

# Appendix B

## Sustainable design and construction

A practical guide for developers

[www.portsmouth.gov.uk](http://www.portsmouth.gov.uk)





Sustainable design and construction  
A practical guide for developers  
Supplementary Planning Document

*“Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development”*

National Planning Policy Framework, paragraph 93

# Acknowledgements

We are grateful to Radian Housing, PMC Construction & Development Services Ltd, SRE Ltd and MH Architects for sharing their experiences in this field with us. Allowing the lessons they have learned through building to high standards of sustainable design and construction to be published will make these standards more deliverable in the future.



An artist's impression of the Copnor Bridge development, courtesy of Radian

# Contents

<b>01   introduction</b>	<b>1</b>
Who is the guide aimed at and how should it be used?	
Local policy context	
Links with the building regulations and the Government's zero carbon buildings policy	
<b>02   checklist for applicants</b>	<b>5</b>
Timing of the assessments	
Conditions	
What if meeting the standards is not feasible on a site or it would render the development unviable?	
<b>03   residential development</b>	<b>13</b>
An introduction to the Code	
What standards will development need to achieve?	
How does the Code work?	
Mandatory and voluntary credits	
How to approach the Code for Sustainable Homes	
Potential pitfalls to avoid	
<b>04   non-residential development</b>	<b>21</b>
Introduction to the Building Research Establishment's Environmental Assessment Method	
What standards for new development are required?	
How does BREEAM work?	
Mandatory and voluntary credits	
<b>05   sustainable conversion</b>	<b>25</b>
What standards are required?	
How does BREEAM Domestic Refurbishment work?	
Mandatory and voluntary credits	
Conversion of older buildings	
<b>06   the costs of complying with the standards</b>	<b>29</b>
Residential development	
Non-residential development	
<b>07   monitoring and review</b>	<b>30</b>
<b>Appendix 1 model conditions</b>	<b>33</b>
<b>Appendix 2 low and zero carbon energy technology guide</b>	<b>35</b>
<b>Appendix 3 from theory to practice</b>	<b>40</b>
<b>Appendix 4 glossary</b>	<b>45</b>



# 01 | introduction

*“The purpose of planning is to help achieve sustainable development”.*

The National Planning Policy Framework’s Ministerial Foreword

- 1.1 The National Planning Policy Framework (NPPF) describes ‘sustainable’ as ensuring that bettering our lives is not at the expense of others. In turn, ‘development’ means growth, housing a rising population and embracing the opportunities that new technologies offer us. In the NPPF sustainable development has three dimensions:
  - an economic role - contributing to a strong, responsive and competitive economy, including identifying and coordinating development requirements
  - a social role - supporting strong, vibrant and healthy communities by meeting the needs of current and future generations and creating a high quality built environment
  - an environmental role - by using natural resources prudently, minimising waste and both mitigating and adapting to climate change.
- 1.2 Sustainable development is thus about positive growth, making economic, environmental and social progress now and into the future. As a result, high standards of sustainable design and construction are at the heart of sustainable development.
- 1.3 This guide will help the development industry to achieve such standards in Portsmouth. This will ensure that homes built today will last into the future, not impede the lives of future generations and are able to adapt to that climate change which is already inevitable.
- 1.4 Key sources of further information on topics in the guide that may be useful can be found in the ‘where else to look’ boxes. There is also a glossary at appendix 4 which helps to explain the more technical terms involved in sustainable design.

## WHO IS THE GUIDE AIMED AT AND HOW SHOULD IT BE USED?

- 1.5 This guide is known as a supplementary planning document. It does not create new policy but provides detailed guidance on how policies in the Portsmouth Plan will be applied to planning applications. The guide is an important (material) consideration in helping to make decisions about planning applications.
- 1.6 The information and guidance here will be of particular use to developers, agents and architects looking to promote development sites in Portsmouth. It provides practical advice to help

developers comply with the Portsmouth Plan’s sustainable design and construction requirements. This guide should be read alongside other planning documents, in particular the Portsmouth Plan, the Urban Characterisation Study and the Housing Standards Supplementary Planning Document.

- 1.7 Following this guide will ensure that issues are addressed at the correct stage in the design and build process so that they can be overcome as quickly, easily and cheaply as possible. It also sets out what information will be required and when it is needed so that reports are commissioned at the right time. By following the advice in this guide, economically viable, architecturally attractive, sustainable development can take place in a timely manner.

## LOCAL POLICY CONTEXT

- 1.8 The Portsmouth Climate Change Strategy aims to both reduce the city’s greenhouse gas emissions and adapt the city for that climate change which is inevitable. The strategy identifies the Portsmouth Plan as key to reducing emissions from new development.
- 1.9 The adopted Portsmouth Plan acknowledges the city’s vulnerability to the effects of climate change from sea level rise and rising temperatures. It includes a policy on Sustainable Design and Construction (PCS15) which requires new development to achieve standards of sustainable design which are higher than, though consistent with, the Government’s zero carbon buildings policy.

### Residential development

- 1.10 Any development of one or more dwellings will need to meet the standards in figure 1.
- 1.11 Proposals for 10 or more dwellings will need to use an element of low or zero carbon (LZC) energy as part of the measures to meet the overall Code level.
- 1.12 Section 3 has more detail about the standard for residential development.

Year	Overall code level	Energy efficiency †
Up to the end of 2012	3	4
2013	4	5
2014		
2015	5	6
2016 onwards	6	

Figure 1

The overall Code levels required by PCS15

† See section 3.12 for more details on this.

### Residential conversions

- 1.13 Conversions yielding one more residential units should achieve the Building Research Establishment’s Environmental Assessment Method (BREEAM) Domestic Refurbishment ‘very good’ standard. Section 5 has more detail about the standard for residential conversions.

### Non-residential development

- 1.14 Applications for development of more than 500m<sup>2</sup> of non-residential floorspace (see section 2 for what constitutes non-residential) must meet certain standards. Applications submitted up until the end of 2012 should meet the Building Research Establishment’s Environmental Assessment Method (BREEAM) ‘very good’ standard. From 2013 onwards, BREEAM ‘excellent’ standard.
- 1.15 An element of LZC energy should be used as part of the measures to meet the overall BREEAM level.
- 1.16 Section 4 has more detail about the standard for non-residential development.



#### Where else to look

Portsmouth Climate change strategy  
[www.portsmouth.gov.uk/living/15773.html](http://www.portsmouth.gov.uk/living/15773.html)

The Portsmouth Plan  
[www.portsmouth.gov.uk/living/7923.html](http://www.portsmouth.gov.uk/living/7923.html)

Urban Characterisation Study  
[www.portsmouth.gov.uk/living/24271.html](http://www.portsmouth.gov.uk/living/24271.html)

Housing Standards SPD  
[www.portsmouth.gov.uk/living/3850.html](http://www.portsmouth.gov.uk/living/3850.html)

## LINKS WITH THE BUILDING REGULATIONS AND THE GOVERNMENT'S ZERO CARBON BUILDINGS POLICY

---

- 1.17 The Building Regulations are set out by the Government and provide technical standards for different aspects of a building's construction. These apply to new build and most renovations or extensions to existing buildings. The regulations include standards relating to the environmental impact of buildings, including energy conservation. This is part L of the regulations.
- 1.18 Checking compliance with the building regulations is a separate process to getting planning permission. However both planning permission and building regulations approval is needed for most development to take place.
- 1.19 The Government are committed to making all homes zero carbon by 2016 and non-residential buildings in 2019. This will not require development to achieve full Code or BREEAM levels but will simply reduce the carbon emissions from new buildings. This will be achieved through changes to part L of the building regulations. The exact standards are still being decided.



# 02 | checklist for applicants

- 2.1 To achieve the standards set out in policy PCS15, new development will need to be formally assessed. The assessment which will be needed depends on what the end use will be. There are different types of assessment because different building uses will have different ways to reduce greenhouse gas emissions and so different criteria make up each assessment. A mixed-use development will need to use different assessments for each end use.
- 2.2 The Code for Sustainable Homes (the Code) can be used to assess:
- new build residential houses or flats.
- 2.3 The Building Research Establishment's Environmental Assessment Method (BREEAM) New Construction family of assessments can be used to assess:
- |  |  |
|--|--|
| ▪ residential care homes                   | ▪ financial and professional services                                |
| ▪ sheltered accommodation                  | ▪ restaurants, cafés, drinking establishments and hot food takeaways |
| ▪ purpose built student accommodation      | ▪ schools and crèches  |
| ▪ hotels                                   | ▪ healthcare facilities  |
| ▪ offices, industrial units and warehouses | ▪ community and cultural uses  |
| ▪ shops and leisure facilities             |  |
- 2.4 BREEAM Domestic Refurbishment can be used to assess:
- residential conversions.
- 2.5 It may be that some residential institutions fall under the Code. This depends on the amount of communal facilities which are available. The licensed assessor will be able to confirm which assessment will apply.
- 2.6 If the proposed use of a development is not listed above, it will probably need to be assessed under BREEAM Bespoke. Call BRE Global on 01923 664462 or email [breeam@bre.co.uk](mailto:breeam@bre.co.uk) to confirm this.

## TIMING OF THE ASSESSMENTS

---

- 2.7 The RIBA Outline Plan of Works sets out in a clear way the essential processes involved in the development process. It is a widely used framework for building design and construction.
- 2.8 RIBA have mapped the ways in which sustainable design and construction can be integrated into the development process. This is known as the Green Overlay.
- 2.9 Figure 2 sets out the Outline Plan of Works, with the Green Overlay. It also shows how this interacts with the Code or BREEAM assessment and the planning process.

### Pre-application meetings

- 2.10 At this point, a licensed assessor should have been commissioned. Ideally, the assessor should accompany the project team to any pre-application meetings with the city council. A pre-assessment estimator can be completed by the assessor prior to the meeting. This will show how the Code or BREEAM rating can be achieved on the site and also highlight any potential issues with meeting the required levels early on so that they can be explored at the meeting.

### Outline Applications

- 2.11 The Code or BREEAM rating that must be achieved is the one which is applicable on the date the application is **determined**.
- 2.12 Outline applications will be addressed on a case-by-case basis as the amount of detail which is provided can vary dramatically from one application to another. However generally speaking, the city council expects a pre-assessment estimator or design stage assessment to be submitted though this will not be required. This would not be expected when most matters are to be reserved though.
- 2.13 Outline approval will be issued with conditions which require the submission of the design stage assessment and certificate **or a pre-assessment estimator** prior to the construction of any phase of the site. Post-construction assessments and certificates will also need to be submitted before any part of the development can be occupied.

### Full applications

- 2.14 As with outline applications, the Code or BREEAM rating that must be achieved is that which is applicable on the date the application is **determined**.
- 2.15 For full applications the city council expects, and strongly encourages, **a pre-assessment estimator or** design stage assessment and certificate to be submitted as part of the application. However this will not be required so as to give applicants the flexibility to approach the issue as they wish.
- 2.16 BREEAM assesses the whole development and so only one assessment and certificate will be required for each end use. However the Code assesses each dwelling, or dwelling type, individually. So for residential developments, the appropriate assessment(s) and certificate(s) will need to be submitted to show that all dwellings will meet the required standards. This will need to include evidence that all mandatory credits have been achieved. This will generally be in the form of the assessor's design stage report together with a covering letter.

