not have a TER set out in Building Regulations, typical emission rates should be used, and the energy statement should set out how the correct rate has been established. The type and level of information needed in these instances will be decided on a case-by-case basis.

4.58 When determining the baseline, it should be assumed that the heating would be provided by gas boilers and that any active cooling would be provided by electrically powered equipment. If a communal heating system is proposed, this should be factored in at Step 1 and the TER should be based on the assumption that energy supply for the building would be provided by communal gas boilers and not individual devices in each dwelling.

Step 2

4.59 The DER or BER is first established at Step 2. The carbon emissions reductions at this stage should be based on energy demand reduction measures only, including low energy design, energy efficient building fabric (passive design measures) and energy efficient building services (active design measures). Energy demand reduction measures should be considered at the outset of design work on the new scheme and follow the energy hierarchy; passive measures should be maximised before moving on to active measures.

4.60 Passive design measures include optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading (see section 5 for more information on low energy design). Active design measures include high efficiency lighting and efficient mechanical ventilation with heat recovery.

4.61 At Step 2, it should be assumed that heating will be provided by gas boilers and that any active cooling will be provided by electrically powered equipment. This is because low and zero carbon energy sources (including CHP/(C)CHP) should not be factored in until Step 3.

4.62 The gas boiler performance must be assumed to be equal with Part L notional values for boiler efficiency and controls in order to only show the performance of the energy efficiency measures that will be installed.

Step 3

4.63 After the demand for energy has been minimised, all schemes should seek to meet as much residual energy need as possible from low and zero carbon energy sources. The reduction in carbon emissions from these systems is factored in at Step 3.

4.64 Where developments propose to connect to existing or planned heat networks, the carbon factor associated with the heat (and power if relevant) supplied by the network should be obtained from the network operator and provided in the energy statement. The assumptions used to derive the carbon factor should be set out, including estimated heat losses. The following information should be provided for each heat source: the proportion of heat provided by the source, the generation plant efficiencies and the type of fuel used. This information is necessary for decision makers to have confidence in the claimed carbon reductions.

4.65 Where developments propose low and zero carbon energy technologies other than (C)CHP, they should be selected on the basis of the appraisal detailed at 4.29 onwards.

4.66 All energy systems should be designed by a suitably qualified professional. Once a low or zero carbon energy system has been designed, heat and/or electricity output data will be available. The carbon emission savings can be calculated by deducting the carbon emissions of the low or zero carbon energy system proposed at Step 3 from the carbon emissions of the energy system proposed at Step 1. For electrical systems like heat pumps, the carbon emissions associated with the electricity required to run the system must be taken into account.

Step 4

4.67 Step 4 presents the total carbon savings from both demand reduction measures and the provision of low and zero carbon energy. This figure should tally with the carbon reductions shown at Steps 2 and 3. The total percentage reduction should be the same as the percentage reduction at Step 2 plus the percentage reduction at Step 3.

Presenting the results of the carbon reduction calculation

4.68 Planning decision makers must be able to see that the proposed scheme has followed the energy hierarchy and that new buildings will achieve the required minimum 20 per cent reduction in carbon emissions. If this information is not available at the appropriate time (see page 9), the result could be delays to the planning process or refusal either to grant permission (whether full, outline or reserved matters) or to discharge relevant planning conditions. As a result, it is important that the information is presented clearly and that it reflects the methodology set out in Table 2. Table 3 shows an example of how to set out the information clearly.

4.69 TER, DER and BER figures shown in the carbon reduction calculation table must be supported by SAP or SBEM modelling outputs, or outputs from a robust equivalent modelling method such as Dynamic System Modelling (DSM) or Building Regulations United Kingdom Part L (BRUKL). The outputs are necessary to prove that the figures used in the calculation are robust. It is not necessary to include all modelling output worksheets – decision makers only

need to see a single output sheet for each building or type of building that shows the TER and the DER or BER. The sheet(s) should be attached to the energy statement in an appendix.

4.70 EPC certificates will not be accepted as proof of energy performance as EPCs do not reliably predict energy usage in buildings[11].

Table 3 Example of table for reporting emissions reductions calculations

Reference	A. TER (kg CO_2/m2)	B. DER/BER before low/zero carbon energy (kg CO_2/m2)	C. DER/BER after low/zero carbon energy (kg CO_2/m2)	D. Total % carbon reduction from TER (kg CO_2/m2)
e.g. “Type A”	22.47	20.19 (-10.15%)	17.56 (-11.7%)	21.85%
e.g. “Type B”	12.54	10.43 (-16.82%)	9.38 (-8.37%)	25.19%
e.g. Plot 5	18.28	14.35 (-21.5%)	14.35 (-0%)	21.5%
e.g. Unit 3	27.2	22.8 (-16.17%)	20.6 (-8.08%)	24.26%
e.g. Northwest unit	32.6	27.43 (-15.86%)	24.89 (-7.79%)	23.65%

4.71 The columns in Table 3 provide the following information:

- The first column provides a reference for the relevant building or building type. Any reference can be used but it is important that it relates back to the planning application. The relevant SAP/SBEM or other modelling sheets that are submitted to prove the figures are correct must be marked with the same reference.
- Column A sets out the TER for the building (Step 1). This must match the TER shown on the relevant modelling sheet(s).
- Column B sets out the DER or BER for the building before low and zero carbon energy is added into the modelling (Step 2). The number in brackets shows the percentage carbon reduction delivered through design and fabric measures based on the calculation shown in Table 2.
- Column C sets out the DER or BER for the building after low and zero carbon energy is added into the modelling (Step 3). The number in brackets shows the percentage carbon reduction delivered through the use of low and zero carbon technology based on the calculation shown in Table 2.
- Column D shows the overall reduction in carbon emissions as a result of all measures based on the calculation shown in Table 2 (Step 4). The percentage carbon reduction should tally with the figures on the relevant modelling output sheet(s).

4.72 Ideally, modelling summary sheets should be provided that support the data in both columns B and C. If modelling sheets are not available for both these columns, sheets should be provided for one of the columns and an explanation of how the figures for the other column have been derived should be provided. Whatever data is submitted, it should be adequate for decision makers to have confidence in the figures in the two columns.

[11] Innovate UK (2016) https://www.gov.uk/government/publications/low-carbon-buildings-best-practices-and-what-to-avoid

4.73 The calculation should be supported by a commentary that explains the mix between energy demand reduction measures and renewable and low carbon energy provision. The commentary should demonstrate that the development has been designed in accordance with the energy hierarchy, employing a low energy design and 'fabric first' approach that maximises energy demand reduction before reducing carbon emissions further by supplying energy from renewable and low carbon technologies.

4.74 Where it is not apparent from the carbon reduction calculation(s) that energy demand reduction has been prioritised (e.g. because the carbon reduction at column B is low), the commentary should explain why this is the case and why it is not feasible or viable to achieve further carbon reductions through energy demand reduction measures.

Unregulated emissions

4.75 Policy D2 part (1)(e) requires schemes to include measures that enable sustainable lifestyles for building occupants, which could include measures that reduce unregulated emissions[12] e.g. through the installation of energy saving appliances, or design measures like drying areas that remove the need for tumble driers. Unregulated emissions must not be factored in to the carbon reduction calculation described in this section because the minimum 20 per cent reduction must be met wholly through reductions in regulated emissions. An additional carbon reduction calculation may be included in the sustainability statement to demonstrate compliance with Policy D2 (1e), but this will not count towards the minimum 20 per cent carbon reduction shown in the energy statement.

[12] Regulated emissions are those that result from building services (e.g. heating, cooling, hot water, pumps, lighting). Unregulated emissions are those from other sources (e.g. appliances, IT equipment, catering facilities).

5. Sustainability statements

5.1 Policies D2, P1 and D4 set a number of requirements covering sustainable design and construction matters. This section provides guidance on those matters and sets out the information that **major developments** should submit so that decision makers can assess whether the schemes comply with Local Plan policy. This section does not cover compliance with the carbon emission and low and zero carbon energy requirements of Policy D2 paragraphs (5) to (11) as compliance with these requirements is established through energy statements - see section 4. In line with usual practice, the name and position/job title of the person producing the statement should be included within the document.

5.2 **Non-major developments** do not need to submit a sustainability statement, but instead should submit sustainability information that is proportionate to the size of the development – see section 6. This requirement can be met by submitting a completed Climate Change, Energy and Sustainable Development questionnaire (see Appendix 2). The guidance provided in the 'sustainable design and construction guide' later in this section should still guide non-major development proposals and applicants should refer to it when drafting sustainability information or completing the questionnaire.

What do sustainability statements need to cover?

5.3 It is expected that developers of major developments will have access to either in-house or external expertise in sustainable development. These experts will be able to guide emerging schemes to ensure that they comply with the sustainability requirements of the local plan, and will be able to draft a sustainability statement setting out how compliance has been achieved.

5.4 This section sets out guidance on sustainable design and construction and climate change adaptation, but it is not intended to be exhaustive or to replace the large amount of guidance that is available elsewhere. However, the sustainability statement must address the following matters in order to demonstrate that the proposals comply with Local Plan policy:

1) Natural resources

   a. Efficient use of mineral resources and incorporation of a proportion of recycled and/or secondary aggregates.
   b. Minimisation of waste and reuse of excavation and demolition waste.

