

IMPERIAL COLLEGE LONDON  
SUPPORT SERVICES ESTATES

SUSTAINIBILITY SPECIFICATION

JULY 2009

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# Sustainable Specification Strategies & KPIs


## Introduction

- 1.0 This document is based around the BREEAM process and intended for use on all projects between £300k and £5 million, these projects are to be assessed using the checklist / tool kit in appendix C.

Projects over £5 million are to be subject to a full BREEAM assessment process, for which this specification is intended to be a guide to that process.

### 1.1 Overview:

The table below sets out defines recommended key performance indicators (KPIs) which are regarded as a minimum target sustainability standard in the renovation and redevelopment of their estate. It has been assumed that projects will be organised in line with the RIBA Plan of Work, therefore the BREEAM 2008 process has been inter-related to the RIBA work stages.



## BREEAM 2008 Assessment through RIBA Stages

Consultancy Service	RIBA Stage	BREEAM Assessment
Advise on type of assessment to be undertaken	Stage B / C	Assessor included to guide process
BREEAM Workshop & pre-assessment	Stage C	1 day workshop overview of BREEAM Design & Procurement process, pre-assessment undertaken to establish possible score / rating
Design & Procure Initial Assessment started	Stage D - K	Assessment process commences reviewed at all stages, included post on site construction start
Initial assessment completion	Stage K	Initial assessment completed approximately 50% through the construction programme. Assessment issued to BRE for QA checking.
Initial Assessment Certificate	Stage K	BRE issue Initial Assessment Certificate
Post Construction Review (PCR)	Stage L	Assessor undertakes a PCR desktop review of the construction process against the initial design & procurement assessment.

It is therefore incumbent upon the ICL management, their design teams and construction contractor in their management of the construction process, at all times, but not less than at monthly intervals or at any such other times as ICL and their agents shall require, to provide an ICL nominated person with full documented evidence of compliance with the specification clauses set out below. In addition the construction contractor must agree that throughout the development and construction programme they will operate a fully open book auditing process for all aspects of the projects programme management.

The KPIs have been predicated on the basis that they are holistic throughout the design, procure, construction and maintenance of the estate. The KPIs are based upon current best practice and have been cross-referenced to relevant BREEAM 2008 clauses. It is intended that the KPIs form a guide to developing a sustainable estate. However the KPIs set out below should not be regarded as absolute, the foregoing document should be considered a living document that will require continual updating.

BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's, leading and most widely used environmental assessment method for

buildings, with over 115,000 buildings certified and nearly 700,000 registered. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance. Credits are awarded in nine categories according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. The operation of BREEAM is overseen by an independent Sustainability Board, representing a wide cross-section of construction industry stakeholders. BREEAM aims to:

- To mitigate the impacts of buildings on the environment
- To enable buildings to be recognised according to their environmental benefits
- To provide a credible, environmental label for buildings
- To stimulate demand for sustainable buildings

With the consequential objectives of encouraging the construction market:

- To provide low environmental impact buildings
- To ensure best environmental practice is incorporated in buildings
- To set criteria and standards surpassing those required by regulations and challenge the market to provide innovative solutions that minimise the environmental impact of buildings
- To raise the awareness of owners, occupants, designers and operators of the benefits of buildings with a reduced impact on the environment
- To allow organisations to demonstrate progress towards corporate environmental objectives

## **1.2 Sustainable Specification:**

Procedural Note – the specification which follows is set out in a non sequential numbering system to enable the inclusion of further clauses at a later date and as required by the development / design teams.

Each KPI clause has been given two linkages:

- An associated BREEAM criteria reference, currently based upon Bespoke BREEAM criteria, but will require updating once the Higher Education criteria scheme has been developed by BRE.
- An associated NBS clause for the construction contract which should be suitably adapted to include relevant wording to enhance ICL's requirements.

In preparing the contract documentation the Employer's Agent (EA)/Project Manager (PM) should ensure full integration of the contractual clauses in the preliminaries and the subsequent specification clauses with KPIs that follow.

NBS produce a suite of documentation viewed on the NBS website,<sup>1</sup> which are referenced in the Appendix, see item 25.

The specification clauses below should be employed in collaboration with the checklists in Appendix B. Working versions of the checklists will be made available on the ICL website. At commencement of a project it is recommended that the operational checklist is activated as part of the project documentation in an ongoing basis. The pre-assessment calculator is intended to guide a project through its key sustainability stages, in order to:

- Address key design decisions
- Aid in the early formulation of a budget
- Determine the operational management of the project

Item	Element	References	
		BREEAM 08	NBS
0.00	<p><b>Overview:</b></p> <p>The following clauses are applicable in general to all projects irrespective of their size or type. Alterations to this specification should only be made on the explicit written instruction of ICL or their</p>		A1 – A2

<sup>1</sup> See <http://www.thenbs.com/>

Item	Element	References	
		BREEAM 08	NBS
	<p>agents.</p> <p>Depending on the project size and complexity elements might be removed at ICL's instruction. In general however they should be regarded as a mandatory obligation to be placed upon ICL employees and its supply chain, which will include from time to time but not be restricted to:</p> <ul style="list-style-type: none"> <li>▪ Design Team consultants</li> <li>▪ Construction companies and their supply chain.</li> <li>▪ Other specialist suppliers nominated by ICL</li> <li>▪ Facilities management providers in relation to the built environment services and infrastructure</li> <li>▪ Maintenance contractors working on the ICL estate</li> </ul> <p>Employers Agents should ensure that design team and main contractor operating requirements are embedded into standard contract terms.</p>		
<b>0.01</b>	<p><b>Design, Procure and Construct Preliminary Contract Clauses:</b></p> <p><u>General Obligations:</u></p> <p>1. The following clauses are to be regarded by the contractor their sub-contractors and suppliers as mandatory in whole or part and shall not be varied without the specific written authority of ICL or the employers agent.</p>		A1 – A2 B06



Item	Element	References	
		BREEAM 08	NBS
	2. The contractor and their sub-contractors and suppliers shall operate an open book policy with full visibility with respect to all data held by them or their sub-contractors and suppliers in compliance with all environmental legislation and/or requests for such data stated in this document or in any future instruction placed upon them by ICL or their agents.		
<b>0.05</b>	<u>Construction Waste:</u>		
1.	<u>Site Waste Management Plans (SWMP)</u> As from the 1 <sup>st</sup> July 2008 all construction projects in England, valued at over £300,000 (excluding VAT) will necessitate the formulation of a SWMP. SWMP's are intended to be a living document for accurately recording the types and quantity of waste produced by a construction project.	Wst 1,	A1 – A2
2.	<u>Demolition and removal of redundant buildings, plant or equipment in whole or part.</u> When required by ICL to either wholly or in part demolish, remove or scrap redundant buildings plant or equipment the contractor shall provide a detailed method statement which should include but not be restricted to the following: 1. A detailed description of the work to be undertaken, with its location including drawings diagrams and photographs if necessary. The statement should include the proposed route of removal through the site or building described to a safe and secure place of storage. 2. Written confirmation that notification as been given to the relevant statutory authorities, such		A1 – A2

Item	Element	References	
		BREEAM 08	NBS
	<p>as:</p> <ul style="list-style-type: none"> <li>▪ Local government</li> <li>▪ Environment Agency</li> <li>▪ Health Protection Agency</li> <li>▪ Telecommunication organisations</li> <li>▪ Any other statutory body that from time to time might come into force.</li> </ul> <p>3. A detailed methodology for the termination and sealing of utility services and the blocking-up and making safe of all foul and surface water connections to the public sewerage.</p> <p>4. A description of the containment methodology to be employed to prevent the spread of airborne dust particles and any noxious orders or gases.</p> <p>5. A location plan for the siting and storage of all demolition material whether to be removed from site or stored and reused. The location plan should clearly identify the separation and recycling containers for different materials. Contaminated or hazardous materials storage should be highlighted separately on the location plan.</p>		
	<p><b>The following main KPIs are grouped in line with BREEAM criteria to achieve an integrated approach with the new Higher Education scheme.</b></p>		