- 2.17 It is important that the information submitted with the application includes details of the licensed Code or BREEAM assessor who has compiled the reports.
- 2.18 If the design stage assessment shows compliance with policy PCS15, subject to other material considerations, conditional planning permission will be granted. If the report shows that the policy will not be met and insufficient evidence has been submitted to demonstrate that it would be unviable or unfeasible to meet the standard on the site in question (see below), then it is likely that the application would be refused.
- 2.19 If no design stage assessment is submitted, conditional planning permission may still be granted. However the conditions will require full compliance with policy PCS15 (see section 2.22). As a result, if this later turns out not to be possible, an application to vary the condition will be required. This would obviously delay the development process. Consequently, developers are strongly encouraged to address this issue when submitting planning applications.

## CONDITIONS

---

- 2.20 When planning permission is issued, one or more conditions will be attached to ensure that the proposals in policy PCS15 are achieved on the ground.
- 2.21 If a **pre-assessment estimator or** design stage assessment and certificate has been submitted, the permission will be accompanied by a pre-occupation condition. This will require the submission of the post-construction assessment and certificate before the development can be occupied. This will ensure that the development has been built to the appropriate standard and the process has been fully signed off by the certification body.
- 2.22 If no **pre-assessment estimator or** design stage assessment is submitted with the application then both a pre-commencement and pre-occupation condition will be attached to the permission. The pre-commencement condition will require a **pre-assessment estimator or** design stage assessment to be submitted to the city council before building work starts. This will ensure that the final design of the development fully incorporates the requirements of policy PCS15 prior to construction commencing. This will help to avoid sustainability measures having to be added retrospectively at immense cost.
- 2.23 Examples of the conditions that will be used are available in appendix 1.

### Where else to look

GreenBookLive

<http://www.greenbooklive.com/>

The Sustainable Planning and Purchasing Centre

<http://www.environmentcentre.com/rte.asp?id=14>.

The Institute of Ecology and Environmental Management

<http://www.ieem.net/members-directory/search>

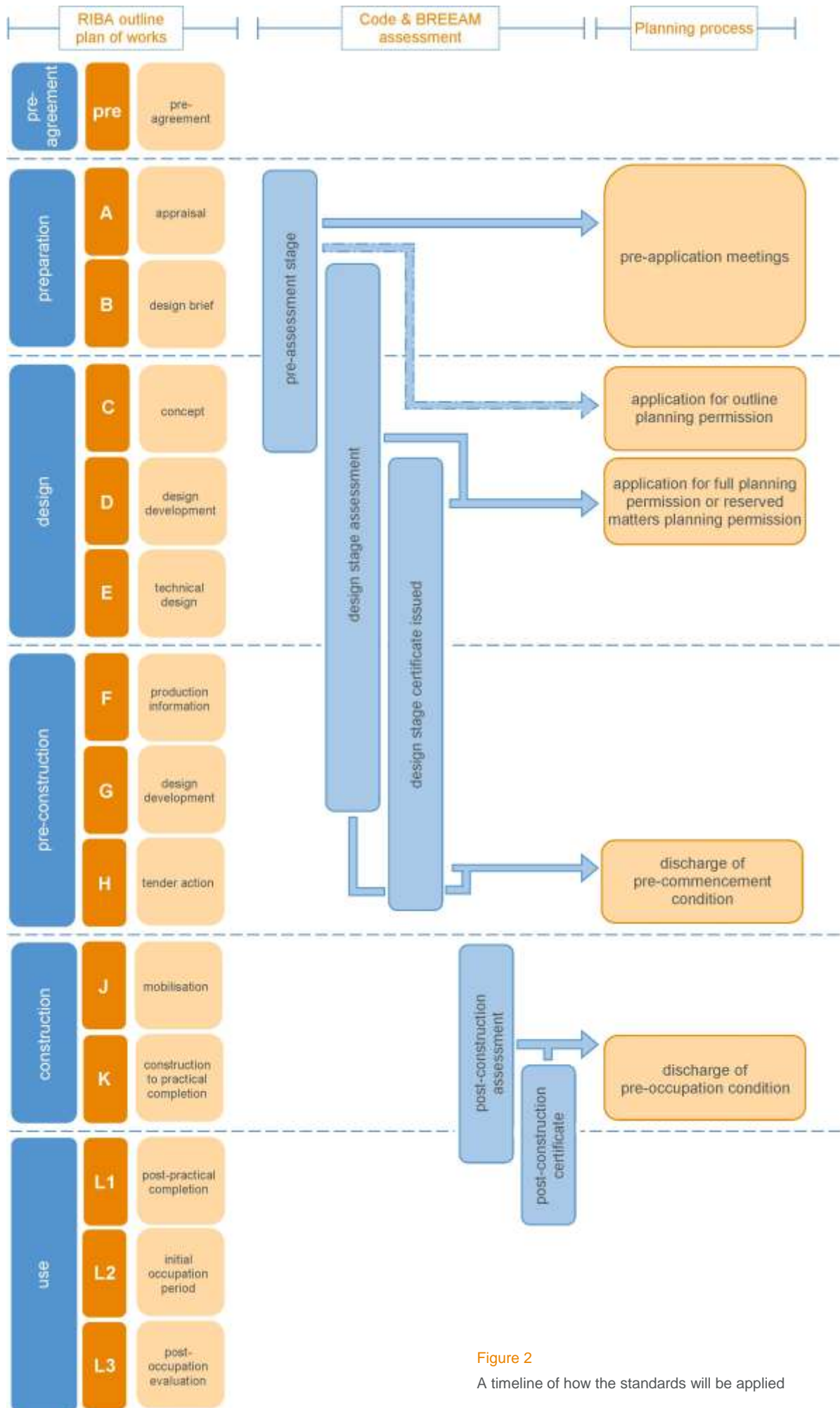


Figure 2  
A timeline of how the standards will be applied

## The green overlay

- strategic sustainability review of client needs and potential sites, including re-use of existing facilities, building components or materials.

- internal environmental conditions and formal sustainability targets stated.
- building lifespan and future climate parameters stated.
- early stage consultation, surveys or monitoring undertaken as necessary to meet sustainability criteria or assessment procedures.
- involvement of design team after practical completion defined.
- Site Waste Management Plan (SWMP) started.

- key design team members appointed.
- formal sustainability pre-assessment and identification of key areas of design focus. Deviation from aspirations reported.
- initial Part L assessment.
- plain English description of internal environmental conditions, seasonal control strategy and systems prepared.
- environmental impact of key materials and construction strategy checked.
- resilience to future changes in climate considered.

- full formal sustainability assessment.
- interim Part L assessment and design stage carbon/energy declaration (e.g. Carbon Buzz).
- design reviewed to identify opportunities to reduce resource use and waste and recorded in SWMP.

- formal sustainability assessment substantially complete - minor technical and contractor items only outstanding.
- principles of handover process and post-construction service agreed.
- details audited for air tightness, continuity of insulation and sub-contractor package coordination.

- part L submission, design stage carbon/energy declaration update and future climate impact assessment.
- non-technical user guide drafted, format and content of Part L log book agreed.
- submission of all outstanding design stage sustainability assessment information.
- compliance of contributions by specialist consultants and contractors with agreed sustainability criteria demonstrated. Building handover process and monitoring technologies specified.

- contractor sustainability standards specified.

- contractor sustainability credentials assessed against specified standards.
- implications of cost reductions and contractor substitutions reviewed against sustainability targets.

- SWMP passed to contractor
- design stage sustainability assessment certified.
- construction sustainability procedures developed with contractor.
- review of commissioning and handover programme.

- contractor's interim testing and monitoring of construction reviewed and observed particularly air tightness and continuity of insulation. Implications of changes to
- specification or design reviewed against sustainability criteria. Non-technical user guide completed and aftercare service set up. Assistance with collating as-built
- information for post-construction sustainability certification.

- assistance with collation of post-completion information for final sustainability certification.
- observations of building operation in use and assistance with fine tuning and guidance for occupants.
- declaration of energy/carbon performance in use (eg Carbon Buzz).

## WHAT IF MEETING THE STANDARDS IS NOT FEASIBLE ON A SITE OR IT WOULD RENDER THE DEVELOPMENT UNVIABLE?

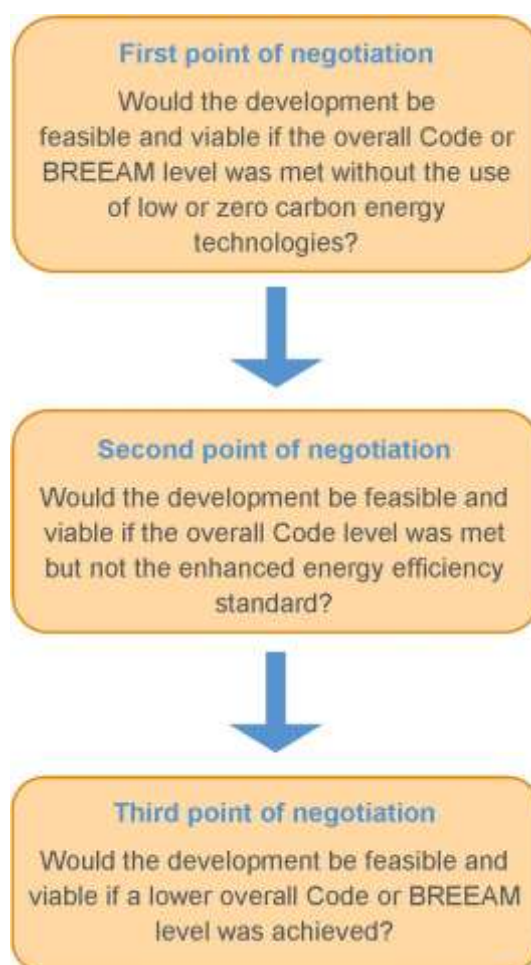
- 2.24 The policy has been assessed by an independent planning inspector as part of the Examination of the Portsmouth Plan. He concluded that the standards would be generally achievable in Portsmouth. Particularly with regard to the standards up to the end of 2014, the costs of meeting these standards are not seen as being particularly challenging or significant (see section 7 for more details on likely costs).
- 2.25 However it is recognised that on some sites the standards required by policy PCS15 may not be achievable, particularly where there are high abnormal costs or if the site is particularly small.
- 2.26 Where the applicant has identified a potential shortfall in the standard which can be achieved, a sound and fully justified case will need to be submitted demonstrating why the policy requirements cannot be met. This will need to be accompanied by an open book viability analysis and/or a feasibility analysis from a licensed Code or BREEAM assessor. This will then be assessed by an independent third party, at the developer's expense.
- 2.27 The onus is on the developer to demonstrate why meeting the standards set in the policy is not feasible or viable based on reasonable market assumptions. A high purchase price for development land will not be regarded as sufficient justification. The likely timescale for the completion of the development will also need to be taken into account. Larger schemes that will be built out over several years will need to demonstrate a realistic viability case over the whole build period in order for a relaxation of the standard for those schemes to be considered.
- 2.28 When discussing whether schemes are able to include the standards in policy PCS15, a staged negotiation will take place.

### Low or zero carbon energy

- 2.29 Whilst it is important to future-proof the energy supply for new developments, it is accepted that installing LZC energy may not be the most efficient way of meeting the necessary Code or BREEAM rating. This is particularly the case on more constrained infill sites where the scope to orientate buildings and adapt the layout of the development is more limited. In such a situation, discussions will take place with applicants to determine whether the required Code or BREEAM level can be met purely through improvements to the building fabric and incorporation of energy efficiency measures, without relying on LZC energy.