2) Sustainable design

   c. The Council's strong support for zero carbon development.
   d. Reduction of energy demand in line with the energy hierarchy, including through landform, layout, orientation, massing and landscaping, with regard to the efficient use of natural resources and to maximise the use of the sun's energy for heating and cooling.
   e. Performing positively against Building for Life guidance.
   f. Incorporation of measures that enable sustainable lifestyles for building occupants.
   g. Compliance with the highest national standards of water efficiency, which for residential developments of one or more gross units means achieving a water efficiency standard of a maximum of 110 litres per occupant per day.

3) Climate change adaptation

h. Adaptation that provides resilience and reduces vulnerability to a changing climate and changing weather patterns and the full range of expected impacts.
i. Prioritisation of SuDS to manage surface water drainage

5.5 Information and guidance on these matters are set out in the following 'sustainable design and construction guide'.

5.6 This SPD is a material consideration in planning decisions and the guidance in the guide will help decision makers to decide whether schemes comply with the sustainability requirements set out in Local Plan policy.

Sustainable design and construction guide

Introduction

5.7 This guide highlights the key sustainable design and construction and climate change adaptation principles and matters that development proposals should take into account (alongside good design, place-making and other considerations). The guidance should not be considered exhaustive; bodies such as the Building Research Establishment and the UK Green Building Council provide extensive guidance covering a range of matters and issues related to sustainable development. The guidance that follows sets out approaches that are generally considered to be good practice. However, there may be instances where local circumstances mean that a greater sustainability benefit can be achieved by taking a different approach.

The energy hierarchy

5.8 The energy hierarchy (see Figure 1 on page 5) is a fundamental principle of sustainable development. It shows the sequence of steps that should be taken in order to reduce operational carbon emissions from new developments.

5.9 Energy demand should be eliminated in the first instance wherever possible. Where energy demand cannot be eliminated, energy use should be reduced as much as possible through efficiency. After these steps, the remaining energy demand should be met from renewable and low carbon energy sources. This approach is often summarised as "**be lean, be clean, be green**".

5.10 The development industry often uses the phrase "**fabric first**", meaning that energy demand should be reduced by maximising the performance of the components and materials that make up the building fabric and designing the building to make best use of the surrounding environment, before improving efficiency further through the use of efficient building services or lowering carbon emissions further through low carbon energy.

5.11 Once energy need is reduced as far as possible, and as much of the remaining energy need has been met through low and zero carbon energy, schemes seeking to deliver zero carbon development can offset any remaining carbon emissions through actions that either prevent an equivalent amount of carbon being released or remove an equivalent amount of carbon from the atmosphere. Examples of offsetting include funding projects that promote tree planting to sequester atmospheric carbon, or projects that support renewable energy and energy efficiency in other places. Offsetting, which falls at the final stage of the energy hierarchy, is considered to be an option of last resort.

5.12 When considering a proposal that includes offsetting, decision makers will consider:

- what the offsetting projects are,

- who is running them and how they are run,
- the expected life of proposed measures (including the expected term for carbon sequestration),
- whether the projected carbon savings are realistic, match the amount of carbon to be offset and how this has been determined, and
- whether the offsetting measures are truly additional to the development.

Zero carbon development

5.13 Proposals for zero carbon development are strongly supported under policy D2. Zero carbon, for the purposes of the policy, means that emissions from all *regulated* energy use are eliminated or offset. Regulated energy refers to energy from building systems (e.g. heating, lighting, hot water) as opposed to unregulated emissions that refers to energy from other sources, like appliances. Fully zero carbon and carbon negative developments, that eliminate emissions from all regulated and unregulated sources, are also strongly supported.

5.14 Where schemes have been designed to achieve zero carbon, the information submitted with the application should show the measures employed and the stages at which carbon reductions have been achieved (e.g. demand reduction, low and zero carbon energy and offsetting). This information must be consistent with the submitted energy calculations.

Site layout, landscaping and urban form

5.15 To maximise solar receipts and reduce shading, taller buildings in a development should be located to the north of the site. Locating parking and garages to the north of a building will allow solar receipts to be maximised in southerly orientated living spaces. Pitched roofs are a common feature in the local vernacular and care should be taken to ensure that roof heights do not overshadow neighbouring buildings unnecessarily.

5.16 The relationship between buildings and open spaces is important to create a quality public realm and a comfortable microclimate for people using outdoor spaces. Placing buildings too close to each other can result in excessive shadowing and little solar gain on external surfaces. Well positioned buildings will create spaces that maximise receipts of natural light and heat.

5.17 Some building designs have inherently different energy requirements to others. For example, flats and terraces are generally more energy efficient than detached or semi-detached dwellings because they have fewer external walls relative to living space from which heat can escape.

5.18 Well placed deciduous trees can increase the shading and natural cooling of buildings and spaces during the summer months and allow more natural light and heat to be received during the winter months after the leaves have fallen and when demand for heating and lighting is highest. Tree planting can also be used to shelter buildings from the wind and minimise unwanted cooling.

5.19 The slope or topography of a site should be considered. Partially or fully building into a slope or setting a building into the ground will enhance thermal buffering.

5.20 A compact urban form is generally more energy efficient as there is less opportunity for heat to escape. However, this needs to be balanced with the need to avoid the Urban Heat Island effect (see ‘Climate change adaptation’ later in this section). A compact form can sometimes lead to deeper floor plans which then can lead to poor natural lighting and ventilation: where this is the case it can be offset by including central atriums or sun tunnels.

5.21 Planting can be used to create a more favourable microclimate and help to manage flood risk; strategically sited tree belts can provide shelter from prevailing winds and shade in the summer without blocking light in the winter. Use of native, non-invasive plant species are often most valuable to local wildlife and have the further benefit of being able to thrive and sustain the local soil and climate conditions.

5.22 The prevailing wind should be a consideration in site design as exposure to cold winds will increase heat loss and energy use. Conversely in the summer, gentle breezes can be used positively within design to enhance natural ventilation improving comfort levels and reducing energy use on mechanical cooling systems. Shelter belts (wind breaks) may be used to protect buildings from excessive winds. Shelter belts should be set out in a convex layout against the prevailing wind direction, rather than concave, to deflect the wind instead of blocking it. They should be dense enough to reduce wind speeds by allowing some wind to pass through but not block the wind in its entirety as this can result in an airflow accelerating over the top of the trees and descending in a turbulent fashion on the building.

Building design

Flexibility and adaptation

5.23 Buildings should be designed from the outset to be flexible to accommodate changing needs (including family size, home working, old age and disability). This will reduce the need for refurbishment and extensions and will prolong the life of the building. This is particularly the case where buildings are designed to occupy a specific niche, such as student housing.

5.24 Alongside this, buildings built today will need to become zero carbon in the future. Buildings should be designed to enable, and not impede, future retrofit measures that improve energy efficiency or allow the use of zero carbon energy.

Passive solar gain, passive cooling and overheating

5.25 Passive solar gain refers to the process whereby a building is heated by the sun, either directly from sunlight passing through a window and heating the inside of the building, or indirectly as sunlight warms the external fabric of the building and the heat travels to the interior. The level of passive solar gain can significantly impact upon the quality of a building, how it is used and the energy needed for it to be inhabited comfortably. Passive solar gain can reduce the need for mechanical heating, which in turn reduces energy use and carbon emissions.

5.26 Key factors that influence passive solar gain include the physical characteristics of the site, immediate surroundings, orientation of buildings, external design, internal layout and the construction materials used.

5.27 Whilst passive solar gain can reduce the carbon emissions associated with heating, if used incorrectly it can lead to overheating, which in turn can lead to the installation of mechanical cooling equipment (e.g. air conditioning). Mechanical cooling increases energy consumption and requires maintenance, resulting in costs and carbon emissions. Mechanical cooling units also produce heat that requires dissipation. The need for mechanical cooling can be avoided or lessened by designing-in passive ventilation and passive cooling measures. Developments should not incorporate mechanical cooling unless passive measures have been fully explored and appraised and proposals that include mechanical cooling should clearly demonstrate that passive measures would not be adequate.

5.28 The following list includes some of the key considerations in the design of new schemes.

- Orientation and layout of habitable rooms, and window size and orientation, should be carefully considered in relation to the path of the sun.
- Rooms that are most frequently occupied should benefit from a southerly aspect, but with appropriate measures to avoid overheating.
- Rooms that include a concentration of heat generating appliances (e.g. kitchens) or are less frequently occupied (e.g. bathrooms) should be located in the cooler part of the building, generally the northern side.
- Conservatories and atria can be used to assist natural ventilation in the summer by drawing warm air upward to roof vents, and to collect heat during the spring and autumn.
- Deep projections that overshadow windows should be avoided, particularly on south facing elevations. Projections should be sized appropriately so that they provide shading from the sun during the hottest part of the year but allow solar gain in the colder months.
- Where there is a chance that overheating can occur (e.g. due to large expanses of glazing on roofs and south facing elevations), design measures such as roof overhangs, brise soleil, external shuttering, photochromatic and thermochromatic glass and a lighter colour palette can help.
- Zonal heating and ventilation systems and controls can be used allowing areas subject to high solar gain to occupy their own temperature control zone. Dynamic controls reduce energy waste.
- Use of materials to build in thermal mass to absorb excess heat during warmer periods and release it slowly during cooler periods (e.g. day/night, summer/winter).
- Buildings should be designed for passive ventilation:
    - cross ventilation with windows located on opposite walls and/or roof mounted turbines or wind cowls that assist with circulation of air by drawing air through windows or top floor openings and
    - passive stack ventilation (PSV) that uses pressure differences to draw in fresh air from outside to replace rising warm air which is released from the top of the building. A heat exchanger can be placed where the air escapes the building to reduce heat loss.