Item	Element	References	
		BREEAM 08	NBS
	<p><b>Credits are grouped to indicate applicability within each section.</b></p> <p><b>Clauses are also cross referenced to applicable NBS clauses.</b></p>		
<b>0.10</b>	<b>Management Procedures</b>		
1.	<p><u>Commissioning:</u></p> <p>Competent Project Team member to be appointed to monitor commissioning on behalf of ICL to ensure compliance with all statutory legislation and best practice recommendations.</p> <p>The contractor their suppliers and / or the design team shall instigate a programme of 'seasonal commissioning' for one year following project completion. The main contractor shall account for the commissioning programme, responsibilities and requirements within the main programme of works.</p> <p>A specialist commissioning manager is appointed (by either client or contractor) for complex systems such as:</p> <ul style="list-style-type: none"> <li>▪ Air conditioning</li> <li>▪ Mechanical ventilation, displacement ventilation, complex passive ventilation</li> <li>▪ Building management systems (BMS)</li> </ul>	Man 1	A1 – A2

Item	Element	References	
		BREEAM 08	NBS
	<ul style="list-style-type: none"> <li>▪ Renewable energy sources</li> <li>▪ Microbiological safety cabinets and fume cupboards</li> <li>▪ Cold storage enclosures and refrigeration plant</li> </ul> <p>For all projects commissioning shall be carried out in accordance with the requirements of:</p> <ul style="list-style-type: none"> <li>▪ Current Building Regulations</li> <li>▪ EU Energy Performance of Buildings Directive</li> <li>▪ Energy Performance Certificate (EPCs)</li> <li>▪ Display Energy Certificates (DECs)</li> <li>▪ Guidance as provided by CIBSE, HVCA, BSRIA and BRE on effective commissioning of building services.</li> </ul> <p>The specialist commissioning manager should be appointed during the design stage and the scope of their responsibility should include:</p> <ul style="list-style-type: none"> <li>▪ Design input, commissioning methodology / design reviews</li> <li>▪ Commissioning management input to construction programming</li> </ul>		

Item	Element	References	
		DT to x-reference BREEAM & NBS for output specifications to MCs	
		BREEAM 08	NBS
	<ul style="list-style-type: none"> <li>▪ Commissioning management input during installation stages</li> <li>▪ Management of commissioning, performance testing and handover/post handover stages.</li> </ul> <p>Where BMS specified, the following commissioning procedures must be carried out:</p> <ol style="list-style-type: none"> <li>a. Commissioning of air and water systems is carried out when all control devices are installed, wired and functional</li> <li>b. In addition to air and water flow results, commissioning results include physical measurements of room temperatures, off coil temperatures and other key parameters as appropriate</li> <li>c. The BMS/controls installation should be running in auto with satisfactory internal conditions prior to handover</li> <li>d. All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface before handover</li> <li>e. The occupier will be fully trained in the operation of the system.</li> </ol> <p>Where specified, all built-in cold storage and chilled rooms are commissioned in accordance with the requirements for refrigeration</p>		

Item	Element	References	
		BREEAM 08	NBS
	<p>equipment as set out in the Carbon Trust publication GPG347 <i>Installation and commissioning of refrigeration systems</i>.</p> <p>All cold storage and chilled rooms over 20m<sup>2</sup> meet the requirements of Section 9.1 of the Cold Store Code of Practice, Part 1.</p> <p>Where specified, fume cupboards and microbiological safety cabinets are installed and commissioned in accordance with the following standards:</p> <p>a. Fume cupboards in accordance with BS EN 14175-2</p> <p>b. Microbiological safety cabinets in accordance with BS EN 12469 (2000).</p> <p>For the commissioning of '<u>Complex Systems</u>' – a '<u>Specialist Commissioning Manager</u>' shall be appointed</p> <p>a. Testing of all building services under full 'load conditions', i.e.</p> <ul style="list-style-type: none"> <li>▪ heating equipment in mid-winter</li> <li>▪ cooling/ventilation equipment in mid-summer</li> <li>▪ part load conditions (spring/autumn)</li> </ul> <p>b. Where applicable, testing should also be</p>		

Item	Element	References	
		BREEAM 08	NBS
	<p>carried out during periods of extreme (high or low) occupancy</p> <p>c. Interviews with building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems</p> <p>d. Re-commissioning of systems (following any work needed to serve revised loads), and incorporating any revisions in operating procedures into the O&amp;M manuals.</p> <p>Where specialist building services systems such as fume cupboards, microbiological safety cabinets and a cold storage system are present then the assessor must ensure that these systems are included in the specialist commissioning agent's responsibilities.</p> <p>Refer to references in Appendix item 1.0</p>		
2.	<p><u>Considerate Constructors Scheme</u></p> <p>Contractors appointed to ICL projects over £1 million construction value shall be members of the 'Considerate Constructors Scheme.' and shall achieve a minimum score as an average of three rolling assessments.</p> <p>The contractor shall ensure that each every project is registered on the CCS website.</p> <p>see <a href="http://www.ccscheme.org.uk/">http://www.ccscheme.org.uk/</a>.</p>	Man 2	A1 – A2
3.	<p><u>Construction Site Impacts</u></p>	Man 3	A1 – A2

Item	Element	References	
		BREEAM 08	NBS
	<p>For major projects over £1 million in value, contractors shall be required to monitor and report on their environmental site impacts, which shall include but not be limited to the following:</p> <ul style="list-style-type: none"> <li>▪ CO<sub>2</sub> emissions arising from the consumption of fossil fuel powered site activities</li> <li>▪ Potable water consumption used as part of normal construction activities</li> <li>▪ CO<sub>2</sub> emissions due to the transport to and from the site of personnel (permanently site based) and goods delivered to the site</li> <li>▪ Best practice in the monitoring of air borne dust pollution</li> <li>▪ Measures to prevent the contamination of ground water through surface spillage.</li> <li>▪ In compliance with item 2 above and the requirements of The Site Waste Management Plans Regulations 2008; while ensuring the separation and streaming of all waste materials.</li> </ul>	LE 1 - 8	
4.	<p><u>Building Users Guide or Part Guide</u></p> <p>The contractor and design team shall issue at least <u>three months prior</u> to project completion, all necessary information to enable the ICL Building Manager to prepare a 'Building Users Guide.' This shall be for the use of occupiers and the contents of which shall include but not be restricted to the</p>	Man 4	A1 – A2



Item	Element	References	
		BREEAM 08	NBS
	<p>following:</p> <ul style="list-style-type: none"> <li>▪ A simplified overview of the technical details of plant and services.</li> <li>▪ General Building Users who need non technical information to enable them to carry out their work in comfort and safety, and to allow the building to operate efficiently and effectively.</li> <li>▪ The guide should include a simplified extract for building visitors.</li> </ul> <p>In addition the Contractor and his design team shall provide for the benefit of ICL and their stakeholders the following guides:</p> <ul style="list-style-type: none"> <li>▪ A technical maintenance guide to cover all aspects of the building envelope, building services, including energy management metering and external works to include foul and surface water drainage and all security installations and utilities infrastructure.</li> <li>▪ A non technical guide for building users, in a simple format, written in plain English – without technical jargon. To describe all user interface operations and equipment, health and safety guidance together with a schedule and description of local amenities, public transport routes cycle storage and waste management.</li> </ul> <p>The above guides shall be presented to ICL for their approval in a final draft version, no less than 6</p>		