### Enhanced energy efficiency

- 2.30 National research has shown that most of the additional cost of meeting Code standards comes solely from meeting the dwelling emission rate standards (issue Ene 1), which determines the energy efficiency of the dwelling. As a result, in financially marginal schemes,





the second point of negotiation will be whether the enhanced dwelling efficiency rate obligation (the right hand column in the policy) should be removed.

#### **Overall Code or BREEAM level**

- 2.31 If the above two options have been tested and this does not make the development both feasible and viable, lowering the overall Code or BREEAM level can be explored.
- 2.32 Please bear in mind that both assessment schemes have lower ratings than are set out in the policy. As a result, if a development cannot meet Code level 3, Code level 2 or 1 is seen as preferable to a zero rating. Similarly, if BREEAM 'very good' is not possible to achieve, then a 'good' or 'pass' rating will be explored.
- 2.33 Applicants and their consultants should bear this negotiation framework in mind so that when viability or feasibility analyses are done, alternative cost or technical scenarios without LZC energy or the enhanced energy rating as well as lower overall ratings should be explored.



# 03 | residential development

## AN INTRODUCTION TO THE CODE

- 3.1 The Code was introduced in 2006 as a way of measuring the sustainability of new housing using objective criteria and verification. The results of the Code assessment are recorded on a certificate and assigned to each dwelling which makes up the development.
- 3.2 The Code covers nine categories:
  - energy and CO<sub>2</sub> emissions
  - water
  - materials
  - surface water run-off
  - waste
  - pollution
  - health and well-being
  - management
  - ecology
- 3.3 At the end of the assessment, the overall performance of the building will result in a Code rating of zero to six stars. An example certificate is shown in figure 3.

## WHAT STANDARDS WILL DEVELOPMENT NEED TO ACHIEVE?

- 3.4 Policy PCS15 of the Portsmouth Plan sets out Portsmouth's local sustainable design standards for residential buildings (see figure 4). However the plan adopts a holistic approach and the policies on flood risk (PCS11), transport (PCS17) and a greener Portsmouth (PCS13) are also relevant to this guide and planning applications.

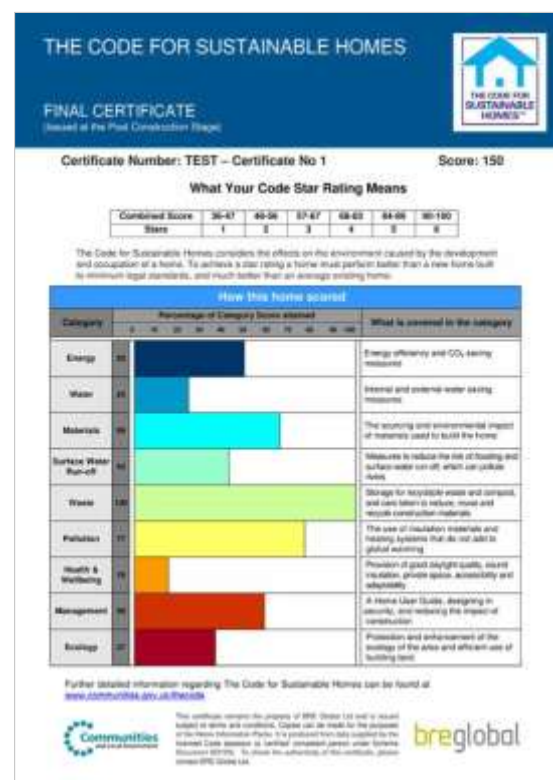


Figure 3  
An example Code certificate

## HOW DOES THE CODE WORK?

3.5 Each of the nine Code categories has a number of issues associated with it. The Code assigns one or more assessment criteria to each of those issues. When each criterion is achieved, a credit is awarded.

3.6 Within each category, credits are weighted and converted into percentage points to reflect the contribution made by each category to the total performance of the building. This is set out in figure 5. The breakdown of the weighting factor for each category is in figure 3. As an example of this, there are 31 credits available for issues in the energy and CO<sub>2</sub> emissions category. However these credits are then weighted and converted into 36.4% of the total available points. This means that the category has a weighting factor of 1.17 and so gaining credits in this category will convert to more points. On the other hand, the 24 credits available in the materials category have a weighting of just 0.3 and so will convert to relatively few points.

Code level	Total percentage points
Level 1 (★)	36
Level 2 (★★)	48
Level 3 (★★★)	57
Level 4 (★★★★)	68
Level 5 (★★★★★)	84
Level 6 (★★★★★★)	90

Figure 6

The amount of points needed for each Code level

3.7 The final points score is between 0 and 100 and determines the Code level which the dwelling will get. The amount of points needed for each level is set out in figure 6.

Year	Overall code level	Energy efficiency <sup>†</sup>
Up to the end of 2012	3	4
2013	4	5
2014		
2015	5	
2016 onwards	6	6

Figure 4

The overall Code levels required by PCS15

<sup>†</sup>This relates to the dwelling efficiency rate of the new dwelling and is covered by issue Ene 1. See section 3.12 for more details.

Code category	Total credits in each category	Weighting factor (% contribution)	Weighted value of each credit
Energy and CO <sub>2</sub>	31	36.4%	1.17
Water	6	9.0%	1.5
Materials	24	7.2%	0.3
Surface water run-off	4	2.2%	0.55
Waste	8	6.4%	0.8
Pollution	4	2.8%	0.7
Health and well-being	12	14.0%	1.17
Management	9	10.0%	1.11
Ecology	9	12.0%	1.33

Figure 5

Total Code credits available, weighting factors and points

## MANDATORY CREDITS

---

3.8 The code has a number of issues where a certain number of credits need to be achieved.

### Required for any Code level

3.9 For three issues, there is a single mandatory minimum performance standard which must be met to achieve any Code level. Credits are not awarded for these issues. These are:

- environmental impact of materials (Mat 1)
- management of surface water run-off from developments (Sur 1)
- storage of non-recyclable waste and recyclable waste (Was 1)

3.10 **If these mandatory standards are not achieved, it is impossible to get any Code level and so the development will not comply with policy PCS15.**

### Energy efficiency and water use

3.11 For two issues, credits are awarded for increasing levels of the Code. These are:

- dwelling emission rate (Ene 1)
- indoor water use (Wat 1)

3.12 Please note that to comply with policy PCS15 the energy efficiency of the dwelling will be required to be higher, generally by one level, than the overall Code level. Up until the end of 2012, three credits will need to be achieved for this issue. This rises to nine credits from 2013 to 2015.

3.13 There are two other issues, where a certain number of credits must be achieved to meet certain Code levels. To achieve an overall Code level of five, at least seven credits will be needed in 'fabric energy efficiency' (Ene 2). Similarly, to achieve Code level six the seven credits from 'fabric energy efficiency' (Ene 2) will be needed together with three credits in 'lifetime homes' (Hea 4).

### Low or zero carbon energy

3.14 Larger developments must also use an element of LZC energy to reduce the total carbon emissions from each dwelling. This should be done as part of the overall set of measures being used to meet the Code requirements and is measured through issue Ene 7.

3.15 In 2012 LZC energy should be used to reduce emissions by 10% and from 2013 onwards there should be a 15% reduction. This equates to gaining one credit for issue Ene 7 in 2012 and then two credits from 2013 onwards. There are more details about the technologies available and which may be most suitable in appendix 2.

### Private amenity space

3.16 Under policy PCS15, all new residential units must include private amenity space. This relates to issue Hea 3 (private space) of the Code. Private amenity space can be provided, at a standard of 1.5m<sup>2</sup> per bedroom as a garden, balcony, patio or something similar. Alternatively, semi-private space can be provided as a communal garden, roof terrace or courtyard at a standard of 1m<sup>2</sup> per bedroom. The space should be designed to make it clear that this is not public open space. This can be done using the buildings themselves, or through a fence or planting.

## Cycle parking

- 3.17 Under PCS17, all new residential units must include cycle parking. This is covered by issue Ene 8 (cycle storage) of the Code.
- 3.18 Two credits must be achieved to show compliance with this policy requirement. This requires:
- studio or one bedroom dwelling - one space per dwelling
  - two or three bedroom dwelling - two spaces per dwelling
  - four+ bedroom dwelling - four spaces per dwelling
- 3.19 This can be provided in a dedicated cycle store, in sheds or garages. For all solutions, there must be easy access from the dwelling to the cycle store and to a public right of way. This cannot be through the new home. Communal storage for flats must be no more than 100m from the main entrance.
- 3.20 However it is recognised that the need to access the cycle store from both the dwelling and a public right of way could be problematic for some sites in Portsmouth. Consequently, whilst cycle parking will still be required on all sites, if these credits are not achievable because it is not possible to directly access a public right of way, this may be allowed.
- 3.21 The forthcoming cycle parking guidance will set out best practice in how to design cycle facilities and gives a number of case studies. This will help developers to design the most effective solutions which will be well used and positively received.

## Summary of mandatory Code credits

### Dwelling emission rate

This is issue Ene 1

Up to the end of 2012 .....	3 credits
2013 - 2015 .....	9 credits
2016 onwards.....	10 credits

### Indoor water use

This is issue Wat 1

2012 - 2014 .....	3 credits
2015 onwards.....	5 credits

### Low and zero carbon technologies (schemes of 10+ units only)

This is issue Ene 7

2012 .....	1 credit
2013 onwards.....	2 credits

### Private amenity space

This is issue Hea 3

All times.....	2 credits
----------------	-----------

### Cycle parking

This is issue Ene 8

All times.....	2 credits
----------------	-----------

### Management of surface water runoff

This is issue Sur 1

All times.....	No credits
----------------	------------

### Environmental impact of materials

This is issue Mat 1

All times.....	No credits
----------------	------------

### Storage of non-recyclable waste and recyclable waste

This is issue Was 1

All times.....	No credits
----------------	------------

### Fabric energy efficiency

This is issue Ene 2

2015 onwards.....	7 credits
-------------------	-----------

### Lifetime homes

This is issue Hea 4

2016 onwards.....	3 credits
-------------------	-----------

## VOLUNTARY CREDITS

- 3.22 Once all of the mandatory credits have been achieved, there is the flexibility to choose which other issues to address to get enough credits, and therefore points, to achieve the required Code level.