Natural light

5.29 Natural lighting reduces the energy used for artificial lighting and creates a healthier internal environment. Issues to consider include how much of the sky is visible through a window (the more, the better), the dimensions of the interior living/working space and distance from the window, and the proportion of glazed surfaces. The depth of the room is an important factor in determining the amount of natural light received. Naturally dark rooms may be lit naturally through measures such as sun tubes which ‘pipe’ sunlight from sunny areas to internal areas.

5.30 Non-residential buildings should be designed to best meet their intended use. Natural light is beneficial to a good working environment, but care is needed to avoid creating spaces with excessive heat gain. This could occur if solar gain is combined with the heat associated with internal lighting, high occupancy and operating equipment such as machinery and computers. A higher proportion of glazing on north facing surfaces can increase natural lighting without significantly increasing solar gain, thereby minimising excessive heat gain.

5.31 Glare created by natural or artificial light can be uncomfortable for people both inside or outside a building. This can be minimised if considered early in the design process through building layout (e.g. low eaves height) or building design (e.g. blinds, brise-soleil screening). If considered together with a lighting strategy this can reduce energy consumption.

Water efficiency

5.32 Policy D2 requires water efficiency in new development to meet the highest national standard. For residential development, this is defined in the supporting text as the 'optional Building Regulation' for water efficiency in new dwellings[13], which is 110 litres per day per person, or a tighter standard if one becomes available nationally. If a new, tighter national standard is introduced, this will be adopted automatically by virtue of Policy D2.

5.33 There are presently no other national standards for non-residential developments than those in the Building Regulations. However, the principle of water efficiency in line with the waste hierarchy applies to all developments. As a result, all developments should seek to reduce demand through efficiency measures, and then meet remaining demand from sustainable sources wherever possible.

5.34 For all developments, the submitted information should set out an approach to water management that reduces water usage and waste and prioritises demand reduction measures over supply measures.

Reducing water use

5.35 Development, whether new construction or change of use and refurbishment, can save water by including measures such as:

- systems for greywater reuse
- aerated washbasin/kitchen taps and shower heads,
- tapered and low capacity baths,
- sensor and low flush toilets,
- shower timers, and
- water efficient white goods and appliances such as washing machines and dishwashers.

5.36 Water use during construction can be reduced through measures including:

- closed loop wheel washers,
- waterless wheel washing using angled steel grids to remove debris,
- high pressure low volume power hoses,
- recirculating water where possible,
- limiting the water used for flushing building services by stopping it as soon as the flush water turns clear, and
- employing a regime for monitoring water use and water waste.

5.37 Choosing the best location for a boiler can reduce water consumption and heat loss. By minimising the length of hot water pipes the volume of water that has to be drawn off each time a tap or shower is used can be reduced. Positioning hot water pipes above pipes carrying cold water will reduce heat transfer. Further heat loss can be reduced by insulating the piping.

5.38 For all new dwellings, a completed "water efficiency calculator for new dwellings" worksheet that accords with Part G of the building regulations' Approved Documents should be provided prior to occupation. The calculation must demonstrate that the new dwellings will achieve a maximum water usage of 110 litres per person per day.

[13] The standard is set out in regulation 36(b) of the Building Regulations 2010 (as amended)

Rainwater harvesting

5.39 Rainwater harvesting is the collection of rainwater directly from a surface it falls on (e.g. a roof). Once collected and stored it can be used for non-potable[14] purposes such as watering gardens, supplying washing machines and flushing toilets, thereby reducing consumption of potable water. Potable water is produced through a purification process and is pumped over large distances, both of which require energy and result in embodied carbon that is not present in water harvested locally. In a residential development, rainwater can be captured for domestic use using water butts connected to a down pipe. Larger systems can use water stored in underground water tanks.

5.40 Schemes should be designed to include space for water storage. In residential developments, down pipes should be carefully placed so that water collection and use is convenient for residents.

Greywater re-use

5.41 Water that is recycled from bathrooms and kitchens for non-potable uses is known as greywater. Greywater systems must ensure treatment on a regular basis to prevent a build-up of bacteria, and some systems are powered, which entails an energy cost. As a result, greywater reuse is generally less preferable than water use minimisation measures.

5.42 Water recycling systems are better suited to new developments rather than retro-fitting in existing buildings because of the excavation required for storage tanks and changes needed to the plumbing system, and they are generally more cost effective for new developments and developments of a larger scale.

5.43 Recycling systems should be backed up by a mains supply or a sufficiently large reserve storage system to meet higher demands during dry spells. Storage tanks will need an overflow to allow excess water to be released which should be able to flow into a soakaway.

Climate change adaptation

5.44 Developments must be fit for purpose and remain so into the future, in line with policy D2(4). They must incorporate adaptations, and be adaptable, for a changing climate and changing weather patterns in order to avoid increased vulnerability and to offer high levels of resilience to the full range of expected climate change impacts including hotter and drier summers, warmer and wetter winters, and an increase in heavy rain, storm events and flooding. Further detail of the expected impacts can be seen in a number of publications from respected sources such as the UK Climate Change Risk Assessment 2017 Evidence Report Summary for England published by the Committee on Climate Change.

https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/uk-climate-change-risk-assessment-2017/national-summaries/england/

5.45 Development proposals should set out the climate change adaptation measures that have been taken and demonstrate that the they are appropriate and adequate to meet the challenge of climate change.

Urban heat island

5.46 The urban heat island effect refers to the situation where urban areas are substantially warmer than the rural areas surrounding them; up to five degrees warmer in urban areas like Guildford and Ash and Tongham. It occurs due to the shape of the urban environment and the use of

[14] Potable water is water that is of drinking quality

hard, impervious and generally dark surfaces that absorb large amounts of solar energy and trap heat. Choice of materials should reflect the need to avoid overheating.

5.47 Introducing natural green and blue features can both reduce heat build-up and allow ambient heat to escape, and trees can provide shading that cools surfaces and reduces ambient air temperature through evaporation of water via the leaves. Urban places can be designed to provide areas of coolness through the shading of streets and public spaces.

5.48 Urban schemes should demonstrate that the urban heat island effect has been addressed and that open spaces and green and blue infrastructure will reduce the effect and provide respite during times of excessive heat.

5.49 The Council will produce a Green and Blue infrastructure SPD that will set out detailed guidance.

Hotter, drier summers and heatwaves

5.50 Buildings should be designed to maximise the opportunities for natural ventilation, cooling and lighting to avoid the risk of overheating, a risk that is likely to increase over time with the increasing prevalence and severity of heatwaves and a generally warmer climate.

5.51 For buildings with high thermal mass, evidence that a provision has been made for night-time venting as a means of cooling during hot weather should be provided. Air conditioning should not be considered, including for large commercial developments, unless it can be demonstrated that passive cooling and ventilation measures have been fully explored and that they would not be adequate.

5.52 Proposed building materials should be resilient to climate impacts e.g. glazing systems that minimise heat loss while avoiding heating through excessive solar gain in warmer months.

5.53 Water stocks are already under pressure and with the increased prevalence of drought the situation is likely to worsen. Developments that require large amounts of water, like golf courses, should set out how they will avoid drawing on public or environmental water stocks e.g. by collecting and storing water from rainfall.

Wetter winters and heavy rainfall events

5.54 Winters will become wetter and extreme rainfall events will become more frequent and more severe. As a result, management of surface water will become more important.

5.55 New developments typically introduce impermeable surfaces, which increase the speed and amount of surface water run-off. This can exacerbate flooding and, in extreme cases, lead to flash flood events. Conversely, permeable surfaces and features that store water or slow it down can help developments become more resilient to the more severe rainfall events likely to result from climate change. They also allow water to return to the environment to recharge natural stocks, which can help mitigate the impact of drier summers.

5.56 Green roofs reduce the peak flow and the total volume discharged from a roof. In addition, green roofs can improve the water quality of the run-off. Traditional rooves should be fitted with guttering and downpipes that are capable of handling heavy rainfall events.

5.57 The use of natural or permeable surfaces should be maximised, including, where appropriate, green roofs and walls. Where new hard surfaces are proposed they will normally need to be of permeable materials and retained for the life of the development, secured by a planning condition. This is particularly important on hillsides where impermeable surfaces can exacerbate river or surface water flooding downslope.

5.58 Consideration should be given to the use of materials that prevent the penetration of the building envelope on surfaces likely to be most exposed to driving rain.

5.59 National policy covers flooding and flood risk and the National Planning Practice Guidance provides guidance on how national policy should be applied. Policy P4 also covers flooding and flood risk. Under national policy, some developments are required to produce a Flood Risk Assessment. When doing so, they must make an allowance for climate change, in accordance with Environment Agency guidance:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Sustainable Drainage Systems (SuDS)

5.60 SuDS should be the primary source of surface water management under Policy P4 (5). Where SuDS are not proposed as the primary source of surface water management, a clear reasoning setting out why it would not be appropriate or effective should be provided.