Item	Element	References	
		BREEAM 08	NBS
	<p>months before the partial or practical completion of the project, and the final version presented in digital and in hard copy format no later than <u>one month prior</u> to the projects completion.</p> <p>Where works comprise internal fit-out operations this clause will apply to the works in question only.</p>		
5.	<p><u>Site Investigations:</u></p> <p>Unless provided by the ICL design team and where deemed appropriate, the contractor, their sub-contractors and suppliers shall undertake full site investigation procedures which shall include but not be limited to the following:</p> <ul style="list-style-type: none"> <li>▪ Archaeological survey – where requested by a statutory body.</li> <li>▪ Site topographical survey, and / or</li> <li>▪ Full site dimensional survey</li> <li>▪ Site contaminations inspection</li> <li>▪ Flood risk assessment</li> <li>▪ Utilities survey</li> <li>▪ Ecology survey</li> <li>▪ Arboriculture surveys</li> </ul>	Man 5	A1 – A3, C10, C14
6.	<p><u>Stakeholder Consultations:</u></p> <p>On projects over £1 million construction value, ICL and their design teams, sub-contractors and</p>	Man 6	A1 – A3

Item	Element	References	
		DT to x-reference BREEAM & NBS for output specifications to MCs	
		BREEAM 08	NBS
	<p>suppliers should take cognizance of the opinions of the local community where development may impact on such residents and building users .The design team on behalf of ICL shall undertake some or all of the following:</p> <ul style="list-style-type: none"> <li>▪ Collected knowledge and experience from any existing buildings (where relevant)</li> <li>▪ identify existing partnerships and networks. If the building is either new in an existing community or for a development / community still under construction.</li> <li>▪ A representative consultation group should be identified from key stakeholders in the area.</li> <li>▪ Carry out consultations which should include the following issues in order to advise on: <ul style="list-style-type: none"> <li>▪ The appearance of the project</li> <li>▪ Functional and design requirements of the project</li> <li>▪ Management and operational implications including transport impacts and infrastructure impacts</li> <li>▪ Potentiality of the project to offer enhanced facilities to the local community (where appropriate)</li> </ul> </li> </ul> <p>Contracting organisations should notify stakeholders</p>		

Item	Element	References	
		BREEAM 08	NBS
	<p>within the immediate neighbourhood of their construction sites shall at the tendering stage outline their methodology for consulting with local residents of the intend works and their duration.</p> <p>See Appendix reference 6.</p>		
7.	<p><u>Shared Facilities:</u></p> <p>Where possible and practical as part of their corporate social responsibility policy ICL shall consider the incorporation of a ‘shared facilities’ strategy for incorporating elements of their estate into local communities</p> <p>Should ICL consider the policy a workable option, then for each project the following shall be made aware to the project design team, by confirming the following:</p> <ul style="list-style-type: none"> <li>▪ Potential users of the shared facilities (such as operators of clubs and community groups) have been consulted and their requirements have informed the brief.</li> <li>▪ They met formally to consider feedback according to the consultation plan</li> <li>▪ A document will describe the facilities to be shared and how secure access will be arranged and maintained to from the standpoint of both ICL and the local community.</li> <li>▪ This document has been communicated to all</li> </ul>	Man 7	NA

Item	Element	References	
		BREEAM 08	NBS
	<p>consultees.</p> <p>In all matters the needs of ICL shall over ride the requirements of enacting this clause.</p>		
8.	<p><u>Publication of Building Information</u></p> <p>For major developments requiring full planning applications the College shall consider publicising their intentions on the College website , in order to:</p> <ul style="list-style-type: none"> <li>▪ To recognise and encourage the publication of information related to the aspects of the design and procurement process’ which reduce the overall environmental impact of the building.</li> </ul> <p>The list below sets out a possible range of information that should be included if the project is to be advertised by ICL on its website:</p> <ul style="list-style-type: none"> <li>▪ Advertised on the developer’s own website</li> <li>▪ Representative reprographics of the proposed design solution</li> <li>▪ Publicly available literature or press release</li> <li>▪ Industry/sector or Government/Local Authority sponsored website or information</li> <li>▪ A basic description of the project and building</li> <li>▪ The proposed BREEAM Rating and score</li> <li>▪ The key innovative and low-impact design</li> </ul>	Man 9	A1 – A3

Item	Element	References	
		BREEAM 08	NBS
	features of the building <ul style="list-style-type: none"> <li>▪ An indication of the area of grounds/buildings to be used by the local community</li> <li>▪ A list of any social or economically sustainable measures to be implemented.</li> </ul>		
9.	<u>Use of Building Project as a Learning resource:</u> Where the development employs includes advanced low carbon technologies and/or similar technologies. The potential should be considered for using the development as a learning resource for developing environmental awareness. This should be demonstrated for both the site development/landscaping and construction aspects of the project.	Man 10	
10.	<u>Ease of Maintenance Strategy</u> ICL wish to encourage the specification of building elements and building services that can be easily maintained during their lifecycle. Design teams, contractors and their supply chain shall demonstrate that specifications for building envelopes, services and systems, together with landscaping have considered ease and efficiency of maintenance in line with best practice, which can be demonstrated <ul style="list-style-type: none"> <li>▪ A long term maintenance strategy for the building fabric and internal finishes</li> <li>▪ Where extensive external landscaping and grounds are present, the provision of a Biodiversity Management Plan, which has been</li> </ul>	Man 11	A1 – A3

Item	Element	References	
		BREEAM 08	NBS
	<p>initiated at the preliminary design stage and available at project completion.</p> <ul style="list-style-type: none"> <li>▪ By a suitable design guide checklist as issued by CIBSE</li> <li>▪ A critical appraisal has been completed at the feasibility stage of building procurement covering the maintenance implications for different design options.</li> </ul> <p>This appraisal must comply with the following:</p> <ul style="list-style-type: none"> <li>▪ Service life (whole life) planning in accordance with ISO 15686 Buildings and constructed assets - Service life planning Part 1</li> </ul> <p>The maintenance strategy has been developed and formulated at the design stage. The maintenance strategy must cover the extent to which maintenance can be designed out and how support systems can be built into the specification to facilitate efficient and cost-effective operation and maintenance. The strategy must include an indication on how all major plant and equipment is to be removed and replaced within the design life of the building, including the access openings, lifting arrangement and route to and from the plant room at a delivery point.</p> <p>See reference item 5.</p>		
11.	<p><u>Whole Life Cycle Costing:</u> ICL's cost consultants in collaboration with the</p>	Man 12	A4

Item	Element	References	
		BREEAM 08	NBS
	<p>project team and consultant will at the earliest opportunity prepare, develop and operate a 'whole life costing' (WLC) model, updated on a regular basis throughout the design and procurement programme. The database shall demonstrate whole life project value through:</p> <ul style="list-style-type: none"> <li>• the design and construction phases</li> <li>• post construction over a period of not less than 30 years for maintenance and operation</li> <li>• 50% of the extra cost in the first 5 years May be possible</li> </ul> <p>No later than one month after the completion of the construction programme and/or handover of all the completed building(s) / sections to ICL; a finalised version of the WLC shall be issued to ICL in digital format, in a format suitable for further development by ICL's cost consultants</p>		
<b>03.00</b>	<b>Demolition &amp; Decontamination</b>		
1.	<p>The contractor shall ensure that any and all hazardous materials will be reported to the College and the relevant authorities and disposed in a legally prescribed manner. In addition the following materials are to be considered hazardous or of a hazardous nature:</p> <ul style="list-style-type: none"> <li>▪ asbestos</li> <li>▪ lead-acid batteries</li> <li>▪ electrical equipment containing hazardous components such as cathode ray tubes (e.g.</li> </ul>	Wst 1 - 5	A1 – A3, C20