## HOW TO APPROACH THE CODE FOR SUSTAINABLE HOMES

---

- 3.23 It would be easy to think that the best way to work through the Code would be to start at the top with energy and CO<sub>2</sub> and work down to ecology. However this is not the case.
- 3.24 The most productive thing that can be done is, as soon as possible in the process, bring in a licensed Code assessor as a sustainability consultant. Exploring the Code and the site in collaboration with an assessor will pay dividends later as a small amount of planning at the concept stage of the development will ensure that cost-effective solutions are not ruled out. This may save thousands of pounds in development cost. It will also make sure that the architects will make the most of the site's benefits. This should result in attractive designs that do not appear to have elements which have been added after the design has been finalised. See figure 1 for a detailed breakdown of how sustainability issues fit into the development process.
- 3.25 The most productive and cost effective route through the Code is to look firstly at the mandatory elements, then those that can be incorporated at a low cost at an early stage and finally to look at where elements interact. This will enable dwellings to be built at the lowest possible cost whilst also producing a high quality product. There is no single best route to the necessary Code rating, it will vary from site to site. However there are some things which are considered best practice and have been learned from several years of using the Code.
- 3.26 Before the site layout is finalised, it is worth considering how the development can maximise its performance through orientation to take advantage of (free) solar gain. This will provide solar energy in the winter, shading in the summer and will automatically orientate the roof so that photovoltaic or solar hot water systems can be used. By doing this, the energy use of the building, and thus the cost of achieving the standards in policy PCS15, will both be reduced.
- 3.27 At this initial stage, a flood risk assessment should be prepared to show that at least the mandatory requirement of Sur 1 (management of surface water run-off from the developments) will be met. **Green roofs and walls can also help achieve the Sur 1 requirements as well as Eco 4 whilst contributing to a variable and interesting built form and improved biodiversity.**
- 3.28 Achieving maximum use of the building footprint, potentially by making provision for the roof space to be habitable is also best considered at an early stage. The Lifetime Homes standard is also heavily weighted and so it may be a pragmatic solution. This will certainly be easier to integrate early in the design process than later.
- 3.29 In most cases it will be relatively simple to gain a large number of credits in the ecology section. As most sites in Portsmouth are brownfield sites with low inherent ecological value, preservation credits should be simple to achieve. It also provides a low baseline from which to improve the site's biodiversity value through simple measures, which will add further credits. Finally, this will help a site to comply with the requirements in policy PCS13 regarding the preservation and enhancement of on-site biodiversity.
- 3.30 One of the best ways to achieve the energy efficiency requirements is to incorporate the principles of PassivHaus developments. This includes using natural heat from the sun, high standards of air tightness and the use of mechanical ventilation and heat exchangers. This maintains a constant, comfortable temperature all year round. In urban settings, particularly on small sites, this will usually be the best way to achieve higher Code levels. These techniques have been successfully incorporated into developments such as Stoneham Green and Copnor Bridge (see appendix 3).

- 3.31 There is also an advantage in aiming for credits that can be verified in advance of the post-construction assessment, i.e. credits that are not dependent on the quality of workmanship or work methods in order to be achieved. For example, becoming part of a considerate constructors scheme can give a high level of confidence that those credits can be achieved. However if relying on a high standard of performance for sound insulation, the result cannot be guaranteed until the end of the construction period. At this stage, if testing does not show the necessary standard has been achieved, costly retrofitting may be the only option, which also cannot be guaranteed to be successful.
- 3.32 There are also some easy wins, although they do need forward planning. Rainwater butts are easy to specify and cheap to install. Their use would also particularly welcome as Portsmouth's sewer system is stretched and the city is in an area of water stress. However, an element of forward planning is required as the downpipe must be appropriately placed.
- 3.33 It is also strongly recommend that developers aim slightly higher than is necessary to achieve the required Code level. This will make sure that if some credits are lost during construction then the required Code level is still met. The most common areas where failure to perform might have serious consequences are air tightness (affecting Ene 1, Ene 2 and (indirectly) Ene 7), auditing of documentation to confirm responsible sourcing of materials (Mat 2 and Mat 3) and sound testing of separating walls and floors (affecting Hea 2). Indeed, one lesson which has been learnt by Housing Associations when building to high Code standards is to allow plenty of time at the end of the construction process for air tightness and sound proofing testing to take place and alternations to be made if needs be.

## POTENTIAL PITFALLS TO AVOID

---

- 3.34 Whilst all measures will help to achieve the Code level being aimed for, some are more technically difficult. Additionally, whilst the financial impact of measures with high capital cost will be obvious, attention should be paid to hidden costs such as installation and rising prices due to demand.
- 3.35 Measures that need extra space, such as soakaways, Combined Heat and Power (CHP), district heating systems or Lifetime Homes can have significant impacts on the site layout and so need to be considered particularly early on in the design process.
- 3.36 In the past, to meet levels 5 and 6 for internal water use (Wat 1), grey water recycling or rainwater harvesting was needed. These systems have very high monetary and carbon costs associated with them. They also need sufficient space to be able to house underground tanks as well as being complex systems to use for future residents. As a result, their use is strongly discouraged.
- 3.37 It is very rare that these systems will be needed when building to Code levels 3 or 4. A typical specification for Code Level 3 and 4 would be:
- WC dual-flush: 4 litre full flush volume, 2.6 litre part-flush volume
  - wash-hand basin taps: maximum 6 litres/minute
  - bath: 150 litre capacity to overflow
  - kitchen taps: maximum 6 litres/minute.
- 3.38 This specification yields a calculated internal water consumption of 104.7 litres/person/day.



- 3.39 Even more efficient fittings are needed to meet Code levels 5 and 6. However such systems are now available and represent a significant financial and carbon cost saving on rainwater harvesting or grey water recycling (see appendix 3). It is strongly recommended that developers achieve the internal water use standards solely through water efficient fixtures and fittings.
- 3.40 Some may question the use of low-flow taps and smaller baths, as there is an obvious danger that residents will later install their own fittings if the water efficient fittings do not feel right. However taps and shower heads can now deliver adequate performance with a **flow rate of four litres per minute (see appendix 3 for the Stoneham Green case study)**. These usually modify the water flow using aeration or modulation to enhance its 'feel'.

#### Where else to look

Code for Sustainable Homes technical guidance

[www.planningportal.gov.uk/uploads/code\\_for\\_sustainable\\_homes\\_techguide.pdf](http://www.planningportal.gov.uk/uploads/code_for_sustainable_homes_techguide.pdf)

The Code for Sustainable Homes simply explained (NHBC)

[www.nhbcfoundation.org/Portals/0/NF15%20The%20Code%20for%20Sustainable%20Homes%20simply%20explained.pdf](http://www.nhbcfoundation.org/Portals/0/NF15%20The%20Code%20for%20Sustainable%20Homes%20simply%20explained.pdf)

Lifetime Homes

[www.lifetimehomes.org.uk](http://www.lifetimehomes.org.uk)



# 04 | non-residential development

## INTRODUCTION TO THE BUILDING RESEARCH ESTABLISHMENT'S ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

- 4.1 BREEAM is the assessment regime for any development other than new build houses and flats. There are many types of BREEAM assessment, depending on whether it is the design and build of a new development, fit out and operation or conversion which is being assessed. An example BREEAM certificate is in figure 7.
- 4.2 PCS15 requires all new build non-residential development to comply with certain BREEAM levels and so these projects will be assessed under the BREEAM New Construction family of assessments. The BREEAM ratings for new construction projects are set out in figure 6 below.

### WHAT STANDARDS FOR NEW DEVELOPMENT ARE REQUIRED?

- 4.3 Non-residential development which results in a net gain of more than 500m<sup>2</sup> net additional floorspace must achieve a BREEAM level of 'very good' for applications submitted in 2012, rising to 'excellent' from 2013 onwards. Please note that if the application is for less than 500m<sup>2</sup> of new floorspace, there is no standard which needs to be met.



Figure 7  
An example BREEAM certificate

## HOW DOES BREEAM WORK?

4.4 BREEAM New Construction has nine categories:

- management
- health and well-being
- energy
- transport
- water
- materials
- waste
- land use and ecology
- pollution

BREEAM category	Total credits in each category	Section weighting
Management	22	0.12
Health & wellbeing	10	0.15
Energy	30	0.19
Transport	9	0.08
Water	9	0.06
Materials	12	0.125
Waste	7	0.075
Land use and ecology	10	0.10
Pollution	13	0.10
Innovation	10	0.1

Figure 8

Total BREEAM credits available and weighting factors

4.5 There is also a tenth category for innovation.

One of the aims of BREEAM is to support innovation within the development industry.

To help do this, there are credits available for sustainability related benefits that are not recognised by standard BREEAM assessment issues and criteria.

This enables clients and design teams to boost their building's BREEAM performance and helps to boost the market for innovative technologies and designs. The BREEAM assessor will be able to give more details about innovation credits.

4.6 Each of the categories, except innovation, has a number of issues associated with it. BREEAM then assigns one or more assessment criteria to each of the issues. When each criterion is achieved a credit is awarded.

BREEAM level	Total percentage points
Pass	30
Good	45
Very good	55
Excellent	70
Outstanding	85

Figure 9

The points needed for each BREEAM level.

4.7 Within each category, credits are weighted and converted into percentage points to reflect the contribution made by each category to the total performance of the building. This means that the final points score is between 0 and 100. The breakdown of the weighting factor for each category is in figure 8. This determines the overall BREEAM level which the development will get. The amount of points needed for each level is set out in figure 9.

4.8 BRE Global regularly updates the standards and guidance for BREEAM New Construction. As a result, developers should refer to the technical manuals on the BREEAM website for the latest requirements.

## MANDATORY CREDITS

4.9 There are mandatory credits which must be achieved to get a certain BREEAM level. To achieve the 'very good' rating, there are seven mandatory issues where certain performance must be achieved as a minimum. This rises to eleven issues for the 'excellent' rating. These are set out below.

### Low or zero carbon energy (renewable energy)

4.10 As part of the measures used to meet these standards, 10% of the development's emissions should also be mitigated for using LZC energy technologies. As with the Code, this relates to a specific issue in the BREEAM assessments and gaining these credits will be used to assess compliance with the requirement. This is usually addressed by BREEAM issue Ene 04 (low and zero carbon technologies).

4.11 As a result, it is generally necessary to achieve at least two credits in Ene 04 as part of the selection of measures selected to meet the required BREEAM level. There are more details about the technologies available and which may be most suitable in appendix 2.

### Cycle parking

4.12 In addition, under policy PCS17 all new development must include cycle parking. This is addressed through TRA 03 (cyclist facilities). Generally two credits will be required under this issue. To achieve these, a certain amount of cycle parking will need to be provided. The exact amount depends on the type of building being built. For example, a new office will need to provide one cycle parking space per ten staff. New retail facilities will need one space per ten staff and one space per twenty public car parking spaces. On top of this, other cycle facilities will need to be provided. Generally out of showers, changing facilities and lockers, two must be selected.

## VOLUNTARY CREDITS

4.13 Once all of the mandatory credits have been achieved, including those made mandatory by the Portsmouth Plan, the developer has the flexibility to choose which other issues to address to get enough credits, and therefore points, to achieve the required level.

4.14 There are many issues that it would be particularly appropriate to focus on in Portsmouth. Green roofs and walls will help create an interesting and variable built form and help improve biodiversity. As a result, they can help gain credits for ecology and surface water runoff.

## Mandatory BREEAM credits

### Cyclist facilities

This is issue TRA 03

All times ..... 2 credits

### Low or zero carbon technologies

This is issue ENE 04

All times ..... 2 credits

### Sustainable procurement

This is issue MAN 01

All times ..... 1 credit

### Responsible construction practices

This is issue MAN 02

2013 onwards ..... 1 credit

### Stakeholder participation

This is issue MAN 04

2013 onwards ..... 1 credit

### Visual comfort

This is issue HEA 01

All times ..... criterion 1 only

### Water quality

This is issue HEA 04

All times ..... criterion 1 only

### Reduction of CO<sub>2</sub> emissions

This is issue ENE 01

2013 onwards ..... 6 credits

### Energy monitoring

This is issue ENE 02

All times ..... 1 credit

### Water consumption

This is issue WAT 01

All times ..... 1 credit

### Water monitoring

This is issue WAT 02

All times ..... criterion 1 only

### Responsible sourcing

This is issue MAT 03

All times ..... criterion 3 only

### Where else to look

BREEAM New Construction technical manuals  
<http://www.breeam.org/page.jsp?id=301>



# 05 | sustainable conversion

- 5.1 A step change in the supply of new homes is a clear opportunity to ensure that high standards of sustainable design and construction are met. However a large section of the supply of new homes in Portsmouth comes from the conversion and refurbishment of existing buildings. As a result, high standards should be sought here too.
- 5.2 The Code for Sustainable Homes is not able to assess conversions to residential, only new build units. BREEAM Domestic Refurbishment has been specifically set up to assess the sustainability of conversion projects.