5.61 SuDS offer multiple benefits – they can help to manage flood risk, improve water quality, provide opportunities for water efficiency, enhance landscape and visual quality, provide amenity value and offer opportunities for biodiversity. The design of SuDS should explore fully the potential to deliver these benefits.

5.62 SuDS limit the volume and rate of surface water entering the public sewer system. They therefore have the potential to play an important role in helping to ensure the sewerage network has the capacity to cater for population growth and is resilient to the effects of climate change.

5.63 It is the responsibility of a developer to make proper provision for surface water drainage to ground, water courses or a surface water sewer as drainage of surface water to the foul sewer is a major contributor to sewer flooding. The connection of surface waters to the public sewer will not be permitted without confirmation from the Lead Local Flood Authority that the sequential approach to the disposal of surface water has been followed and all practical alternatives have been explored.

5.64 More information on SuDS can be obtained from Susdrain. Susdrain is a community that provides a range of resources for those involved in delivering sustainable drainage systems: https://www.susdrain.org/

5.65 Local guidance is available from the Lead Local Flood Authority (LLFA), Surrey County Council. The LLFA is consulted on proposals for SuDS as part of the planning process. https://www.surreycc.gov.uk/people-and-community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-planning-advice.

Measures that enable sustainable lifestyles for building occupants

5.66 There are many measures that can be included in developments that enable the occupants of the new buildings (whether employees, residents or others) to live lifestyles that are more sustainable. The following measures should not be considered exhaustive.

Sustainable transport

Electric vehicles

5.67 Sufficient provision of electric vehicle (EV) charging points in new developments drives the uptake of EVs, bringing benefits in terms of air quality and (taking into account the decarbonisation of the energy grid) carbon reductions. EVs also provide energy storage that,

when used alongside other measures, such as smart meters, can deliver smart energy networks.

5.68 Provision of charging points is expected for specific types of development as set out in borough and county guidance (see below). Alongside this, provision of charging points should be considered for any new developments that are likely to result in trips by car, whether by residents, customers, employees, visitors or others.

5.69 All schemes, whether they provide charging points or not, should be designed so that installation of charging infrastructure is simple, for example, by ensuring that cabling is in place to enable the easy connection of a charging point, or adequate ducting is provided to enable cables to be inserted at a later date without the need for excavation. These measures will ensure that building occupants can install or upgrade charging infrastructure in the future.

5.70 There are currently three speeds available for electric vehicle charging – trickle (3kw), fast (7kw) and rapid (40kw+). The capacity of electric vehicle batteries has increased in recent years and continues to do so in order to provide drivers with a greater range. As a result, trickle charge times may exceed 12 hours for a full charge and charging infrastructure that provides speeds lower than 7kw are no longer appropriate.

5.71 Surrey County Council's Vehicular and Cycle Parking Guidance (2018) sets out standards for the provision of electric vehicle charging points in new developments. Surrey County Council is currently reviewing this document and proposes, among other changes, to increase the requirement for EV charging to 100 per cent provision for all dwellings with parking spaces. In all cases, the most recently adopted guidance and policies will apply.

EV, cycling and parking standards

5.72 Cycle parking areas should be included in new developments. This is especially important where space for storing cycles may otherwise be limited (e.g. flats and shared housing). The Council's Vehicle Parking Standards SPD (2006) contains cycle parking standards and Surrey County Council's non-statutory Vehicular and Cycle Parking Guidance (2018) provides up-to-date cycle parking standards.

5.73 The Guildford Vehicle Parking SPD and the Surrey Vehicular and Cycle Parking Guidance document are available at:

https://www.guildford.gov.uk/article/17696/Vehicle-Parking-Standards-SPD

https://www.surreycc.gov.uk/roads-and-transport/policies-plans-consultations/transport-plan/surrey-transport-plan-strategies/parking-strategy

5.74 Planning applications are currently considered against Policy ID3 of the Local Plan, which sets requirements for sustainable transport, and the documents listed above alongside other material considerations. The Strategic Development Framework SPD (2020), which provides planning guidance for five of the largest sites in the borough, sets out requirements for electric vehicle charging for the strategic sites. These requirements and guidance take precedence, where there is any difference, over the design guidance set out in the Vehicle Parking Standards SPD (2006).

Public and shared transport

5.75 New developments must maximise the use of the sustainable transport modes (walking, cycling and public and community transport) in line with policy ID3, and developments that include new roads should ensure that the roads are designed to provide safe and attractive walking and cycling routes. Beyond this, developments can meet the requirement to enable

sustainable lifestyles by providing other models of shared transport, such as car clubs and bike share schemes, or enabling these by designing schemes to provide space for the necessary infrastructure such as. bike hubs, parking for car club vehicles and EV charging infrastructure for both bikes and car club cars.

5.76 Car clubs and bike share schemes offer an alternative model to ownership for individuals and businesses. Having access to a vehicle without being tied to ownership can save substantial amounts of money for members, while bike share schemes can be incorporated with other modes, offering a first/last mile solution. Many car clubs operate low or zero carbon vehicles, while shared e-bikes allow a greater distance to be covered than conventional push bikes, or allow the trip to be undertaken more often[15]. Shared transport can be easily incorporated into a 'mobility hub' which co-locates public and shared modes, aiding convenience[16].

5.77 Replacing private transport with public and shared transport will reduce the number of vehicles per head of population, reducing the amount of land needed for parking and reducing the embodied emissions caused by the manufacture of vehicles.

Energy demand reduction

5.78 Where dwellings or commercial units are sold or leased fully fitted/furnished, low energy appliances should be provided in order to reduce the energy used by building occupants. An energy calculation showing the consequent reduction in unregulated carbon emissions should be included to quantify the improvement. However, this should not form part of the carbon reduction calculation included in the energy statement as that calculation should only address regulated emissions.

5.79 Buildings can be designed to remove the need for appliances. For example, by providing space to dry clothes naturally, the need for a dryer is removed. Adequately sized and well-located windows reduce the need for artificial lighting during the day and daylight systems (e.g. sun tunnels, fibre optics) can deliver natural light to areas that are too deep within a building for windows to be effective.

5.80 Self-regulating smart meters and smart controls on heating, lighting and appliances can reduce energy waste. These devices measure, control and optimise the use of energy, delivering benefits including:

- maximising consumption of locally generated energy,
- reduce energy costs by responding to time-of-use tariffs,
- enable and optimise the use of smart energy grids by providing demand response services to grid and network operators, and
- provide useful feedback to the building occupant that helps them to improve efficiency.

Recycling storage

5.81 At present in Guildford borough, all recycling material is usually collected in one bin and is sorted after collection. However, this is not the case for all properties – for example, bars that sell bottled drinks may have glass collected for recycling separately. The current recycling collection regime is likely to change in the near future, with regulatory changes proposed that would require recyclable materials to be separated.

5.82 Internal and external storage areas for recycling purposes should be integrated into a development. In order to future proof developments, recycling storage space should be

[15] Bike Share Users Survey (CoMoUK, 2018)
[16] Mobility Hubs Guidance (CoMoUK, 2019)

adequate to allow the occupants of buildings to separate their recyclable waste, taking into account the size of recycling material containers, the frequency of collection and an allowance for seasonal variation. For commercial developments, space should be allowed for the collection and storage of bulk material for recycling. The proposed refuse and recycling storage points should be identified when detailed plans are submitted.

Community food growing

5.83 Community food growing spaces help achieve sustainable development in the following ways:

- locally grown food reduces food miles, lowering embodied carbon and contributing to improved air quality,
- vegetated open spaces reduce the urban heat island effect,
- the permeable surfaces of food growing spaces and the harvesting of rainwater contribute to sustainable drainage, and
- rooftop gardens provide accessible open space in high-density developments.

5.84 The guidance document "Good planning for good food - using planning policy for local and sustainable food" (2011), prepared by Sustain, explores how local authorities and communities can use planning policy and decisions to create more local and sustainable food systems. The report is available at: https://www.sustainweb.org/publications/good_planning_for_good_food

5.85 The inclusion of community composting facilities can increase the sustainability of community food growing by reducing the amount of organic waste transported off site and the amount of compost transported into the site.

Resources, materials and waste

5.86 The issues of efficiency in the use of mineral resources, waste minimisation and reuse of buildings and materials are closely linked. In construction, the efficient use of resources reduces the amount of leftover materials that are sent for recycling or disposal, and the reuse of waste from construction and demolition both reduces the amount of new materials needed and the amount of waste sent for disposal. Large amounts of waste can be avoided, and consumption of new materials can be reduced, by refurbishing, retrofitting and repurposing existing buildings rather than demolishing them and rebuilding.

5.87 New developments should apply the principles of the waste hierarchy (see Figure 1) and seek to eliminate waste as the first step, reuse waste as the second step, send waste materials for recycling/reclamation as a third step and ensure waste is sent for energy recovery or safe disposal as a last resort, depending on the material.

Materials

Embodied carbon and energy

5.88 Embodied energy and embodied carbon are key considerations in sustainable development. Embodied energy is the cumulative energy needed to grow/extract, manufacture and transport materials to a development site and embodied carbon refers to the cumulative carbon emissions produced from that energy. Databases such as the Green Guide to Specification from the Building Research Establishment and the Inventory of Carbon and Energy (ICE) from Circular Ecology set out the environmental credentials of various building materials and enable scheme designers to "design out" embodied carbon by choosing materials that are lower in carbon.