Item	Element	References	
		BREEAM 08	NBS
	televisions) <ul style="list-style-type: none"> <li>▪ oily sludges</li> <li>▪ solvents</li> <li>▪ paint and paint cans</li> <li>▪ fluorescent light tubes</li> <li>▪ chemical wastes</li> <li>▪ pesticides</li> </ul>		
<b>05.00</b>	<b>Materials specification</b>		
1.	<p>This section sets out ICL's intentions with respect to the specification of materials for the building structure, external envelope and internal finishes. The aim is to recognise and encourage the use of construction materials with a low environmental impact over the full life cycle of the building. As such best practice can be seen to be demonstrated by reference to BRE 'The Green Guide' (<a href="http://www.thegreenguide.org.uk">www.thegreenguide.org.uk</a>) which covers the specification of:</p> <ul style="list-style-type: none"> <li>▪ External Walls</li> <li>▪ Windows</li> <li>▪ Roof</li> </ul>	Mat 1	F10 – F42

Item	Element	References	
		BREEAM 08	NBS
	<ul style="list-style-type: none"> <li>▪ Upper Floor Slabs</li> <li>▪ Internal Finishes and Coverings</li> </ul> <p>The Green Guide categorises ratings by building type and element. When using the Green Guide online, the main page asks the user to select a building type. To obtain the appropriate ratings for the assessed building elements, select the in accordance with the relevant BREEAM scheme.</p> <p>The Green Guide categorises ratings by building type and element. When using the Green Guide online, (<a href="http://www.thegreenguide.org.uk">www.thegreenguide.org.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 BREEAM scheme.</p>		
2.	<p>The contractor shall maximise the use of recycled aggregates in all elements of the construction process, especially where concrete mixes are concerned; formation levels and bedding materials. Reclaimed materials shall make up at least 5% of the total project materials by value:</p> <ul style="list-style-type: none"> <li>▪ Crushed concrete or bricks for hardcore</li> <li>▪ Crushed glass recycled as sand or cement replacement</li> <li>▪ Recycled materials to replace Portland cement</li> </ul>	Mat 1 & 5	D20 – D50; J10 – J44



Item	Element	References	
		BREEAM 08	NBS
	<p>finishes and building services.</p> <ul style="list-style-type: none"> <li>Only commence construction of the sample study room once all drawings have been approved in writing by ICL.</li> </ul>		
2.	<p>Where boundary protection and external hard surfaces are to be specified they shall have a low environmental impact, taking account of the full life cycle of materials used.</p> <p>Where economically viable a minimum of 80% of all external hard landscaping and boundary protection (by area) shall be designed to achieves an A or A+ rating, as defined in the <i>Green Guide to Specification</i>.</p>	Mat 2	D41, D41, D45,
3.	<p><u>Reuse of building façade</u></p> <p>In order to maintain a sustainable use of materials, wherever possible ICL design team consultants, contractors and their supply chain shall be encouraged to reuse existing building façades; the aim shall be that:</p> <ul style="list-style-type: none"> <li>At least 25%of the total façade (by area) is reused</li> <li>At least 80% of the reused façade (by mass) is made up from in-situ reused material.</li> </ul>	Mat3	C40 – C90
4.	<p><u>Reuse of building structure</u></p> <p>The ICL design teams, consultants, contractors and</p>	Mat 4	C40 – C90

Item	Element	References	
		BREEAM 08	NBS
	<p>their supply chain shall be encouraged to undertake design solutions which reuse existing building structures:</p> <ul style="list-style-type: none"> <li>Where part refurbishment and part new build is deployed, the volume of the reused structure comprises at least 50% of the final structure by volume.</li> </ul>		
5.	<p><u>Responsible Resourcing</u></p> <p>ICL design teams, contractors and their supply chain shall ensure that a minimum of at least 80% of the following applicable materials included in a project from the following building elements should be responsibly sourced. Where this is not possible a report shall be issued to ICI by the design giving reasons for not achieving this percentage</p> <p>Responsible resourcing is defined as procurement of materials, products and components which are purchased on the basis of:</p> <ol style="list-style-type: none"> <li>location of material source</li> <li>method of extraction and manufacture</li> <li>Level of resource labour deployed and their remuneration</li> <li>Travel distance to point of inclusion in a project</li> </ol>	<p>Mat 5, Wst 2,</p>	<p>E, F, G, H K10 – K46 L10 - L40 M10 – M61</p>

Item	Element	References	
		BREEAM 08	NBS
	<p>The schedule of materials listed below is not exclusive and will require reviewing on a project by project basis, but in general will include the following:</p> <ul style="list-style-type: none"> <li>▪ Aggregates and ballast from recycled sources – ground glass, recycled stone and hardcore, ground granulated blast furnace slag.</li> <li>▪ Brickwork, clay tiles and other ceramics</li> <li>▪ Resin-based composites and materials, including GRP and polymeric render</li> <li>▪ Concrete both in-situ and pre-cast concrete, blocks, tiles, mortars, cementious renders</li> <li>▪ Glass and glass based products</li> <li>▪ Plastics and rubbers including EPDM, TPO, PVC and VET roofing membranes including polymeric renders</li> <li>▪ Metals (steel, aluminium copper, lead and zinc.)</li> <li>▪ Dressed or building stone including natural slate</li> <li>▪ Plasterboard and plaster</li> <li>▪ Bituminous materials, such as roofing membranes and asphalt</li> <li>▪ Other mineral-based materials, including fibre</li> </ul>		

Item	Element	References	
		DT to x-reference BREEAM & NBS for output specifications to MCs	
		BREEAM 08	NBS
	<p>cement and calcium silicate</p> <ul style="list-style-type: none"> <li>Timber and wood boards and panel systems (including MDF, chipboard and Cement Bonded Particleboard).</li> </ul> <p>All timber products employed in the construction process will be responsibly sourced from a sustainable source, confirmed through the provision of chain of custody documentation from a recognised sustainable timber scheme as set out below:</p> <div data-bbox="378 989 987 1192" data-label="Diagram"> <pre> graph LR     A["standards setting body (CSA, FSC, MTCC, PEFC, SFI)"] --&gt; B["Accreditation process"]     B --&gt; C["Auditable third party Certificate issuing body (e.g. Soil Association, BM Trada, CTB, IMO, KPMG, SGS...)"]     C --&gt; D["Certification"]   </pre> </div> <p>Contractors must provide evidence of compliance with the above at the completion of all building projects.</p> <p>Legally Sourced Timber: BREEAM follows the UK Government's definition of legally sourced timber, as outlined in the CPET 2nd Edition report on UK Government Timber Procurement Policy, which states that legal timber and wood derived products are those which originate from a forest where the following requirements are met:</p> <ul style="list-style-type: none"> <li>The forest owner/manager holds legal use</li> </ul>		

Item	Element	References	
		BREEAM 08	NBS
	<p>rights to the forest.</p> <ul style="list-style-type: none"> <li>▪ There is compliance by both the forest management organisation and any contractors with local and national legal requirements including those relevant to: <ul style="list-style-type: none"> <li>▪ Forest management</li> <li>▪ Environment</li> <li>▪ Health &amp; safety</li> <li>▪ Other parties' tenure and use rights</li> <li>▪ All relevant royalties and taxes are paid.</li> <li>▪ There is compliance with the requirements of CITES.</li> </ul> </li> </ul> <p>See Appendix references item 8 &amp; 9.</p>		
6.	<p><u>Insulation</u></p> <p>Materials with a high global warming potential (GWP) is a major contributor to climate change. It is therefore important where practically possible that insulation materials should not have a global warming potential of greater than 5, but preferable only those specified with a GWP of 0.</p> <p>For both new build and renovated envelopes the contractor will show evidence of compliance with BRE Report 262 'Thermal Insulation: Avoiding Risks,</p>	Mat 1, 5 & 6	P10 – P31