## WHAT STANDARDS ARE REQUIRED?

- 5.3 When extensive work is being done to a building, it is an ideal time to install measures such as underfloor insulation, low flow water fixtures and LZC energy systems. Consequently the city council encourages new conversions yielding one or more residential units to meet BREEAM Domestic Refurbishment 'very good' standard.

## HOW DOES BREEAM DOMESTIC REFURBISHMENT WORK?

- 5.4 BREEAM New Construction has seven categories:
  - management
  - health and well-being
  - energy
  - water
  - materials
  - waste
  - pollution

BREEAM category	Credits available	Section weighting
Management	11	0.12
Health & wellbeing	12	0.17
Energy	29	0.43
Water	4	0.11
Materials	45	0.08
Waste	5	0.03
Pollution	8	0.06
Innovation	-	0.10

Figure 10

Total BREEAM Domestic Refurbishment credits available and weighting factors

BREEAM level	Total percentage points
Pass	30
Good	45
Very good	55
Excellent	70
Outstanding	85

Figure 11

The points needed for each BREEAM Domestic Refurbishment level.

- 5.5 There is also a category for innovation as in other BREEAM assessments. A BREEAM Domestic Refurbishment assessor will be able to give more details about innovation credits.
- 5.6 Each of the categories, except innovation, has a number of issues associated with it. BREEAM Domestic Refurbishment then assigns one or more assessment criteria to each of the issues. When each criterion is achieved a credit is awarded.
- 5.7 Within each category, credits are weighted and converted into percentage points to reflect the contribution made by each category to the total performance of the building. This means that the final points score is between 0 and 100.
- 5.8 The breakdown of the weighting factor for each category is in figure 10. This determines the overall BREEAM level which the development will get. The amount of points needed for each level is set out in figure 11.

## MANDATORY AND VOLUNTARY CREDITS

- 5.9 There are mandatory credits which must be gained to achieve a certain level. To achieve the 'very good' level, there are five issues where certain performance must be achieved as a minimum.
- 5.10 Once all of the mandatory credits have been achieved, the developer has the flexibility to choose which other issues to address to get enough credits, and therefore points, to achieve the required level.

## CONVERSION OF OLDER BUILDINGS

- 5.11 Most conversions in Portsmouth are of larger Victorian houses into several flats. BREEAM Domestic Refurbishment is able to assess conversions of historic buildings and there are many simple alterations that can be made to older buildings which will improve their energy efficiency whilst respecting their non-renewable character. Measures such as draught proofing, improved wall and floor insulation or bringing internal shutters back into use are all low cost, low intervention measures. However measures such as cavity wall insulation are likely to prevent moisture from moving in and out of the building and could eventually cause structural damage.

## Mandatory BREEAM Domestic Refurbishment credits

### Energy efficiency post refurbishment

This is issue Ene 02

All times ..... 1.5 credits

### Internal water use

This is issue Wat 01

All times ..... 1 credit

### Ventilation

This is issue Hea 05

All times ..... 1 credit

### Safety

This is issue Hea 06

All times ..... 1 credit

### Responsible sourcing of materials

This is issue Mat 02

All times ..... criterion 3 only



5.12 Alterations to older buildings should always be considered carefully to make sure that they do not cause buildings that were previously functioning well to fail. It is important to remember that construction techniques are very different now to when Victorian terraces were built. Crucially new buildings are built with the aim of sealing the building whereas Victorian buildings were designed to ‘breathe’ (see figure 12). There are more details about the differences between modern and older construction methods in English Heritage’s Energy Efficiency and Historic Buildings guide to the building regulations.

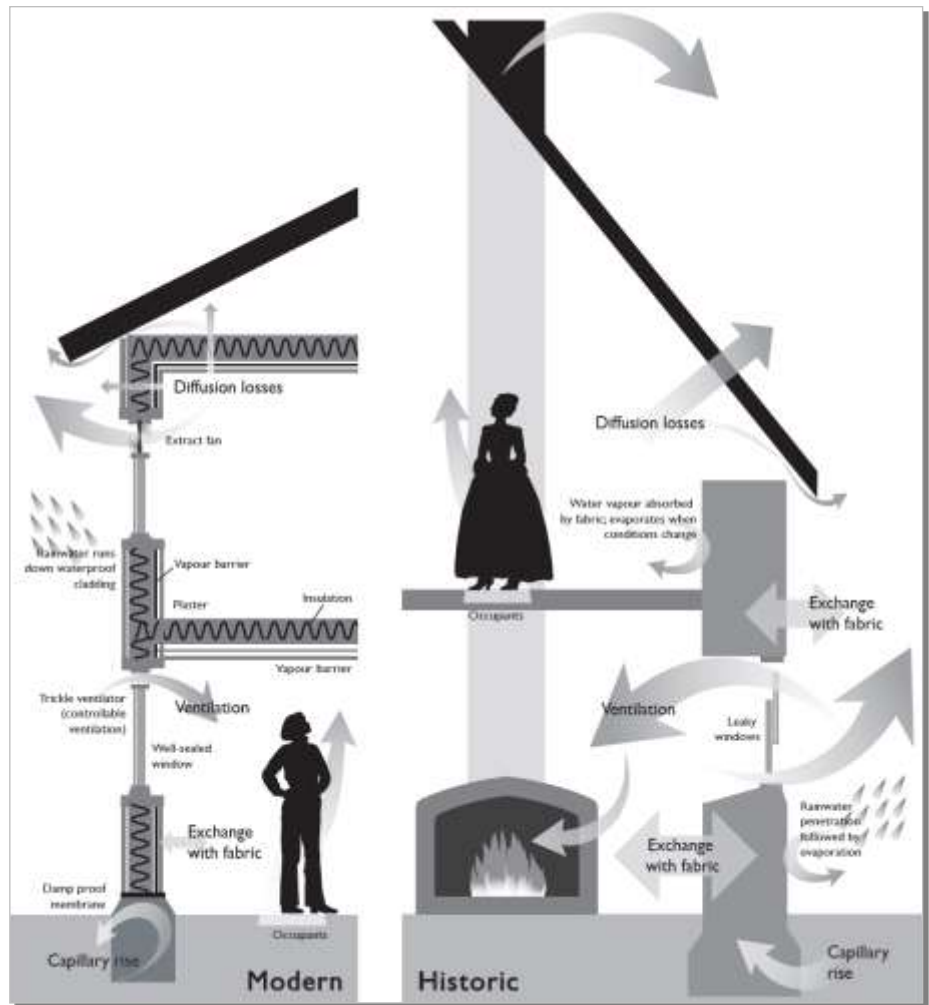


Figure 12 The typical differences in the movement of moisture between an older and modern building.

5.13 There are around 600 listed and 500 locally listed buildings in Portsmouth whilst a large number of homes are in one of the city’s 25 conservation areas. Improvements to the environmental performance and thermal upgrading of heritage assets will always be sought. However this must be done in ways which are sympathetic to their older character and construction methods.

5.14 BREEM Domestic Refurbishment recognises that conversion of heritage assets limits the scope of what can be achieved. In such situations, the standards should be achieved as far as is practically possible within the restrictions of the heritage designations.

5.15 Generally speaking, in conservation areas the visual impact of energy efficiency or LZC energy technologies should be minimised. There should be no loss of the overall character or older interest of the conservation area.

5.16 For listed buildings of all grades or locally listed buildings, non-intrusive ways of improving the energy efficiency of the building should be considered. More intrusive energy efficiency or microgeneration technologies will be acceptable as long as the least damaging type of technology has been chosen, the equipment is not visible from important viewpoints and the older fabric of the building is undamaged. The key test of acceptability is that there should be no loss of special interest in the building (the reason it was listed).

**Where else to look**

Climate change and the Historic Environment (English Heritage)  
[www.helm.org.uk/upload/pdf/Climate-change.pdf](http://www.helm.org.uk/upload/pdf/Climate-change.pdf)

Energy efficiency and Historic buildings  
[www.english-heritage.org.uk/publications/energy-efficiency-historic-buildings-pt/](http://www.english-heritage.org.uk/publications/energy-efficiency-historic-buildings-pt/)



# 06 | the costs of complying with the standards

- 6.1 Policy PCS15 sets local standards for sustainable design and construction which, whilst in line with national policy, go beyond the national standards set out in the Building Regulations. This results in additional construction costs. However the policy has been viability tested to ensure that the additional costs are manageable. An independent planning inspector has concluded that the standards will not be an unreasonable burden or constrain the supply of land for development.
- 6.2 It is obviously impossible to correctly determine how much it will cost to achieve different Code or BREEAM levels for certain as this will vary site by site and depend on which voluntary credits are sought. However a great deal of work has been done looking at the general costs for developers of meeting different Code and BREEAM levels and how these have changed over time.

## RESIDENTIAL DEVELOPMENT

- 6.3 The Government conducted an analysis of the cost of applying the Code in 2011. This showed that the extra construction costs required to meet Code level 3 are negligible (approximately 1.5%) and the cost for level 4 is relatively small (approximately 6%). The average cost of building a new home to Code level 3 has fallen by more than 70% recently from £4,458 in 2008 to £1,128 in 2010.
- 6.4 There is still a significant jump in the costs required to meet Code level 5 (approximately 25%) and Code 6 (approximately 45%) at 2010 prices. However this is not a static picture as costs will decrease as developers and suppliers gear up to achieving higher Code levels.
- 6.5 Indeed many credits tend to be gained at very low cost by the majority of developers, either by continuing standard practices or through minor alterations that do not incur a significant cost. These include construction waste management (Was 2), considerate constructors scheme (Man 2) and private space (Hea 3).
- 6.6 In 2013, the Building Regulations will be the equivalent of level 4 on issue Ene 1. In 2010 the cost difference between a level 3 and level 4 home was approximately £3,400 for a three bedroom house and £2,700 for a two bedroom inner city flat. However, more than £3,000 and £2,000 of this was due to the extra carbon emission reduction required through Ene 1. As a result, the additional costs of full Code compliance are extremely low.

6.7 Viability will always be a material consideration in the determination of planning applications. However, if the advice in this guide is followed and the assessment process is engaged with, then the costs for the development industry as a result of these requirements should be manageable.

**Where else to look**

Cost of building to the Code for Sustainable Homes Updated cost review (CLG)  
[www.communities.gov.uk/publications/planningandbuilding/codeupdatedcostreview](http://www.communities.gov.uk/publications/planningandbuilding/codeupdatedcostreview)

## NON-RESIDENTIAL DEVELOPMENT

6.8 Unlike the Code, BREEAM also awards credits for the location of development, based on the distance to, and availability of, public transport. As a result, the costs of meeting different BREEAM levels are dependent on whether the development can get ‘free’ credits for its location. A place where these credits are awarded is known as a good location. Given Portsmouth’s densely populated nature and the fact that very little development is on greenfield sites, a large amount of development will be eligible for these free credits.

6.9 Generally, the additional capital costs to achieve the ‘very good’ or ‘excellent’ ratings are minimal. Cyril Sweett and the BRE looked at the costs in 2005 and these are set out in figure 13. The maximum additional cost of the ‘excellent’ rating was 3.5% whilst the ‘very good’ rating can be achieved for no additional capital cost.