Aggregates

5.89 Policy D2 requires developments to incorporate a proportion of recycled and/or secondary aggregates. Recycled aggregates are created by reprocessing materials that have previously been used in construction, either at the demolition site (thus saving transport costs and emissions) or in an offsite processing plant. Secondary aggregates are usually by-products of other industrial processes that have not previously been used in construction. Secondary aggregates can be further sub-divided into 'manufactured' (e.g. pulverised fuel ash and metallurgical slags) and 'natural', (e.g. china clay stent and slate aggregate) depending on their source. The use of recycled and secondary aggregates reduces the amount of primary aggregates extracted from natural deposits, reduces the amount of industrial and construction waste sent for disposal and can reduce the embodied carbon of concrete slightly[17].

5.90 Concrete and demolition rubble can be crushed, screened and re-used as recycled aggregate in a range of applications from bulk fill to use in new concrete. Mobile plant can be hired to crush material on-site.

5.91 Development proposals should set out estimates of the amount of aggregate likely to be used, the amount of aggregate waste likely to be generated and the proportion of building materials that will be supplied from (in order of preference):

1. the reuse of demolition waste sourced from the development site,
2. secondary or recycled aggregates imported into the site, and
3. primary aggregates imported into the site.

5.92 The estimates should be accompanied by a commentary setting out how the scheme has complied with the waste hierarchy by prioritising sources with the lowest environmental impact in line with the list above.

Other materials

5.93 As with aggregates, proposals should include estimates of other types of waste materials that will arise on site and set out how these will be reused on site as a substitute for new materials wherever possible.

5.94 When sourcing materials, the following five key principles should be followed:

- Environmental Impact - use materials that have low embodied energy and have been manufactured through processes that consume less energy.
- Responsible Sourcing - use materials from sustainably managed sources.
- Re-use of materials - re-use uncontaminated materials from the development site and reclaimed or recycled materials.
- Transport - use local materials to reduce transportation related impacts.
- Purchasing - when considering contractors and suppliers of materials, consider whether the supplier has an environmental policy, a track record in high environmental performance or any environmental accreditation, and whether unused materials and packaging can be returned rather than disposed of.

5.95 Materials from a sustainable, renewable or recycled source can limit the impact of the development on the environment: for example, timber from sustainable forests can be certified

[17] Academic research indicates that the embodied carbon of concrete can be reduced through the use of recycled aggregates, but that the reduction is often limited unless the substitute replaces cement (cement production accounts for a significant proportion of the embodied carbon in concrete).

by an organisation such as the Forest Stewardship Council (FSC) or the Programme for the Endorsement of Forest Certification (PEFC).

5.96 Trees and other plants remove carbon from the atmosphere as they grow, and when plant-derived building materials such as timber and hempcrete are used, the carbon is locked up within the building for an extended period, mitigating climate change. Consideration should be given as to whether sustainably sourced renewable materials can replace other building materials, taking into account the benefits of sequestering carbon within buildings. Recent years have seen growth in the use of mass timber (structural timber) as a replacement for steel and concrete.

5.97 Using locally sourced materials will reduce the impact on the environment by lowering the embodied carbon in transport. Materials can also be chosen that use fewer resources or produce less waste when they are manufactured.

5.98 Materials that have a long lifespan are of greater environmental benefit. They should be durable, low maintenance and use waterproofing agents that are not harmful to the environment.

5.99 Construction materials can reflect, absorb and release heat differently and will influence the energy characteristics of the building. The direct carbon emissions released throughout the life of the building as a result of energy use needs to be considered alongside embodied carbon when choosing the most sustainable materials.

5.100 Environmentally sensitive and sustainable materials can also be employed inside a building. Paints and glues can include Volatile Organic Compounds and oils that can be harmful during use or disposal. Water based paint is less environmentally harmful and better for health than oil-based paint.

5.101 Proposals should set out how materials have been chosen and sourced in order to reduce the impact on the environment.

Waste

5.102 Around a third of the UK's waste comes from construction and demolition. A significant proportion of construction waste is packaging that comes with construction materials (wooden pallets, sand bags, plastic sheeting). The waste created during construction and at the end of a building's life can be minimised through good design and site waste management planning.

5.103 Construction waste can be eliminated through measures such as:

- sizing rooms so that they reflect the standard sizes of construction materials, such as sheets of plasterboard and lengths of timber, to avoid off-cuts,
- collecting off cuts (e.g. half bricks) and reusing them on other parts of the site,
- careful handling of materials to avoid damage,
- just-in-time deliveries of materials that help minimise the length of time that materials are vulnerable to damage on the building site
- ordering from suppliers that accept returns of unused materials and packaging, and
- accurate estimates of the required quantities of materials to avoid over-ordering.

5.104 Further information about designing out waste and case studies on reducing construction and demolition waste is available on the Waste and Resource Action Programme (WRAP) website: www.wrap.org.uk. Good practice for waste management is part of the Considerate Constructors Scheme: www.ccscheme.org.uk/.

5.105 When designing schemes and selecting materials, developers should consider designing for deconstruction rather than demolition. Deconstruction is the dismantling of a structure in the reverse order in which it was constructed, which means that the materials that were put on last are removed first. From the outset, new buildings should be designed with the prospect of future deconstruction in order to facilitate the segregation and extraction of materials during redevelopment for reuse or recycling at the end of the building's life.

5.106 Where materials are to be reused or recycled these will need to be inspected to ensure they are suitable for the development and do not need any repairs. Reuse can reduce the amount of raw materials used in the construction of a building and help retain the character of an existing building or area (e.g. through the use of reclaimed bricks or roof tiles). This is particularly important when working on a listed building or in a Conservation Area.

5.107 Developments should include a waste reduction strategy which sets out:

- how waste will be minimised through design or through construction practice (including offsite/modular construction),
- how waste materials will be reused, recycled or returned to suppliers in order to avoid disposal,
- how the development has been designed to facilitate reclamation of materials at deconstruction, and
- how demolition or other reclaimed materials have been incorporated into the new construction.

5.108 Schemes with a cost over £500,000[18] and schemes that would produce large amounts of waste should consider using a Site Waste Management Plan (SWMP). A SWMP is a live document that is used to monitor waste and to set out a strategy for managing it in the most sustainable way. A SWMP should be drafted at an early stage in order to influence the concept and design, and it should be reviewed and updated throughout the planning and construction process. An initial SWMP may be provided alongside a planning application to set out the waste strategy for the proposed development, while the completed document may be provided at a later stage.

5.109 Planning decision makers may require a SWMP through condition where appropriate, including proposals that would generate large amounts of waste.

5.110 From 2008 until 2013 SWMPs were compulsory for all projects with a cost over £300,000. Applying inflation to this figure brings it up to around £500,000 in 2020.

Off-site prefabrication

5.111 The offsite fabrication of building elements (e.g. walls, roofs and rooms) can reduce waste due to the controlled manufacturing process. Most elements of a development can be manufactured offsite at a range of scales; bathrooms, loft conversions and whole buildings are all available as pre-fabricated units. The manufacture and pre-assembly in controlled conditions and improved accuracy of building elements can significantly reduce the time required to construct a development on-site, as well as deliver high levels of energy efficiency for the end user. Developers should consider either using pre-fabricated/modular systems or incorporating elements of pre-fabrication.

5.112 Offsite pre-fabrication of whole buildings is becoming more common and a number of companies have entered the UK market. The products on offer typically have very high energy

[18] Based on the price agreed in the tender excluding VAT and consultant fees or, if there is no tender, the cost of labour, plant and materials, overheads and profit. This mirrors the criteria set out in the withdrawn Site Waste Management Plans Regulations 2008

efficiency standards and some (but not all) are built to very high standards for quality of internal environment and the use of sustainable materials. The Council recognises the benefits of low-waste, high energy efficiency pre-fabrication methods and will take this into account when assessing proposals. Where a significant proportion of a scheme's construction employs offsite prefabrication or modular construction methods, decision makers are likely to be able to conclude that the scheme has reduced construction waste substantially (but not necessarily demolition waste) in line with Local Plan policy.

Building for life

5.113 Building for life sets out design guidance for new housing developments and includes criteria that relate to environmental and social sustainability, as well as promoting design that generally creates good places. The most recent version of the standard is Building for life 12, which sets out 12 questions to assess how well proposals provide attractive, functional and sustainable places. The 12 questions are designed to help structure discussions between local communities, the local planning authority, the developer of a proposed scheme and other stakeholders. Schemes that are considered to have achieved 12 'greens' (12 greens based on a BfL12 assessment endorsed by the local planning authority) will be eligible to be awarded 'Built for Life' status.

5.114 Applications should include a checklist against the questions set out in the latest Building for Life guidance, as required by Policy D1(2). The Council will engage positively with developers to assist them in achieving 'Built for life' status.

5.115 Policy D1 expects new development to perform positively against the recommendations in Building for Life guidance. What this means in practice is that each of the recommendations should be followed, unless there are genuine reasons for not doing so, which should be explained in the submitted sustainability information.