Item	Element	References	
		BREEAM 08	NBS
	2002 edition. The Green Guide rating for the thermal insulation materials must be determined. Green Guide ratings for thermal insulation can be found at <a href="http://www.thegreenguide.org.uk">www.thegreenguide.org.uk</a>		
<b>08.00</b>	<b>Internal Finishes</b>		
1.	Floor finishes shall be manufactured from recycled or natural sustainably resourced materials, where appropriate	Mat 1 & 5	
<b>09.00</b>	<b>Building Services</b>		
<b>09.01</b>	<b>Thermal Performance, Energy Management &amp; Building Services</b>		
1.	<p><u>Energy</u></p> <p>ICL is an ethical organisation and conscious of their responsibility to mitigate against the adverse effects of CO<sub>2</sub> emissions and global climate change and desire to achieve a low carbon development. Design teams, contractors and their supply chain at all times shall be mindful of the need to minimise CO<sub>2</sub> emissions emanating from the design and construction stages of the project.</p> <p>At the commencement of a project design teams should be encouraged to follow a design methodology which encourages the minimisation of CO<sub>2</sub> emissions associated with their operational energy consumption.</p> <p>The CO<sub>2</sub> index for the assessed building is based upon the Ene 1 'Reduction of CO<sub>2</sub> emissions' credit</p>	Ene 1	T10 – T90 U10 – U90 V10 – V90

Item	Element	References																			
		BREEAM 08	NBS																		
	<p>described in the Energy Section criteria of the BREEAM Assessment. The number of credits achieved is determined by comparing the building's CO<sub>2</sub> index (EPC Rating), taken from the Energy Performance Certificate (EPC), with the table of benchmarks set out below.</p> <p>The design team should verify that the building has been modelled using a method compliant with the National Calculation Method (NCM) and an Energy Rating and certificate produced using Approved software by an Accredited Energy Assessor.</p> <p><b>CO<sub>2</sub> Index (EPC Rating)</b></p> <table border="1"> <thead> <tr> <th>Potential BREEAM Credits Available</th> <th>New Build Projects</th> <th>Refurbishment / Historic Projects</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>63</td> <td>100</td> </tr> <tr> <td>2</td> <td>53</td> <td>87</td> </tr> <tr> <td>3</td> <td>47</td> <td>74</td> </tr> <tr> <td>4</td> <td>45</td> <td>61</td> </tr> <tr> <td>5</td> <td>43</td> <td>50</td> </tr> </tbody> </table>	Potential BREEAM Credits Available	New Build Projects	Refurbishment / Historic Projects	1	63	100	2	53	87	3	47	74	4	45	61	5	43	50		
Potential BREEAM Credits Available	New Build Projects	Refurbishment / Historic Projects																			
1	63	100																			
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3	47	74																			
4	45	61																			
5	43	50																			

Item	Element			References	
				BREEAM 08	NBS
	6	40	47		
	7	37	44		
	8	31	41		
	9	28	36		
	10	25	31		
	11	23	28		
	12	20	25		
	13	18	22		
	14	10	18		
	15	0	15		
	Exemplar credit 1	<0	≤0		
	Exemplar credit 2	True zero carbon building			
2.	<u>Thermal Efficiency of the building fabric</u> <ul style="list-style-type: none"> <li>The design team and contractor or their supplier chain shall demonstrate by thermal modelling that the following standards have been achieved. The thermal model shall be SBEM or a similar methodology approved by the Department of Communities and Local</li> </ul>			Ene 1 – 5, Pol 1 - 4	P10, P11, P12 and P31.

Item	Element	References	
		BREEAM 08	NBS
	<p>Government (CLG).</p> <ul style="list-style-type: none"> <li>▪ For existing buildings which have an historic grade listing the contractor will show evidence of compliance with current guidance from: <ul style="list-style-type: none"> <li>▪ Department for Communities &amp; Local Government</li> <li>▪ The Local Planning Authority in the locality of the development</li> <li>▪ The GLA</li> <li>▪ English Heritage</li> </ul> </li> </ul> <p><i>See NBS. 2006. 'Guide to Part L of the Building Regulations: Conservation of Fuel and Power.'</i></p> <p>New build - the thermal efficiency of the external envelope shall achieve u-values 10% better that required by the Building Regulations Part L2A In addition it is expected that the consultant/contractor's design shall achieve a CO<sub>2</sub> emission reduction of TER- 10% or better to a stretch target of 20 % to comply with local planning guidance and the Building Regulations Part L1B &amp; 2B:</p> <p>Existing buildings - for the renovation and refurbishment works the thermal efficiency of</p>	HW3	

Item	Element	References	
		BREEAM 08	NBS
	<p>the external envelope shall achieve u-values 10% better than that required by the Building Regulations Part L2A. For refurbished buildings it is expected that the consultant/contractor's design shall achieve a CO<sub>2</sub> emission reduction 10% to comply with local planning guidance and the Building Regulations Part L1B &amp; 2B:</p> <p>All working spaces windows must encompass a user operated glare control facility.</p>		
3.	The consultant/contractors design shall achieve an average area weighted u value of <math> < 2W/m^2K </math> for all renovated and refurbished buildings.		
4.	<p><u>Thermal Comfort</u></p> <p>The design team and or contractor and his supply chain will undertake thermal modelling has been carried out using software selected and applied in accordance with CIBSE AM11 "<i>Building Energy and Environmental Modelling</i>".</p> <p>The model should demonstrate that the building design and services strategy provides internal summer temperatures significantly better than the recommendations of Building Bulletin 101 e.g. there are fewer than 120 hours a year where temperatures rise above 28°C.</p> <p>The software used to carry out the simulation at the detailed design stage provides <i>full dynamic thermal analysis</i>. The modelling demonstrates that the building design and services strategy can deliver</p>	Hea 10	

Item	Element	References	
		BREEAM 08	NBS
	<p>thermal comfort levels in <i>occupied spaces</i> in accordance with the requirements set out in CIBSE Guide A "<i>Environmental Design</i>"; in particular that internal winter and summer temperature ranges will be in line with the recommended comfort criteria in table 1.5 of the Guide.</p> <p>The software used to carry out the simulation at the detailed design stage must provide <i>full dynamic thermal analysis</i>. For smaller and more basic building designs an alternative less complex means of analysis may be appropriate (such methodologies must still be selected and applied in accordance with CIBSE AM11).</p>		
5.	<p><u>Thermal Zoning</u></p> <p>Where appropriately possible in permanently occupied operational spaces local occupant control should be made available for temperature adjustment in each <i>occupied space</i> to reflect differing user demands through the use of TRV radiator controls.</p> <p>In general however large spaces will be zoned for the purpose of heating and cooling and the basis of centralised controls.</p>	Hea 11	
6.	<p><u>Energy Performance Certificates:</u></p> <p>A further provision of the Energy Performance of Buildings Directive is the requirement to measure the Energy Performance of Buildings by the process</p>	Ene 1	

Item	Element	References	
		BREEAM 08	NBS
	<p>of 'Energy Performance Certificates' (EPC) and 'Display Energy Certificates.' The requirements are set out below:</p> <ul style="list-style-type: none"> <li>▪ From <b>6 April 2008</b> those buildings with a total useful floor area greater than 10,000m<sup>2</sup> (see glossary of terms for a definition) require an Energy Performance Certificate on construction, sale or let</li> <li>▪ From <b>1 July 2008</b> those buildings with a total useful floor area greater than 2,500m<sup>2</sup> (see glossary of terms for a definition) require an Energy Performance Certificate on construction, sale or let.</li> <li>▪ From <b>1 October 2008</b>, all remaining buildings that are not dwellings require an Energy Performance Certificate on construction, sale or let.</li> </ul> <p>EPCs for the sale or letting of buildings other than dwellings will be valid for 10 years.</p> <p>EPCs are not required on construction, sale or rent for:</p> <ul style="list-style-type: none"> <li>▪ places of worship</li> <li>▪ temporary buildings with a planned time of use less than two years (see glossary terms)</li> <li>▪ stand alone buildings with a total useful floor</li> </ul>		