Location	BREEAM score (and rating) for the base case	% increase in cost for Pass	% increase in cost for Good	% increase in cost for Very good	% increase in cost for Excellent
Poor location	25.4 (pass)	0	0	2	-
Typical location	39.7 (pass)	-	0	0	3.4
Good location	42.2 (good)	-	-	0	2.5

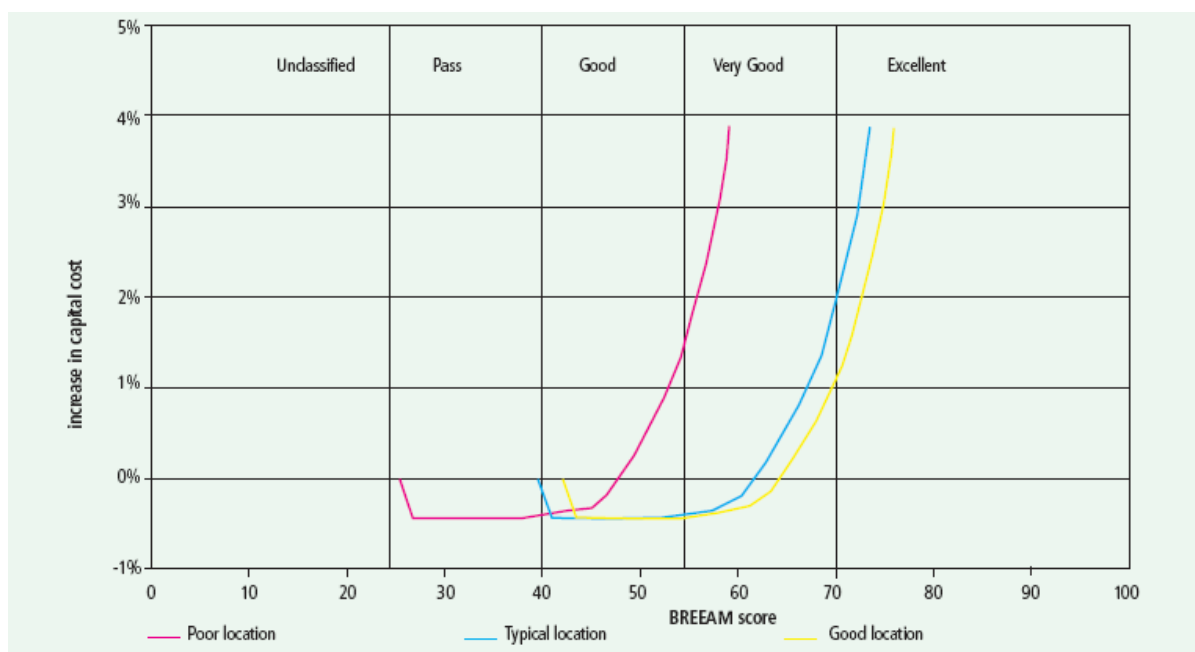


Figure 13

| 30 | Increase in capital costs as a result of different BREEAM levels.  
 Source: ‘Putting a price on sustainability’, Cyril Sweett and BRE.

# 07 | monitoring and review

- 7.1 The implementation of policy PCS15 will be regularly monitored through the Annual Monitoring Report (AMR). This will set out the number of homes built to each Code level together with the amount of non-residential floorspace built to each BREEAM rating. This is in line with the first two points of the monitoring framework for policy PCS15. It will also set out the number of occasions where developments were permitted which do not fully comply with the standards.
- 7.2 This is an area of planning and development where there is constant change taking place. Innovation is constantly changing the way that homes are designed to meet sustainability standards. Mass markets are driving down the cost of the technologies and Government regulation is in the process of being changed.
- 7.3 As has been described previously in this guide, Code levels 3 and 4 are seen as being achievable fairly easily at minimal cost. The development industry has less experience of building to higher Code levels. However this area has seen rapid change and progress in recent years and it is expected that this will continue and make higher Code and BREEAM levels achievable for the mass market.
- 7.4 Nonetheless, if the monitoring of policy PCS15 indicates that development is universally unable to meet the standards in the Portsmouth Plan, the advice in this SPD will be updated to reflect the latest published work on sustainable design. The SPD will also be updated if the Code or BREEAM are replaced with alternative assessments, as is set out in the Portsmouth Plan.



# Appendix 1

## model conditions

A1.1 Below are the model conditions which will be attached to planning permissions. Several of the conditions have an 'x' in them. This is where the amount of credits or the level changes over time. If an applicant has negotiated different standards based on the negotiation framework in sections 2.24 - 2.34, then the conditions will be altered accordingly.

### RESIDENTIAL PRE-COMMENCEMENT CONDITION

---

A1.2 No construction shall commence until written documentary evidence has been submitted to the local planning authority proving that the development will achieve a minimum of level X of the Code for Sustainable Home, including X credits from issue Ene 1, X credits in issue Ene 7, two credits from Hea 2 and two credits from issue Ene 8, which evidence shall be in the form of a Code for Sustainable Homes design stage assessment, prepared by a licensed assessor and submitted to and approved in writing by the local planning authority, unless otherwise agreed in writing with the local planning authority.

A1.3 Reason: To ensure that the development as built will minimise its need for resources and be able to fully comply with policy PCS15 of the Portsmouth Plan.

### RESIDENTIAL POST-CONSTRUCTION CONDITION

---

A1.4 Before any part of the development is occupied, written documentary evidence shall be submitted to, and approved in writing by, the local planning authority proving that the development has achieved a minimum of level X of the Code for Sustainable Homes, including X credits from issue Ene 1, X credits from issue Ene 7, two credits from Hea 2 and two credits from issue Ene 8, which will be in the form of a post-construction assessment which has been prepared by a licensed Code for Sustainable Homes assessor and the certificate which has been issued by a Code Service Provider, unless otherwise agreed in writing by the local planning authority.

A1.5 Reason: to ensure the development has minimised its overall demand for resources and to demonstrate compliance with policy PCS15 of the Portsmouth Plan.

## NON-RESIDENTIAL PRE-COMMENCEMENT CONDITION

---

A1.6 No construction shall commence until written documentary evidence has been submitted to the local planning authority proving that the development will achieve a minimum of X of the Building Research Establishment's Environmental Assessment Method (BREEAM), including two credits in issue ENE 04 and two credits from issue TRA 03, which evidence shall in the form of a BREEAM Design Stage Assessment, prepared by a licensed assessor and submitted to and approved in writing by the local planning authority, unless otherwise agreed in writing with the local planning authority.

A1.7 Reason: To ensure that the development as built will minimise its need for resources and be able to fully comply with policy PCS15 of the Portsmouth Plan.

## NON-RESIDENTIAL POST-CONSTRUCTION CONDITION

---

A1.8 Before any part of the development is occupied, written documentary evidence shall be submitted to, and approved in writing by, the local planning authority proving that the development has achieved a minimum of level X of the Building Research Establishment's Environmental Assessment Method (BREEAM), including two credits in issue ENE 04 and two credits in issue TRA 03, which will be in the form of a post-construction assessment which has been prepared by a licensed BREEAM assessor and the certificate which has been issued by BRE Global, unless otherwise agreed in writing by the local planning authority.

A1.9 Reason: to ensure the development has minimised its overall demand for resources and to demonstrate compliance with policy PCS15 of the Portsmouth Plan.



# Appendix 2

## low and zero carbon energy technology guide

*“The sources of renewable energy...are inexhaustible, indigenous and abundant, and their exploitation, properly managed, has the potential to enhance the long-term security of the United Kingdom’s energy supplies and to help us cut carbon dioxide emissions”*

House of Lords Science and Technology Committee, July 2004

- A2.1 Low and zero carbon (LZC) energy has the potential to reduce carbon dioxide emissions, reduce the UK’s dependence on imported energy and reduce fuel poverty. Reducing the need to use energy and putting in place more efficient ways of using energy should be considered first, hence the requirement that development has a higher standard of energy efficiency (Ene 1) than the overall Code level.
- A2.2 However, it is also important to provide energy security for new homes and businesses, lower energy bills for future residents and reduce the likelihood of fuel poverty. Including low or zero carbon energy in new development will also contribute towards the objective of the Climate Change Act to reduce carbon emissions by at least 80% by 2050. It also contributes towards the EU Renewable Energy Directive’s aim of 15% of energy coming from renewable sources by 2020.
- A2.3 For these reasons, an element of LZC energy technology should be used. Residential development of more than ten dwellings and non-residential development over 500m<sup>2</sup> will need to include LZC energy technology within the development. It is important to stress that this should be done as part of the measures to meet the required Code or BREEAM level. This is not an extra requirement on top of the Code or BREEAM levels.
- A2.4 In the Code, LZC technology is covered by issue Ene 7. Up until the end of 2012, there must be a 10% reduction in emissions from the home using LZC technology, rising to 15% from 2013 onwards. This means that in 2012, one credit must be obtained in issue Ene 7 rising to two credits from 2013. For non-residential developments, 10% of the development’s emission must be mitigated for with LZC technology in the same way. This means that two credits must be obtained in issue Ene 04.
- A2.5 The sections below set out the advantages and disadvantages of the different technologies available and their suitability in Portsmouth. However it should be emphasised that the best LZC energy strategy on some sites will be a combination of multiple technologies. For an example of this, please refer to the Stoneham Green case study in appendix 3.

## SOLAR PHOTOVOLTAICS

- A2.6 Photovoltaic (PV) systems use cells to convert solar radiation into electricity. When light shines on the cell, it creates an electric field across the layers, creating electricity. The greater the intensity of the light, the more power will be produced. However PV systems still create power when the sun is hidden by clouds. Typical systems are generally around 1.5 - 2 kilowatts peak and use 10 - 15m<sup>2</sup> of roof space.
- A2.7 PV is one of the most straightforward micro-generation technologies available, particularly for new development. Technology is advancing quickly and costs are falling as demand increases. Traditionally, the array was fixed on top of the roof, although lightweight thin film technology which can be applied as window film and PV roof tiles are now available. While PV tiles are more expensive than panels, this can be offset as a reduced number of roof tiles will be needed and the technology will blend in with the overall design more.
- A2.8 For non-residential development, it is generally fairly easy to install PV onto flat roofs (mounted on arrays at a 35° to 45° angle), oriented southwards. Figure 15 shows the different technological solutions available.

A2.9 The south coast is the sunniest part of the UK. Figure 14 shows the average annual amount of sunshine across the UK between 1970 and 2000. During this time, the Bognor Regis weather station (the closest one to Portsmouth) received an average of 1902.9 hours of sunshine each year, which is the highest of any Met Office weather station in the UK. As a result, PV will be more effective in Portsmouth than virtually anywhere else in the UK.

A2.10 Additionally, PV systems are user friendly, discrete and require relatively little maintenance compared to other technologies. As a result, they are increasingly used and it is recommended that this should generally be the first technology tested for development sites in Portsmouth.