5.116 The Building for Life guidance can be found here:

https://www.designcouncil.org.uk/resources/guide/building-life-12-third-edition

The performance gap

5.117 It is generally accepted that the carbon and energy performance of buildings as-built falls short of the performance anticipated at the design stage. Studies have shown that this 'performance gap' can be extreme, with some new buildings emitting many times more carbon than expected from both regulated and unregulated sources[19]. Most new homes do not achieve the levels of energy efficiency predicted by their SAP assessments.

5.118 The Building Control system does not require new buildings to be tested against their design specifications after construction. The exception to this is airtightness, which is tested after construction and where buildings generally perform much better than Building Regulation standards. The Government may change the method for assessing the performance of new buildings through a change to Building Regulations (see the 'Future Homes' consultation for details of the proposed changes)[20].

5.119 One of the reasons for the performance gap may be a lack of post-construction testing and post-occupancy monitoring and feedback, which means that problems in construction are not

[19] For example, studies undertaken by Innovate UK: https://www.gov.uk/government/publications/low-carbon-buildings-best-practices-and-what-to-avoid and https://www.gov.uk/government/publications/low-carbon-homes-best-strategies-and-pitfalls
[20] See https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings

identified, occupant behaviour is not corrected, and future projects do not benefit from changes that correct problems in the construction process.

5.120 The Council strongly supports the use of measures that would act to close the performance gap. Where such measures will be employed, the Sustainability Statement should provide details. Such information could include:

- detailed information setting out the site developer's robust internal processes and quality controls,
- the implementation of a third-party process or system that focuses on ensuring that standards are met during construction e.g. the BEPIT Better Building Tool Kit or NEF's Assured Performance Toolkit, and
- the use of a post construction testing regime for the proposed development and/or for previous developments undertaken by the same developer, with details of the outcome on previous developments.

6. Non-major development submission requirements

6.1 Under Policy D2, **non-major development** proposals must provide the following information statements:

- "adequate information" showing how the energy and carbon requirements have been met, and
- "information proportionate to the size of the development" covering the other sustainability matters set out in the policy.

6.2 A Climate Change, Energy and Sustainable Development questionnaire (the questionnaire) can be found at Appendix 2 of this document. **Non-major developments** can submit a completed questionnaire in order to satisfy the two requirements set out above. **Major developments** must instead submit a full energy statement and full sustainability statement (see sections 4 and 5).

6.3 **Non-major developments** may also submit energy and sustainability information statements instead of a completed questionnaire. If this route is taken, applicants must ensure that the submitted information complies with the requirements of Local Plan policy, and that energy information complies with the carbon reduction calculation methodology set out later in this section. Sustainability information should refer back to the Sustainable Design and Construction Guide in section 5.

6.4 The questionnaire or statements should be produced at an early stage in the initial design work as they should inform the scheme as it emerges. Where schemes are not subject to a full plans application, a partially completed questionnaire or partial information statements may be submitted at the outline stage covering the matters covered by the outline application. A fully completed questionnaire or final information statements may then be provided at a later stage.

6.5 The remainder of this section sets out guidance on how to complete the questionnaire. Additionally, there are signposts throughout the questionnaire back to the sections of this SPD that provide relevant guidance on sustainability matters.

Questionnaire Part 1: Sustainable design and construction

6.6 Part 1 of the questionnaire deals with sustainable design and construction matters and asks a series of questions that link to specific requirements in Local Plan policy. The matters it covers are:

- minerals and waste,
- low energy site and building design,
- water efficiency,
- measures that enable sustainable lifestyles, and
- climate change adaptation.

6.7 There is a large amount of guidance covering sustainable design and construction available nationally and some guidance on the key points is provided in the sustainable design and construction guide in section 5 of this SPD.

Self-build and custom-build homes

6.8 Self-build and custom-build homes are types of housing (defined nationally) for people who want to play a role in developing their own homes, either by directly organising the design and construction (self-build) or by hiring a specialist to deliver the home (custom-build). Both types of housing are exempt from the Community Infrastructure Levy.

6.9 In order to qualify as self-build or custom-build, the owner of the home must have primary input into its final design and layout, which means that the end user of the home is able to balance the benefits of building an energy efficient and climate adapted home against the long-term costs that result from energy bills and adaptative retrofitting.

6.10 Self and custom housebuilders are encouraged to exceed the minimum requirements of Policy D2: Climate change, sustainable design, construction and energy and achieve very high levels of sustainability. Small projects such as custom and self-build are likely to be suitable for offsite and modular construction methods (small schemes do not benefit from the traditional build economies of scale that volume housebuilders enjoy), which can offer a range of benefits (see 'Off-site prefabrication' in section 5).

6.11 Many modular and pre-fabrication systems use timber in place of other materials and in doing so sequester carbon that is removed from the air during the growth of the trees from which the timber is sourced. This benefit will be recognised during the planning process.

Questionnaire Part 2a: Energy

6.12 Part 2a of the questionnaire deals with low and zero carbon energy provision. It covers Combined (Cooling) Heating and Power ((C)CHP) and other low and zero carbon energy technologies.

(C)CHP Distribution Networks

6.13 When completing question 7, the reference to (C)CHP distribution networks should be taken to cover a broad range of scales from small scale systems that distribute cooling and/or heating to a number of dwellings or units within one building up to district scale systems that serve entire neighbourhoods (district heating systems). It should also be interpreted as a reference to all types of heat network and not just CHP based systems (see paragraphs 4.7 and 4.8 for more information). In order to answer the questions, applicants will need to have undertaken investigation work to establish whether such systems exist in the vicinity of the proposed development, taking account of this broad definition.

Low and zero carbon energy technologies

6.14 Question 8 asks for details of any proposed low and zero carbon energy technologies. There are a number of low and zero carbon energy technologies available on the market that can supply electricity and/or heat to residential and commercial buildings. These include (but are not limited to):

- solar photovoltaic (electricity),
- solar thermal (heat),
- ground, air and water source heat pumps,
- small scale wind turbines,
- standalone wind turbines,
- biomass power and heat,
- small scale hydro power,

- geothermal energy,
- micro CHP, and
- Combined Heat and Power (CHP) systems.

6.15 In order to be sure that proposed energy technologies will be effective, decision makers will need to be sure that the building occupants will use them to meet a significant portion of their energy needs. As a result, heat sources such as log burners, which may be used sporadically, will not be accepted as low carbon energy technologies.

6.16 The section “Low and zero carbon energy appraisal” in section 4 sets out information about low and zero carbon energy technologies.

Questionnaire Part 2b: Carbon reduction calculation

6.17 Part 2b of the questionnaire applies to schemes that involve the construction of any new buildings. In order to answer the question correctly, applicants must provide a calculation showing an improvement of at least 20 per cent against the relevant national carbon emission standard for the building(s). A methodology for this calculation is set out later in this section and a table that can be used to present the results is included in the questionnaire.

Building regulations and emission rates

6.18 The national mandatory standards for construction are set out in the Building Regulations 2010 (as amended). They cover all aspects of construction and set minimum Target Fabric Energy Efficiency (TFEE) rates as well as overall maximum carbon emissions rates for new buildings, referred to as the Target Emission Rate (TER). The TER differs for different types buildings (e.g. flats, detached dwellings, offices) and is expressed in annual kilograms of carbon dioxide per square metre.

6.19 The emission rate of a proposed building is based on its specification and is expressed as:

- Dwelling Emission Rate (DER) for self-contained dwellings and individual flats (excluding common areas). This is the annual carbon dioxide emissions of the proposed dwelling expressed in kilograms per square meter.
- Building Emission Rate (BER) for building types other than dwellings. This is the annual CO_2 emissions of the proposed building expressed in kilograms per square metre.

6.20 Under the building regulations, the DER or BER for the proposed building must not exceed the TER.

6.21 The DER or BER of a proposed building is established through modelling. The approved national calculation methods used in the building control system are the Standard Assessment Procedure (SAP) for dwellings and the Simplified Building Energy Model (SBEM) for commercial buildings. Other models are sometimes used to give more detailed and accurate information. The models make assumptions about the carbon emissions from different energy sources (like electricity and gas), referred to as emission factors (see ‘Emission factors’ in section 4 for more information).

Local plan carbon emission standard

6.22 Policy D2 requires new developments to be designed so that carbon emissions are minimised in line with the energy hierarchy (see Figure 1: Energy and waste hierarchies). It also stipulates that new buildings (except retail only developments in Guildford town centre) must achieve an emission rate that is at least 20 per cent lower than the relevant TER in building regulations.

6.23 In order to demonstrate compliance with the energy hierarchy, the questionnaire includes questions that deal with low energy design and other energy measures. In order to demonstrate compliance with the minimum 20 per cent carbon reduction, it includes a carbon reduction calculation template that quantifies the carbon reduction achieved by new buildings. Guidance on completing the template is set out later in this section.

Retail units in Guildford town centre

6.24 Retail only developments (falling within Use Classes A1, A2, A3 and A4) in Guildford town centre are not subject to the minimum 20 per cent carbon reduction requirement applied to new buildings, but under the general principles set out in Policy D2 must still seek to be energy efficient and reduce carbon emissions as far as possible in line with the energy hierarchy. As a result, they must still provide a carbon reduction calculation.

6.25 Where Guildford town centre developments are mixed use and include retail units, the non-retail units are subject to the minimum 20 per cent carbon reduction target and must demonstrate that the target has been met through the carbon reduction calculation.