Item	Element	References	
		BREEAM 08	NBS
	<p>area of less than 50m<sup>2</sup> that are not dwellings</p> <ul style="list-style-type: none"> <li>industrial sites, workshops and non-residential agricultural buildings with low energy demand (see glossary of terms for a detailed description).</li> </ul> <p>EPCs/DECs only apply to public authorities or public institutions (those providing services traditionally associated with local or national government) occupying a building must display a DEC. Other private occupants of the same building are not required to display a DEC.</p> <p>The contactor shall ensure concurrence with the UK building energy labelling scheme approved from time to time for commercial buildings. Provision shall be made from the outset to display a labelling scheme in a prominent location in all new and renovated buildings on the campus.</p> <p>See Appendix A, advice note on EPCs and DEC</p>		
7.	<p>For new build projects the design team, the contractor and their supply chain shall design for an 'Energy Efficiency Rating' of not less B is achieved. However if applicable the team shall seek to achieve an ' A ' rating</p>		



Item	Element	References DT to x-reference BREEAM & NBS for output specifications to MCs	
		BREEAM 08	NBS

## Display Energy Certificate

HM Government

**How efficiently is this building being used?**

A Government Dept  
12<sup>th</sup> & 19<sup>th</sup> Floor  
Jubilee House  
High Street  
Anytown  
A12CD

Certificate Reference Number:  
1234-1234-1234-1234

The certificate indicates how much energy is being used to operate the building. The Operational Rating is based on meter readings of all the energy actually used in the building. It is compared to a benchmark that represents performance indicative of all buildings of the type. There is more advice on how to interpret the information on the Government's website [www.communities.gov.uk/ledd](http://www.communities.gov.uk/ledd).

### Energy Performance Operational Rating

This tells you how efficiently energy has been used in the building. The numbers do not represent actual sets of energy consumed; they represent comparative energy efficiency. 100 would be typical for this kind of building.

More energy efficient

A	0-25
B	26-50
C	51-75
D	76-100
100 would be typical	
E	101-125
F	126-150
G	Over 150

Less energy efficient

### Total CO<sub>2</sub> Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO<sub>2</sub>.

Month	Electricity	Heating	Renewables
Mar 2008	~150	~150	~100
Apr 2008	~120	~120	~80
Apr 2007	~100	~100	~60

### Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods.

Period	Rating
Apr 2007	105
Apr 2008	125
Mar 2008	100

### Technical Information

This tells you technical information about how energy is used in the building. Consumption data based on actual readings.

Main heating fuel: Gas  
 Heating Environment: Air-Conditioned  
 Total useful floor area (m<sup>2</sup>): 200  
 Asset Rating: B

	Heating	Electrical
Annual Energy Use (kWh/m <sup>2</sup> /year)	125	120
Typical Energy Use (kWh/m <sup>2</sup> /year)	120	95
Energy from renewables	0%	20%

### Administrative Information

This is a Display Energy Certificate as defined in BS2007:2011 as amended.

Assessment Scheme: GBU4  
 Property Reference: 60412375542  
 Assessor Name: John Smith  
 Assessor Number: AGO12345  
 Accreditation Scheme: AGO Accreditation Ltd  
 Employer/Trading Name: George Walsh Ltd  
 Employer/Trading Address: Apple House, New Way, Stroudham, SO14AA  
 Issue Date: 12 May 2007  
 Renewal Date: 01 Apr 2007  
 Valid Until: 31 Mar 2008  
 Related Party Disclosure: George Walsh are contracted as energy managers  
 Recommendations for improving the energy efficiency of the building are contained in Report Reference Number: 1234-1234-1234-1234

Renovated and refurbished buildings should achieve a rating of no less than D.  
 However if applicable the team shall seek to achieve C rating

8.	Stand alone energy producing appliances should only be procured with an energy label rating of A or	Ene 1	
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Item	Element	References	
		BREEAM 08	NBS
	B.		
9.	The use of robust detailing wherever possible shall be deployed as a minimum standard. It should be noted however that BRE do not accept robust detailing as supporting evidence.		
10.	Good air permeability design can aide the conservation of fuel and power by up to 40%. Design teams and contractors and their supply chain are directed towards the SEDA website <a href="http://www.seda2.org/dfa/index.htm">www.seda2.org/dfa/index.htm</a> ; 'Design and Detailing for Airtightness.' 2006.		P12, P30, P31,
11.	Other than the kitchens the design will take advantage of natural ventilation and free cooling. In such areas of the development where this is not practically feasible low energy consumption passive vent technologies should be employed. Natural ventilation rates shall comply with the CIBSE guides.	Hea 7	
12.	<u>High Frequency Lighting</u> Where lighting design encompasses linear fluorescent and compact fluorescent lamps they should incorporate high frequency ballasts, this is applicable to: <ul style="list-style-type: none"> <li>▪ Operational work areas either for individuals</li> <li>▪ public areas and common parts</li> </ul>	Hea 4	
13.	<u>Internal and external lighting</u> All lighting schemes are to be designed to achieve the required visual environment in accordance with	Hea 5, P12	V50, V51, V55, V56, V57, V59, V60

Item	Element	References	
		BREEAM 08	NBS
	<p>technical policy statement E9 with the minimum operating/running costs.</p> <p>For all common areas shall have PIR activation and control. The reduction of night time light pollution must be addressed at an early design stage design.</p>		
14.	<p><u>Renewable Energy Resources.</u></p> <p>The London Plan requires a minimum of 20% reduction of CO<sub>2</sub> emissions from the total consumption of all thermal energy and power consumed on a site to be generated from renewable energy resources, as recognised by the BRE's Low Carbon Buildings Programme 2 (LCBP2) and the BRE as being a low and zero carbon technology (LZC). Only LZC technologies which are grant aided under the LCBP2 scheme, will be considered as acceptable, the full benefit of all grants received being returned to ICL in their entirety.</p> <p>All renewable energy resources will be grid connected with separate measuring, monitoring and smart metering equipment (Energy Management). A target figure of 20% CO<sub>2</sub> emission reduction for new buildings shall be over and above the requirements of Part L 2A – B of the Building Regulations shall be aspired too</p>	Ene 5	T25, T26 and T40, V13, V14
15.	<p><u>Energy and Utility Metering and Monitoring</u></p> <p>The contractor's design shall encompass a full scale energy monitoring and management system and must include zone sub-metering for thermal services, power and cold water services, together with the provision of pulse metering to the incoming</p>	Ene 2 – 3	

Item	Element	References	
		BREEAM 08	NBS
	<p>water supply and the provision of leak detection.</p> <p>ICL design teams, contractors and their sub-contractors and suppliers shall ensure that for all new developments and refurbishment projects shall include the provision of 'SMART' metering systems in line with ICL current policy.</p>		
16.	<p><u>Microbial Contamination</u></p> <p>Design teams and construction contractors shall ensure that building services are designed to reduce the risk of legionellosis in operation, through a robust risk analysis process that the risk of waterborne and airborne legionella contamination has been minimised, compliance will be demonstrated by:</p> <ul style="list-style-type: none"> <li>▪ All <i>water systems</i> in the building are designed in compliance with the measures outlined in the Health and Safety Executive's "<i>Legionnaires' disease - The control of legionella bacteria in water systems</i>". Approved Code of Practice and guidance, 2000.</li> <li>▪ Where no humidification is specified or only steam humidification is provided.</li> </ul> <p>This credit will apply to:</p> <ul style="list-style-type: none"> <li>▪ Cooling towers</li> <li>▪ Evaporative condenser</li> <li>▪ Domestic hot and cold water systems</li> <li>▪ Other plant and systems containing water which</li> </ul>	Hea 12	S10,