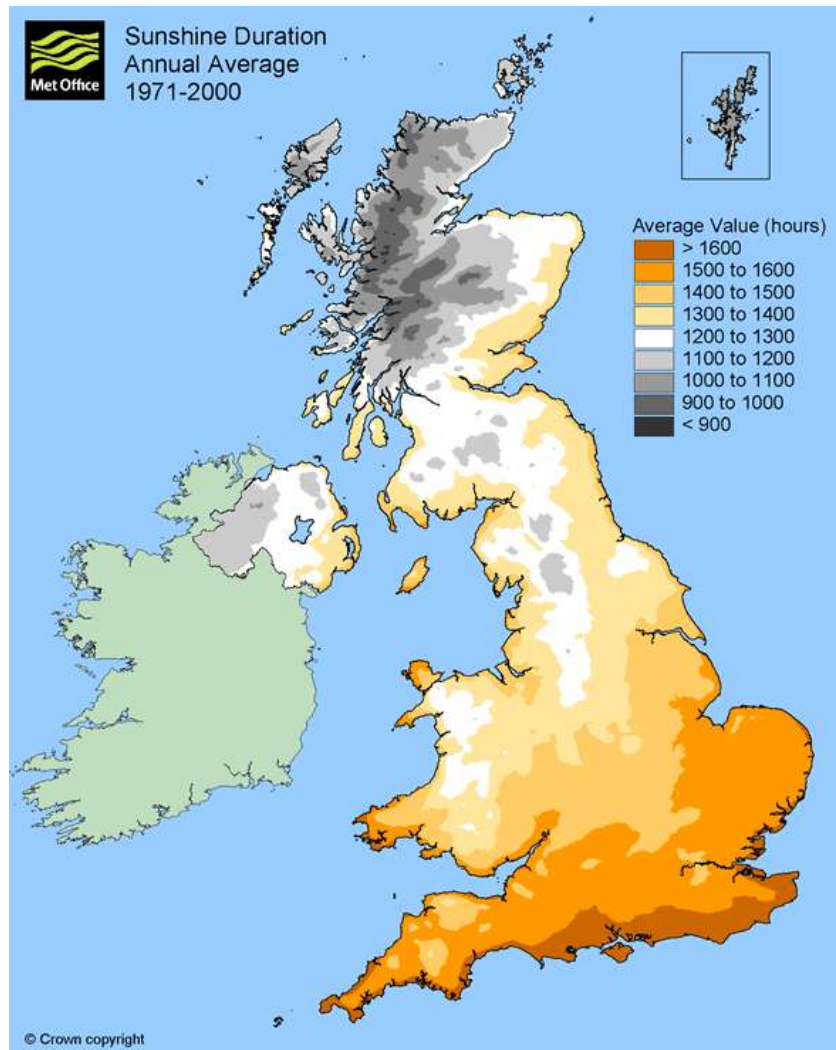


Figure14

The average annual amount of sunshine across the UK between 1970 and 2000.  
Source: Met office regional climate averages. Contains public sector information licensed under the Open Government Licence v1.0



Figure15

From the left: PV array on Southsea library, roof mounted PV system and PV tiles.

## SOLAR HOT WATER

A2.11 Otherwise known as solar thermal, solar hot water systems use a heat collector, generally mounted on the roof, which contains a fluid that is heated by the sun (see figure 16). The heated liquid then passes through a coil in a hot water cylinder where it heats water for use in the home. The water can then be used directly or heated further in a boiler.

A2.12 During the summer, this can achieve 80% - 100% of hot water demand, averaging out to between 50% and 60% over the year. However, although some energy will still be collected during the winter, there is an obvious mismatch between when the system will be most efficient and when the occupier is likely to need the most hot water.



Figure16

Roof mounted solar hot water system.

A2.13 Like PV, solar hot water systems work best with a southerly orientation, however this is not as important as PV and roofs facing anywhere within 45 degrees of south will provide a significant contribution to hot water demand.

A2.14 Given the city's high average sunlight hours (see figure 11), solar hot water will be particularly efficient in Portsmouth. Unfortunately given the seasonality it is generally not as effective as PV and the heating coils take up a reasonable amount of space within the new home. However on sites where the aspect is not ideal for PV, solar hot water may offer a more effective alternative.

## COMBINED HEAT AND POWER (CHP), BIOMASS AND DISTRICT HEATING

---

- A2.15 A CHP or district heating system can be powered by either fossil fuels (usually gas) or renewable fuels (usually biomass). Generally the technology works by driving an engine to produce electricity. A by-product of this process is heat, which in a CHP system is recovered via a boiler to provide space and hot water heating. Compared to other combustion systems which produce only electricity, CHP systems can be over 75% more efficient.
- A2.16 The size of CHP systems can vary from a few kilowatts to several megawatts, depending on the heat and electrical loads required. This is sufficient to power anything from a few homes to several hundred. Small Stirling engine units will typically produce around 10-20% of their output as electricity (usually 1-1.5kW). When such units are put into a single dwelling, they can deliver a carbon emissions reduction of 11%. Internal combustion engines produce higher electrical output but are usually larger in size and so more suitable to small groups of dwellings. In this situation, they can deliver a reduction of around 15% of emissions.
- A2.17 These systems work on the basis of a network. If there is a local network already in operation, the easiest and most cost effective way to meet the LZC requirement may well be to join the existing network.
- A2.18 CHP and district heating are particularly viable and attractive for larger developments which can benefit from economies of scale and should be explored on such sites. However, biomass systems may be less suitable on some sites due to the need to have space for fuel storage.

## GROUND SOURCE HEAT PUMPS

---



Figure17

A horizontal ground source heat pump.

A2.19 About 1-2 metres below the surface of the Earth, a constant temperature of about 11-12°C is maintained throughout the year because of stored radiant solar energy. This can be exploited and used to supply low-level heating demands.

A2.20 Ground source heat pumps extract heat from the ground using a ground loop, which is buried vertically or horizontally. The pipe contains a fluid which collects the ground's energy as heat as it moves around the system.

The liquid then passes through a heat exchanger and the heat then passes around the dwelling, usually through under floor heating.

- A2.21 Heat pumps can be designed to supply up to 100% of a dwelling's heat requirements but will usually only pre-heat domestic hot water so an auxiliary form of heating hot water will also be required.
- A2.22 However the horizontal systems require space, typically a trench (see figure 17), and are more difficult to achieve in urban locations. Vertical systems use a borehole and so are generally suitable for larger developments. However, a number of sites in Portsmouth have contamination. As a result, extensive piling for vertical heat pumps in particular may not be feasible on some contaminated sites.

A2.23 As a reasonably large space is needed for horizontal systems, they will not often be suitable in Portsmouth. However vertical systems may be suitable for some sites.

## AIR SOURCE HEAT PUMPS

---

A2.24 These work by absorbing the ambient heat from outside a building. In air-to-water systems, air is used to heat water which then heats a building via radiators or under floor heating. An air-to-air system produces warm air which is circulated around a building with fans. However for sites on the gas grid, air source heat pumps are unlikely to result in carbon reductions given the amount of energy needed to power them.

## WIND

---

A2.25 Wind turbines harness the power within the wind and convert it into electricity (see figure 18).

A2.26 However the economics of small-scale turbines on domestic buildings has not been comprehensively proven. Additionally, whilst the UK has the largest wind resource in Europe, it tends to be disrupted in urban environments where there are lots of obstructions.

A2.27 Site specific data on wind speeds would be needed before the amount of electricity they could produce could be worked out. Furthermore, given the large number of nature conservation designations in and around Portsmouth, there may be areas where they would not be suitable.

A2.28 Overall, it is unlikely that wind will be a suitable technology most of the time given Portsmouth's urban character, although it would still be worth exploring for more exposed sites where the wind is less likely to be disturbed.



Figure 18

Micro-wind at Voyager Park, Hilsea.

# Appendix 3

## from theory to practice

### COPNOR BRIDGE

---

- A3.1 Radian are currently building out a development of 14 new houses and flats on the site of the former Copnor Bridge Bowling Green. The primary purpose of the development is to provide a flagship scheme of low energy homes that can also be monitored to help further the knowledge and understanding of sustainable design and construction.
- A3.2 The scheme will achieve a mix of levels 3, 4 and 5 of the Code for Sustainable Homes and is a mix of houses and flats.
- A3.3 This scheme is the first exemplar development to be built in Portsmouth. However its importance also lies in the fact that this is a small constrained site, typical of many others in Portsmouth. As a result, it is useful in showing how medium to high Code levels can be achieved on a small constrained, urban site.
- A3.4 As part of the site analysis, the sun's path was mapped (see figure 19). This allowed Radian to optimise the layout of the site at an early stage to ensure the homes received the maximum level of solar gain and natural light. Together with the positioning of the windows and solar shading devices, this has ensured that the homes minimise heating demand in the winter and provide

Figure 19

Existing site constraints and context together with the design response strategy



shading in the summer. It also allowed for the PV to be ideally sited on south facing roofs. However, whilst doing this it was also possible to orientate the windows and doors towards private spaces to provide a strong connection with these outdoor areas.



Figure 20

Artists impressions of the Copnor Bridge development, top - from the southeast, bottom - the proposed courtyard.

A3.5 Careful consideration was also given to architectural design and its relationship with sustainable design. As well as maximising solar gain, the layout also created a pleasant modern terraced design together with a courtyard between the blocks. Additionally, together with being south-facing, the PV arrays were also sited so as to minimise their visual impact.

A3.6 The development was then designed to Passive House principles. This uses a building fabric which results in a highly sealed unit. A mechanical heat exchange and ventilation system then takes warm air from the kitchen and bathroom and circulates it throughout the home.

- A3.7 Whilst the main building fabric is different to most new build units, it is treated with render and grey boarding with slate roofs creating an interesting and vibrant design. Whilst the PV arrays can be seen from street level, their placement on a slate roof, well integrated with the overall design allows the development to subtly express its environmental credentials.
- A3.8 The buildings are coated in a white render, resulting in a modern architectural style which is similar to many other new build houses and flats.
- A3.9 All of the new homes will have the following features:
- high insulation standards to minimise heat loss
  - high performance windows to minimise heat loss and maximise natural light
  - low energy internal and external lighting
  - low polluting insulation materials
  - enhanced ecological value of the site through new planting
  - low environmental impact materials
  - a detailed home user guide
  - clothes drying space
  - space for a home office
  - Lifetime Homes standard
- A3.10 The higher Code level homes also had the following additional features:
- enhanced overall energy efficiency
  - solar PV arrays
  - enhanced sound insulation
  - composting bin
  - water butts
- A3.11 All of the homes, including those built to Code level 5, used water efficient fixtures and fittings to achieve the internal water use standards, which avoided the use of rainwater harvesting or grey water recycling.
- A3.12 All of the homes also achieved credits for cycle storage and private space. For the houses, this was through a private garden as well as a balcony. For the flats, this was through a communal courtyard (see figure 20).



A3.13 On some sites, usually with the support of the Homes and Communities Agency, Radian have built exemplar schemes to the highest Code levels. These exemplar schemes offer an opportunity to use cutting edge technology to see how high levels of the Code can be achieved in practice and have helped to refine the techniques required these high levels. The developments also help to refine the technology so that in the future, it will be possible for mainstream housing to be zero carbon.



A3.14 The Stoneham Green site is an inner city, brownfield site which was formerly allotments and a community centre. Radian has redeveloped the site into 11 Code level 6 units. This is one of the first and largest Code 6 schemes in the south.



A3.15 All of the homes are designed to reduce the impact on the environment and maximise the use of renewable energy. Each home also has a fully interactive Energy Dashboard (see figure 21) to help residents to get the most from the renewable energy technologies which have been installed. As a result, the residents should have significantly lower energy bills.

A3.16 The development site is a narrow strip of land at the edge of an established residential area close to the Ford factory in Southampton (see figure 22). This restricted the amount of development which could take place on the site. It also meant that careful consideration had to be given to the orientation and placement of the homes to ensure the maximum use of daylight, solar gain and solar shading. This orientation also means that the PV arrays on the roofs of the houses received the maximum possible amount of sunlight.