Developments that do not include new buildings

6.26 Developments that do not include construction of new buildings, but are subject to a modelling assessment (e.g. SAP or SBEM) as part of the building control process, should submit a carbon reduction calculation in order to show that energy efficiency and carbon emissions have been addressed in line with policy D2 and the energy hierarchy. They do not need to demonstrate a minimum 20 per cent carbon reduction, though this is encouraged.

6.27 Developments that are not subject to modelling assessment as part of the building control process do not need to complete the calculation.

Residential extensions

6.28 Residential extensions generally do not require modelling assessments as part of the building control process so do not need to complete the carbon reduction calculation. However, the submitted information should still demonstrate that energy efficiency and carbon emissions have been addressed in line with policy D2 and the energy hierarchy, and the guidance in this SPD.

Carbon reduction calculation

6.29 In order to grant permission for developments that include new buildings, decision makers will need clear evidence of the carbon emission rate that will be achieved by the new buildings. The questionnaire includes a carbon reduction calculation table that, when completed, will set out the required information clearly for decision makers.

6.30 The table in the questionnaire can be completed, or the table can be reproduced separately and appended to the questionnaire.

The carbon reduction calculation table

Column 1

6.31 Column 1 should contain a reference for each building (e.g. ‘plot 1’, the building name etc.).

6.32 In order to demonstrate that the TER and DER or BER figures in the table are robust, it is necessary to attach modelling output sheets (e.g. SAP or SBEM worksheets) for each row in the table. A single page showing the TER and DER or BER is adequate (it is not necessary to

attach all the modelling output sheets). Each sheet should be marked with the relevant reference from Column A so it is clear to which building each sheet corresponds.

Column 2

6.33 Column 2 must set out the TER for the relevant building. This must match the TER on the relevant modelling output sheet.

Column 3

6.34 Column 3 must set out the DER (for dwellings) or BER (for non-residential buildings), depending on the building type. This must match the DER or BER on the relevant modelling output sheet.

Column 4

6.35 Column 4 must set out the percentage carbon reduction between TER and DER or BER based on the following calculation:

(DER or BER – TER) / TER x 100

6.36 Energy Performance Certificates (EPC) certificates will not be acceptable as proof of energy or carbon performance because EPCs do not reliably predict energy usage in buildings[21].

Retrofitting

6.37 Retrofitting buildings can dramatically improve their energy performance and consequently reduce carbon emissions, bring general improvements to the quality of the internal space and improve resilience to climate change impacts. Retrofitting older buildings to extend their useful life should usually be considered preferable to demolition and rebuilding as it reduces the consumption of materials in line with the waste hierarchy. However, there may be instances where replacing a building would lead to greater sustainability benefits in the longer term.

6.38 The following methods/accreditations are focused on delivering sustainable outcomes for retrofit projects:

- BREEAM – Refurbishment and Fit Out, and
- Energiesprong.

Change of use developments

6.39 There are likely to be opportunities for significant retrofit improvements where buildings are converted from one use to another (e.g. from commercial to residential). Many such projects do not require planning permission from the Council. However, the Council strongly encourages change of use developments to fully explore opportunities to deliver energy efficient and sustainable buildings.

6.40 Where change of use requires a planning application, proposals will be required to comply with the policy and guidance set out in the Local Plan and this document.

Heritage buildings

6.41 The historic environment should play its part in mitigating and adapting to climate change. However, it is vital that proposed changes are consistent with the aims of heritage protection and the statutory duty of care placed on the Local Planning Authority to safeguard architectural and historical significance.

[21] Innovate UK (2016) https://www.gov.uk/government/publications/low-carbon-buildings-best-practices-and-what-to-avoid

6.42 Good maintenance and repair are often the first advisory steps in improving a property's climate resilience and environmental performance. However, change and adaptation can also be possible where it is carried out in a manner sympathetic to the property's authenticity, character and setting. It is important to recognise that buildings of traditional construction perform very differently to buildings of modern construction as they need to breathe, and changes to their fabric performance, heating and ventilation, if not correctly undertaken can lead to unnecessary damage and maintenance problems caused by trapped moisture. Therefore, it is important when considering any work to understand how that building was designed to work.

6.43 There is considerable technical advice on improving the energy efficiency of historic buildings provided by Historic England: https://historicengland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/

6.44 Planning permission and/or listed building consent may be required for certain works and advice should be sought where in doubt. The Council will work proactively with applicants to find solutions that deliver improvements while respecting the heritage value of historic assets.