Item	Element	References	
		BREEAM 08	NBS
	<p>is likely to exceed 20°C and which may release a spray or aerosol during operation or when being maintained, for example:</p> <ul style="list-style-type: none"> <li>▪ humidifiers and air washers</li> <li>▪ spa baths and pools</li> <li>▪ car/bus washes</li> <li>▪ wet scrubbers</li> <li>▪ Indoor fountains and water features.</li> </ul> <p>See Appendix reference item 15.</p>		
<b>09.02</b>	<b><u>Water Conservation and Management</u></b>		
1.	<p><u>Potable Water Conservation</u></p> <p>The design team should demonstrate that the specification includes taps, urinals, WCs and showers that consume less potable water in use than standard specifications for the same type of fittings.</p> <p>To be in alignment with the BREEAM assessment methodology the following water consumption reduction should aim to achieve the following reduction characteristics:</p> <ul style="list-style-type: none"> <li>▪ potable water consumption for domestic uses in new and refurbished buildings shall be targeted at <math>\geq 3.0\text{m}^3/\text{person}</math> per year in relation to the effective flush volumes and flow rates for</li> </ul>	W1- 6,	S12, S17, S51

Item	Element	References	
		BREEAM 08	NBS
	<p>the following installed sanitary fittings:</p> <ul style="list-style-type: none"> <li>▪ WCs</li> <li>▪ Urinals</li> <li>▪ Taps</li> <li>▪ Showers</li> </ul> <p>If any rainwater collection or greywater recycling systems are specified for the purpose of meeting WC/urinal flushing demand, determine the following information (as appropriate to system type):</p> <ol style="list-style-type: none"> <li>a. Annual rainfall for the site location (mm)</li> <li>b. Rainwater catchment area (m2)</li> <li>c. Catchment type e.g. pitched roof, flat roof</li> <li>d. Rainwater filter co-efficient</li> <li>e. Rainwater collection tank capacity</li> <li>f. Percentage of tap and shower water collected and used for WC/urinal flushing.</li> <li>g. Percentage of building's WC/urinals using harvested rainwater to meet flushing demand.</li> </ol> <p>All water supply fittings throughout the development shall be low flow, WCs shall be dual flush. Where</p>		

Item	Element	References	
		BREEAM 08	NBS
	public WCs are provided automated sanitary shut-off is to be installed through PIR activation; potable cold water services shall be mains fed to avoid legionella risk. Where economically and technically viable, the aim will be for 50% of all water for WC flushing and ground works irrigation is to be provided through a rainwater harvesting installation.		
2.	<u>Catering Facilities</u> Not included		
<b>12.00</b>	<b>Transport</b>		
1.	<u>Green Travel Plan</u> ICL should ensure that and up to date 'Green Travel' has been prepared and is placed in the public domain. The plan will require regular up dates to ensure compliance with current legislation.	Tra 5	
2.	<u>Cyclist Facilities</u>  To encourage building users to cycle as a mode of commuting transport ensuring adequate provision of cyclist facilities.  ICL should demonstrates that covered, secure and well-lit cycle storage facilities are provided for building users; in addition to the above, adequate changing facilities, showers and drying space should be provided for cyclists and accessible by all college members.  See references item 26 for further reading matter.	Tra 3	
3.	<u>Pedestrian Safety</u>	Tra 4	

Item	Element	References	
		BREEAM 08	NBS
	<p>To encourage the provision of safe and secure pedestrian and cycle access routes on the ICL campus, demonstrated by a site layout which is designed in accordance with best practice to ensure safe and adequate pedestrian and cycle access.</p> <p>See reference item 27 for further guidance.</p>		
<b>15.00</b>	<b>Anti-Pollution Methods</b>		
1.	<p><u>Low Global Warming Potential Refrigerants:</u> ICL their design teams and contracting organisations shall demonstrate evidence that all specified refrigerants have a global warming potential (GWP) of less than 5 (CO<sub>2</sub>e). Refrigerants from the following list shall be regarded as having a low GWP:</p> <ul style="list-style-type: none"> <li>▪ R22 (HCFC-22) 1700 R290 (HC290 propane) – GWP =3</li> <li>▪ R123 (HCFC-123) 93 R600 (HC600 butane) – GWP =3</li> <li>▪ R134a(HFC-134a) 1300 R600a (HC600a isobutane) – GWP =3</li> <li>▪ R124 (HCFC-124) 480 R290/R170(HC290/HC170) – GWP =3</li> <li>▪ R141b (HCFC-141b) 630 R1270 (HC1270 propene) – GWP =3</li> </ul> <p>See Appendix A item 29 for reference material</p>	Pol 1	The linkage between NBS and BREEAM compatible clauses should be x-referenced to U10 – U84 for the following Pollution clauses.



Item	Element	References	
		BREEAM 08	NBS
2.	<p><u>Refrigerant Leak Detection:</u></p> <p>In combination with 15.01 above ICL and their designers should demonstrate that refrigerant leaks can be detected and that the provision of automatic refrigerant pump down is made to a heat exchanger (or dedicated storage tanks) with isolation valves.</p> <p>A leak detection system will be compliant if specified as follows:</p> <ul style="list-style-type: none"> <li>▪ Systems using refrigerants are contained in a moderately air tight enclosure (or a mechanically ventilated plant room), and a refrigerant leak detection system is installed covering high-risk parts of the plant.</li> <li>▪ An automatic permanent refrigerant leak detection system is specified, which is not based on the principle of detecting or measuring the concentration of refrigerant in air.</li> </ul> <p>In addition a refrigerant recovery system shall enable:</p> <ul style="list-style-type: none"> <li>▪ The automatic shutdown and pump down of refrigerant when detection of high concentrations of refrigerant in the plant room/enclosure. For the majority of cases only systems in mechanically ventilated/moderately air tight plant rooms (or enclosures) comply.</li> <li>▪ Automatic pump-down to either a separate</li> </ul>	Pol 2	

Item	Element	References	
		BREEAM 08	NBS
	<p>storage tank or into the heat exchanger is acceptable but only where automatic isolation valves are fitted to contain the refrigerant once fully pumped down.</p> <ul style="list-style-type: none"> <li>The alarm threshold that triggers automatic pump down is set to a maximum of 2000ppm (0.2%), but lower levels can be set.</li> </ul> <p>Manual systems shall only regarded as compliant with the specification as a final unavoidable last resort.</p> <p>Refer to the Appendix A, item 30 for further information.</p>		
3.	<p><u>Refrigerants:</u></p> <p>Refrigerants within cold storage systems should have a global warming potential (GWP) of less than 5.</p> <p>The following demonstrates compliance:</p> <ol style="list-style-type: none"> <li>All refrigerant types used in cold storage systems have a global warming potential (GWP) of less than 5.</li> <li>The requirement applies to refrigerants used in systems integral to the building, including where specified:</li> </ol>	Pol 2 - 3	

Item	Element	References	
		BREEAM 08	NBS
	<p>a. Cold storage enclosures.</p> <p>b. Cold store services including: Chilled water pipework, refrigerant pipework and ductwork etc</p> <p>c. Fixed cold or chilled storage cabinets</p> <p>d. Fixed cold drink coolers.</p>		
4.	<p>NOx Emission Reduction</p> <p>To encourage the installation of heat producing system that minimises NOx emissions, and therefore reduces pollution from greenhouse gases.</p> <p>Where evidence provided demonstrates that the maximum dry NOx emissions from a heat producing source, for current best practice are set within the range of:</p> <ul style="list-style-type: none"> <li>▪ ≤40, to a maximum of less than ≤70 mg/kWh (at 0% excess O<sub>2</sub>)</li> <li>▪ emissions from delivered water heating energy are not greater than ≤70 mg/kWh (at 0% excess O<sub>2</sub>).</li> </ul> <p>Confirmation that the above has been achieved will be by the contractor and their sub-contractors providing evidence of the boiler manufacturer's details that demonstrate that the plant installed to meet the building's space heating demand has maximum dry NOx emission levels as defined above. The emissions should be estimated under normal</p>	Pol 4	