Figure 21

From the top: the energy dashboard, terraced house and semi-detached houses at Stoneham Green. Courtesy of Radian.

A3.17 Overall, the homes also have the following features:

- timber frame construction with high performance insulation
- a high performance building fabric providing significantly reduced U values and improved air tightness
- whole house mechanical ventilation
- a communal biomass boiler burning wood pellets
- low flow rate taps and showers
- high performance timber framed triple glazing
- Roof mounted PV arrays
- Lifetime Homes standard across the site
- an advanced Building Energy Management system with interactive energy dashboard

A3.18 To achieve Code level 6 across the site, a well-sealed building fabric, using the principles of PassivHaus was essential. The building fabric was so well sealed that it achieved an air tightness score of 2, compared to the building regulations requirement of 10. Similarly, the windows have a U value of 0.1 compared to the building regulations requirement of 0.3.

A3.19 In the original specification, it was thought that either grey water recycling or rainwater harvesting would be required to meet the internal water use requirements. However due to the advancements in low-water products, it was possible to meet the internal water use requirements using only water efficiency measures.

A3.20 The specifications included:

- WC dual flush: 4 litre full flush, 2.6 litre part flush
- wash hand basin and bath taps: 4 litres per minute
- bath: 130 litres to overflow
- shower: 4.5 litres per minute
- kitchen sink taps: 4 litres per minute
- washing machine: 7.5 litres per minute

A3.21 These measures led to a water consumption rate of 79.9 litres per person per day and so meet the requirements of level 5 and 6 for internal water use. Radian was careful to ensure that, although the products used have very low flow rates, the feel of the water coming out of them was acceptable. As a result, it is unlikely that residents will replace them with alternative products as there is little difference in the appearance or feel of the water.

Figure 22

The row of terraced houses at Stoneham Green



# Appendix 4

## glossary

Building Regulations	A national set of standards for design and construction which apply to most new buildings and many alterations to existing buildings.
BREEAM Domestic Refurbishment	The Building Research Establishment's Environmental Assessment Method for conversions of a building to residential use. There are more details online at <a href="http://www.breeam.org/page.jsp?id=228">www.breeam.org/page.jsp?id=228</a>
BREEAM New Construction	The Building Research Establishment's Environmental Assessment Method for new build developments. This is a family of assessments for any type of development other than new building houses or flats (i.e. C3 uses). There are more details online at <a href="http://www.breeam.org/podpage.jsp?id=369">www.breeam.org/podpage.jsp?id=369</a>
Carbon dioxide (CO <sub>2</sub> )	A significant contributor to climate change. A gas resulting from the combustion of fossil fuels, including gas, oil and coal.
Code for Sustainable Homes	A national environmental standard for sustainable design and construction for new homes. This ensures new homes deliver improvements in key areas such as carbon dioxide and water conservation.
Considerate Constructors Scheme (CCS)	<p>The Considerate Constructors Scheme is a UK certification scheme that encourages the considerate management of construction sites. The scheme is operated by the Construction Confederation and points are awarded in increments of 0.5 over the following eight sections:</p> <ul style="list-style-type: none"><li>▪ considerate</li><li>▪ environmentally Aware</li><li>▪ site Cleanliness</li><li>▪ good Neighbour</li><li>▪ responsible</li><li>▪ accountable</li></ul> <p>To achieve certification under this scheme, a score of at least 24 is required.</p>
Design stage assessment	An official assessment of the development, prior to construction commencing. This should be submitted with a planning application to demonstrate that the development fully complies with the required standards.

Dwelling emission rate (DER)	The DER is the estimated CO <sub>2</sub> emissions per m <sup>2</sup> per year (KgCO <sub>2</sub> /m <sup>2</sup> /year) for the dwelling as designed. It accounts for energy used in heating, fixed cooling, hot water and lighting.
Ecohomes	The BREEAM assessment for new homes. This was later replaced by the Code for Sustainable Homes for new build residential units and BREEAM Domestic Refurbishment for conversions to residential.
Flood Risk Assessment (FRA)	A study to assess the risk of a site flooding and the impact that any changes or development on the site will have on flood risk on the site and elsewhere. A flood risk assessment must be prepared according to good practice guidance as outlined in PPS25 Development and Flood Risk: Practice Guide (available from <a href="http://www.communities.gov.uk">www.communities.gov.uk</a> ). For developments of less than 1 ha (10,000 m <sup>2</sup> ), the level of detail required in an acceptable FRA (for Sur 1) will depend on the size and density of build. This will range from a brief report for small, low-density developments, to a more detailed assessment for a high-density development of 2000-10,000 m <sup>2</sup> . For example, for very small developments (2000 m <sup>2</sup> and less), an acceptable FRA could be a brief report carried out by the contractor's engineer confirming the risk of flooding from all sources of flooding, including information obtained from the Environment Agency, water company/sewerage undertaker, other relevant statutory authorities, site investigation and local knowledge.
Flow restrictors	Flow restrictors contain precision-made holes or filters to restrict water flow and reduce the outlet flow and pressure. They are typically fitted within the console of the tap or shower heads, in pipework or at the mains inlet to the dwelling.
Green Guide to Specification	<p>The Green Guide to Specification is an easy to use comprehensive reference website and electronic tool, providing guidance for specifiers, designers and their clients on the relative environmental impacts for a range of different building elemental specifications. The ratings within the Guide are based on Life Cycle Assessment, using the Environmental Profile Methodology.</p> <p>The Green Guide categorises ratings by building type and element. When using the Green Guide online, (<a href="http://www.thegreenguide.co.uk">www.thegreenguide.co.uk</a>), the main page asks the user to select a building type. To obtain the appropriate ratings for the assessed building elements, select the corresponding building type for this scheme.</p>
Greenhouse gases	There are six greenhouse gases regulated by the Kyoto Protocol, which are emitted in significant quantities into the atmosphere by human activity. These are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
Grey-water recycling	The appropriate collection, treatment and storage of used shower, bath and tap water for use instead of potable water in WCs and/or washing machines. Grey-water recycling systems normally collect used shower, bath and tap water and recycle it for toilet flushing.

Home user guide	A guide for new occupants that contains necessary details about the everyday use of the home in a form that is easy for users to understand.
Lifetime Homes	Lifetime Homes was developed by the Habinteg Housing Association, the Helen Hamlyn Foundation and the Joseph Rowntree Foundation in the early 1990s. The scheme involves the incorporation of 16 design features that together create a flexible blueprint for accessible and adaptable housing in any setting.
Low and Zero Carbon Technologies	Technologies such as wind and solar photovoltaics which convert naturally occurring energy into heat or power. This also includes Combined Heat and Power (CHP) systems which mostly use gas as these are considerably more efficient than conventional energy supply systems. Please note that subscribing to green tariffs that draw energy from the National Grid will not count as this is not an efficient energy source.
Net CO <sub>2</sub> Emissions	The annual dwelling CO <sub>2</sub> emissions (Kg CO <sub>2</sub> /m <sup>2</sup> /year) from space heating and cooling, water heating, ventilation and lighting, and those associated with appliances and cooking. To achieve Code level 6, net CO <sub>2</sub> emissions must be zero.
Non-residential development	Developments for any use other than residential (i.e. C3) houses or flats. Non-residential development needs to be assessed through the Building Research Establishment's Environmental Assessment Method (BREEAM). Non-residential development generally includes residential institutions such as residential care homes and purpose built student accommodation.
Passive solar gain	Refers to the siting, form, fabric and internal layout of buildings so that natural light and solar heat gains are harnessed and controlled reducing the need for artificial lighting, space heating and mechanical ventilation and cooling.
Post-construction assessment	An official assessment of the development once it has been built. This shows that the development as built has fully complied with the Portsmouth Plan's sustainable design and construction requirements. Applicants will be required to submit the post construction certificate and assessment to the local planning authority.
Pre-assessment estimator	An unofficial assessment of the development's design to see what credits it would be eligible for and thus what Code or BREEAM level it would get. Pre-assessment estimators are a good way of refining the design of the development in collaboration with the accredited assessor. They can also be brought to pre-application meetings to demonstrate how the development would perform against the criteria in PCS15.
Rainwater recycling	The appropriate collection and storage of rain from hard outdoor surfaces for use instead of potable water in WCs and/or washing machines. In some cases, rainwater could also be used to contribute towards Wat 2 for irrigation and possibly large water-consuming fittings such as hot tubs or swimming pools. In such cases, reference should be made to the relevant definition for sufficient size, as set out in Wat 2.
Regulated emissions	Those greenhouse gas emissions included within the SAP 2005 methodology and arising from space heating, water heating, fixed lighting and ventilation.

RIBA Outline Plan of Work	The Royal Institute of British Architects published an Outline Plan of Work in 1991 which describes the UK traditional approach to the project delivery process in 12 well-defined steps, labelled A to M. The RIBA process begins at the project inception (A), where a general outline of requirements and a plan of action are produced by an architect and the commissioning client, and it ends at feedback (M) following the completion and handover of the building to the client.
Secured by Design	This is a police initiative to encourage the building industry to adopt crime prevention measures in the design of developments to assist in reducing the opportunity for, and fear of, crime, creating a safer and more secure environment. Secured by Design is owned by the Association of Chief Police Officers (ACPO), and has the support of the Home Office Crime Reduction & Community Safety Group and the Planning Section of the Department for Communities and Local Government.
Standard Assessment Procedure for Energy Rating of Dwellings	<p>The Government's approved methodology for assessing the energy performance of new dwellings. The current version is SAP 2009 version 9.90. The procedure accounts for energy used in:</p> <ul style="list-style-type: none"> <li>▪ space heating and cooling</li> <li>▪ hot water provision</li> <li>▪ fixed lighting</li> </ul> <p>The indicators of energy performance are energy consumption per unit floor area, energy cost rating (SAP rating), environmental impact rating based on CO<sub>2</sub> emissions (EI rating) and dwelling CO<sub>2</sub> emission rate (DER). They are used in the production of energy performance certificates (EPCs) and to demonstrate compliance with AD L1A and the Code for Sustainable Homes.</p>
SuDS	As defined in the SuDS manual, sustainable drainage systems are an approach to surface water management that combines a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques. These systems infiltrate, store, convey and partially treat surface water runoff, which minimises environmental impact and maximises environmental opportunities. SuDS should aim to maximise the use of on-the-surface techniques for operational and maintenance reasons.
Target Emission Rate	The target emission rate is the maximum allowable CO <sub>2</sub> emissions per m <sup>2</sup> (Kg CO <sub>2</sub> /m <sup>2</sup> /year) arising from energy used in heating, cooling, hot water and lighting which would demonstrate compliance with Criterion 1 of AD L1A. The TER is calculated using the SAP methodology
Unregulated emission	Those emissions arising from electrical appliances, cooking and non-fixed lighting.





Portsmouth  
CITY COUNCIL

Planning Services  
Portsmouth City Council  
Guildhall Square, Portsmouth  
PO1 2AU

Telephone: 023 9268 8633  
Email: [ldf@portsmouthcc.gov.uk](mailto:ldf@portsmouthcc.gov.uk)

[www.portsmouth.gov.uk](http://www.portsmouth.gov.uk)

You can get this  
Portsmouth City  
Council information  
in large print, Braille,  
audio or in another  
language by calling  
023 9268 8633.



Corporate member of  
Plain English Campaign  
Committed to clearer communication.

264