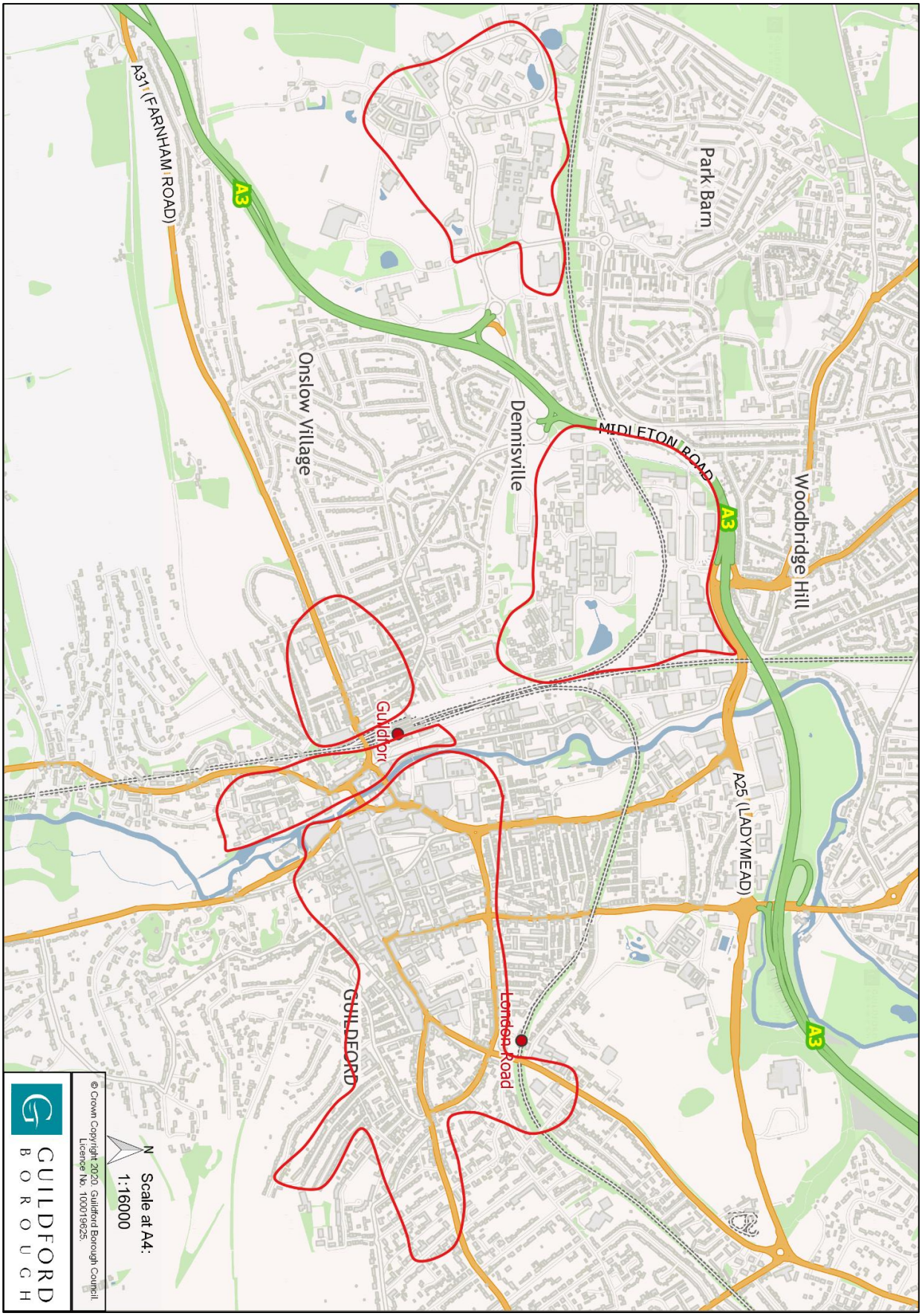
7. Glossary

BER	Building Emission Rate - the CO_2 emission rate of a non-residential building based on its design specification. The BER is a metric used to assess compliance with the Building Regulations.
CCHP	Combined Cooling Heating and Power: A power plant that generates electricity and useful heating and cooling simultaneously for distribution through a network providing power and heat to buildings. The lack of energy lost means the system is highly efficient. CCHP plants and distribution networks can work at a number of scales and can be powered by carbon based fuels, like oil and gas, or renewable fuels, like wood pellets. CCHP is often referred to as trigeneration and CCHP networks that serve multiple buildings may be referred to as district heating and cooling networks.
CHP	Combined Heating and Power - A power plant that generates electricity and useful heat simultaneously for distribution through a network providing power and heat to buildings. The lack of energy lost as heat results in high efficiency. CHP plants and distribution networks can work at a number of scales and can be powered by carbon-based fuels, like oil and gas, or renewable fuels, like wood pellets. CHP is often referred to as cogeneration and CHP networks that serve multiple buildings may be referred to as district heating networks.
Climate Change Adaptation	Adaptations to buildings, places or environments that make them more resilient to, and potentially benefit from, expected changes in climate and weather patterns.
Climate Change Mitigation	Action to reduce the impact of human activity on the climate system, mainly through reducing greenhouse gas emissions.
DER	Dwelling Emission Rate - the CO_2 emission rate of a dwelling based on its design specification. The DER is a metric used to assess compliance with the Building Regulations.
Direct carbon emissions	The direct or operational carbon emissions are emissions that result from the use of a building (e.g. space and water heating, lighting, mechanical ventilation)
District heating	See heat network
Embodied carbon	The carbon footprint of a material or building that results from the embodied energy used to create it.
Embodied energy	The energy consumed by all of the processes associated with the production of a material or building including mining and processing of natural resources, manufacturing, transport and product delivery.
EV	Electric vehicle - a vehicle powered by electricity.
FSC	Forest Stewardship Council - a body that promotes responsible management of the world's forests. It provides sustainability certification for timber products by seting specific standards that timber supplier must meet.
Heat Distribution Network	See heat network
Heat Network	A system of insulated pipes which transports heat from a source (or multiple sources) to more than one end user.
Heat Pump	A heating system that absorbs heat from the air, ground or water and uses it to heat a building. Some heat pumps can also cool buildings by transporting heat outside.
MMC	Modern Methods of Construction - methods of construction that are typically quicker, cheaper and more sustainable than traditional construction methods. MMC include offsite prefabrication, modular construction, precast panels and insulated concrete forms.
Offsite construction	The construction of buildings or building elements away from a development site.

Modular construction/modular buildings	Modular buildings are assembled on site from components manufactured in factories.
Operational carbon emissions	See direct carbon emissions
PEFC	Programme for the Endorsement of Forest Certification - an umbrella brand incorporating national timber certification schemes (see FSC).
SuDS	Sustainable Drainage Systems (previously known as Sustainable Urban Drainage Systems) - drainage systems designed to reduce surface water flooding impacts from development through the use of natural systems e.g. by creating ponds and swales and using permeable materials for hard surfaces.
Sun tunnel/sun tube	A pipe or tube that transports sunlight from the exterior to the interior of a building, reducing the need for electric lighting in areas where windows would not provide enough natural light.
TER	Target Emission Rate - the target CO_2 emission rate for a new building set by the Building Regulations. The TER differs depending on the detail of the building.

8. Appendices

Map of Heat Priority Areas



GUILDFORD BOROUGH

Climate Change, Energy and Sustainable Development Questionnaire

When should this questionnaire be used?

This questionnaire is for minor developments (developments from one to nine residential units and one to 1000 square meters of non-residential floor space) and householder developments.

Developments of a scale above these thresholds (major developments) should not use the questionnaire, but should instead submit a Sustainability Statement and an Energy Statement. See policy 'D2: Climate change, sustainable design construction and energy' (policy D2) and the 'Climate Change, Sustainable Design, Construction and Energy SPD' (the 'SPD') for more information.

What is the purpose of this questionnaire?

Policy D2 requires non-major developments to submit "adequate information" about how the development complies with the energy requirements of policy D2 and "information proportionate to the size of the development" regarding other matters of sustainability. These requirements for information will be deemed to have been met if a correctly completed questionnaire is submitted.

The questions in the questionnaire are based on requirements set out in Local Plan policies and you should refer to these to make full use of the questionnaire. The Climate Change, Sustainable Design, Construction and Energy SPD sets out guidance on the matters covered within the questionnaire.

The questionnaire is not an exhaustive list of sustainability matters and additions to the questionnaire are welcome.

The questionnaire is intended to guide development towards sustainable outcomes through compliance with Local Plan policy, from the initial proposal and site layout through to detailed design proposals, the construction process and finally the operation of the completed building. As a result, it is important that the questionnaire is first considered at the outset of planning and at the earliest stage of design. It should be updated as plans evolve.

If planning permission is granted, a condition will be applied requiring work to be carried out in accordance with the information provided in the questionnaire. It is important that the questionnaire is completed in good faith and any works identified within it are deliverable.

Other notes

If extra space is needed, attach additional pages to the questionnaire as necessary or paste the questions into a new document. The questionnaire has been designed to be easily cut and pasted into a new document.

Applicant's name:	
Agent's name:	
Site Address:	
Application reference (if known):	
Description of proposal: (e.g. total and types of units/floorspace)	
Questionnaire prepared by: (name and qualification/job title)	
Signature of above:	
Energy information prepared by: (name and qualification/job title):	
Signature of above:	

Part 1: Sustainable design, construction and climate change adaptation

1. Efficient use of minerals, use of secondary aggregates, waste minimisation and reuse of material from excavation and demolition (Policy D2 1a &1b). See 'Resources, materials and waste' in the sustainable design and construction guide in section 5 of the SPD.

1.a Will the use of primary minerals be minimised through e.g. the use of renewable materials, recycled and secondary aggregates, and other recycled and reused materials? Please provide details.

1b. Will demolition/excavation material from the proposed works be reused on site? Please provide details of where material will be derived and where it will be used.

1c. Will unused mineral waste be sent for reuse or recycling? Please provide details.

1d. Will non-mineral construction waste (e.g. packaging, timber, plastics) be minimised? Please provide details.

1e. Will locally-sourced materials be used? Please provide details.

1f. Will materials be sustainably sourced (e.g. FSC certified timber)? Please provide details.

2. Low energy design: landform, layout, building orientation, massing and landscaping (Policy D2 1c and 2). See 'Site layout, landscaping and urban form' and 'Building design' in the sustainable design and construction guide in section 5 of the SPD.

2a. Will operational energy demand be minimised through low energy design and the use of energy efficient fabric? Please provide details. This information should align with the energy data provided in parts 2a and 2b of this questionnaire.

2b. Has the layout of the site, landscaping and orientation of buildings taken account of solar receipts and other environmental factors to reduce the need for mechanical heating and artificial lighting in the development? Please provide details.

2c. Will the internal layout of buildings make best use of solar gain and natural light? Please provide details.

2d. Will passive cooling/ventilation measures be incorporated into the scheme? Please provide details.

2d. Will the scheme include mechanical cooling (e.g. air conditioning)? If so, explain why passive measures would not be adequate.

3. Water efficiency (Policy D2 1d). See 'Water efficiency' in the sustainable design and construction guide in section 5 of the SPD.

3a. If the scheme includes new dwellings, will these be designed to the national optional building regulation water efficiency standard of 110 litres per person per day (regulation 36(2b))? The relevant Water Efficiency Calculation (s) (Part G) for the new dwellings should be submitted to the Council prior to occupation.

3b. For all developments, will water efficiency measures be incorporated into the scheme to reduce the demand for water? Please provide details.

3c. For all developments, will water harvesting measures be incorporated into the scheme? Please provide details.

4. Measures that enable sustainable lifestyles for building occupants (Policy D2 1e). See 'Measures that enable sustainable lifestyles for building occupants' in the sustainable design and construction guide in section 5 of the SPD.

4a. Will measures that enable sustainable lifestyles for building occupants be incorporated into the scheme? Please provide details.

5. Climate change adaptation (Policy D2 4 and P4). See 'Climate change adaptation' in the sustainable design and construction guide in section 5 of the SPD.

5a. Will the scheme incorporate adaptations for the full range of expected climate impacts including: hotter/drier summers, warmer/wetter winters, more frequent and severe heatwaves and overheating, and more frequent and severe heavy rainfall events and flooding? Please provide details.

5b. Will the use of soft landscaping and permeable surfaces be maximised (as opposed to hard surfacing)? Please provide details.

5c. Will surface water be managed by Sustainable Drainage Systems (SuDS)? Please provide details.

6. Any further information

6a. Please provide information about any other sustainable design, construction and climate change measures that will be incorporated into the scheme.

Part 2a: Energy

7. Combined (Cooling) Heating and Power ((C)CHP) networks (Policy D2 6, 7 and 8).

7a. Will the development fall within the vicinity of a (C)CHP/heat distribution network (of any scale from single building to district heat)? If so, please list the identified networks.

7b. If the development will fall within the vicinity of a (C)CHP/heat distribution network, will the proposed development connect to it or be connection-ready? If not, please set out a clear justification.

7c. Is the development within a Heat Priority Area? If so, is a (C)CHP or heat distribution network proposed as the primary source of energy for the development? If not, please set out a clear justification.

7d. If a new (C)CHP or heat distribution network is proposed, is it designed in accordance with the CIBSE Heat Networks Code of Practice? If not, please provide a clear justification.

8. Low and zero carbon energy

8a. If the scheme includes the provision of low and zero carbon technologies, provide details of the proposed energy systems here including: type of technology, location of installation and predicted energy yield.

9. New buildings: Carbon reduction calculation

9a. Will the proposed scheme deliver any new buildings (net or gross)?

9b. If the answer to 9a is yes, please complete the following carbon reduction calculation template in part 2b.

Part 2b: Carbon reduction calculation

For guidance on how to complete this table, see section 'Questionnaire Part 2b: Carbon reduction calculation' in section 6 of the SPD. Add more rows as appropriate.

1. Reference	2. Target Emission Rate (TER)	3. Dwelling Emission Rate (DER) or Building Emission Rate (BER)	4. % carbon reduction from TER
e.g. Plot 1	e.g. 17.2	e.g. 13.4	e.g. 22.09%