Item	Element	References	
		BREEAM 08	NBS
	operating conditions not in a standby mode.		
<b>17.00</b>	<b>Land-Use &amp; Ecology</b>		
1.	Best practice precedent suggests that that the majority of the footprint of a proposed new development falls within the boundary of previously developed land – brownfield sites only. This can be demonstrated by at least 75% of the proposed development's footprint being situated on an area of land which has previously been developed for use in the last 50 years.	LE 1	
2.	At an early stage in a projects programme the project team/contractor shall undertake a survey to ascertain the level, if any, of site contamination.	LE 2	A1
3.	The project team / contractor shall undertake a flood risk assessment of the site at an early stage in the design process.	Pol 5	
4.	It is the responsibility of the project team to fully investigate and ascertain the status of all trees on the development	Man 3	
5.	The project team where applicable shall undertake an ecological survey of the site by a suitably competent and qualified person being a corporate member of one of the following organisations: A member organisation of the Association of Wildlife Trusts Consultancies (AWTC).  A full member of the Institute of Environmental Management and Assessment and is a practising ecologist with 'registered' level status on the IEMA	LE 3	

Item	Element	References	
		BREEAM 08	NBS
	<p>register of Environmental Impact Assessors. Details of the register can be viewed at <a href="http://www.iema.net">www.iema.net</a>. To obtain details of a suitably qualified member from the register,</p> <p>A full member of the Institute of Ecology and Environmental Management (IEEM) with three years experience in the field of ecological impact studies/assessments.</p> <p>OR</p> <p>A full member of the Landscape Institute (LI) with at least three years experience in the field of ecological impact studies/assessments</p> <p>OR</p> <p>Another advisor operating within a relevant professional code of practice ensuring a consistent and credible approach to ecological advice. To ensure that these requirements are not misinterpreted, any advisor that is not a full member of IEEM, IEMA, LI or the AWTC must be approved by BRE.</p>		
6.	The project team's design proposals shall include ecological impact and mitigation proposals.	Man 3 LE 3 – 4	
7.	In collaboration with ICL the project team's design proposals will include a 'biodiversity management plan.'	LE 6	
8.	During their town planning negotiations, the project team / contractor will show evidence of consulting with local wildlife partnerships.	LE 8	
9.	The project team / contractor shall allow in his design for a surface water attenuation infrastructure	Pol 5	

Item	Element	References	
		BREEAM 08	NBS
	and consult with the local drainage authority for the installation of a site wide SUDS system. The system should allow for the recovering of surface water for non potable requirements		
10.	The project team / contractor's design shall maximise the use of recycled and or harvested rainwater for all non potable water requirements.	Wat 1 Wat 5 - 6	
11.	The project team shall give consideration to and demonstrate evidence that a site wide blackwater recycling system has been considered.	Wat 6	
12.	The project team / contractor's design shall allow for adequate external space (to ICL's approval) for the provision of a dedicated storage enclosure for the separation and collection of all waste materials; to be aligned with ICL's waste policy. All external waste collection areas shall be provided with wash down facilities including surface water drainage. Wash down points shall be supplied by non potable water.	Wst 3 - 5	

## A APPENDIX:

### References:

1. The Commissioning engineer shall make reference to the CIBSE Commissioning Codes: Set of Seven Codes (2003), as set out below:

CIBSE Commissioning Code A: Air Distribution Systems

CIBSE Commissioning Code B: Boilers

CIBSE Commissioning Code C: Automatic Controls

CIBSE Commissioning Code L: Lighting

CIBSE Commissioning Code M: Management

CIBSE Commissioning Code R: Refrigeration

CIBSE Commissioning Code W: Water Distribution Systems

In addition reference shall be made to the BSRIA Commissioning Guides, as follows:

Application Guide 1/91 - Commissioning of VAV systems in Buildings

Application Guide 20/95 - Commissioning of Pipework Systems

Technical Memoranda 1/88.1 - Commissioning HVAC Systems

Application Guide 3/89.3 - Commissioning of Air Systems in Buildings

Application Guide 1/2001.1 - Pre-commission Cleaning of Pipework Systems

Application Guide 2/89.3 - Commissioning of Water Systems in Buildings

Application Guide 2/89.3 – Commissioning water systems application principles

Application Guide 5/2002 - Commissioning Management

- AG16/2002 - Variable flow water systems: design, installation and commissioning guidance
2. [www.dqi.org.uk](http://www.dqi.org.uk); [www.cabe.org.uk](http://www.cabe.org.uk); Design Note 14 "School & Community – 2", DES, 1976. [www.bcse.uk.net](http://www.bcse.uk.net); [www.ltl.org.uk](http://www.ltl.org.uk); (<http://www.audit-commission.gov.uk/Products/NATIONAL-REPORT/D7701D4F-C130-4BA6-B10D-6D0644BDAA98/PFITechnicalqualityreportBRE.pdf>)
  3. "Secured By Design – Schools". ACPO Crime Prevention Initiatives Limited, 2004. <http://www.securedbydesign.com/pdfs/schools.pdf>
  4. [www.constructingexcellence.org.uk](http://www.constructingexcellence.org.uk); [www.wellbuilt.org.uk/lascn/login.jsp](http://www.wellbuilt.org.uk/lascn/login.jsp)
  5. ISO 15686 Buildings and constructed assets - Service life planning. Part 1 - General principles, 2000. Part 2 - Service life prediction procedures, 2001. Part 3 - Performance audits and reviews, 2002. Part 6 - Procedures for considering environmental impacts, 2004. Building Bulletin 70, "Maintenance and renewal in educational buildings, maintenance of mechanical services". DfES. Guide to ownership, operation and maintenance of building services". CIBSE 2000.
  6. BS/ISO 15686-5 "Service Life Planning – Life Cycle Costing". BSI. OGC guidance Achieving Excellence in Construction 7 – "Whole Life Costing and Cost Management". OGC guidance Achieving Excellence in Construction 11 – "Sustainability". Green Book – Treasury guidance "Appraisal and Evaluation in central government". Crown Copyright 1997 and 2000. HM Treasury "How to construct a public sector comparator - Technical Note No. 5", Treasury Taskforce, London 1999. CCF "Whole Life Costing - A Clients' Guide, BRE report funded by DETR". Clients Construction Forum London: 1999. BS/ISO 15686 Buildings – "Service Life Planning - Part 1 - General Principles". BSI 2000. "Applying facilities expertise in building design". Jaunzens D, Warriner D, Garner U and Waterman A London: CRC Ltd.2001. BRE Digest 452 "Whole life costing and life cycle assessment for sustainable building design". Bartlett E, Edwards S, Garston CRC 2000. OGC Common Minimum Standards for the procurement of built environments in the public sector, downloadable from [http://www.ogc.gov.uk/documents/Common\\_Minimum\\_Standards\\_PDF.pdf](http://www.ogc.gov.uk/documents/Common_Minimum_Standards_PDF.pdf). Treasury's Value for Money (VfM) Initiative for PFI projects. Treasury website: [http://www.hmtreasury.gov.uk./documents/public\\_private\\_partnerships/additional\\_guidance/ppp\\_vfm\\_index.cfm](http://www.hmtreasury.gov.uk./documents/public_private_partnerships/additional_guidance/ppp_vfm_index.cfm)



7. [www.thegreenguide.org.uk](http://www.thegreenguide.org.uk)
  
8. In the source of natural materials especially tropical hardwoods CITES (Convention on International Trade in Endangered Species) Appendices I and II of the CITES list illustrate species of timber that are protected outright. Appendix III of the CITES list illustrates species that are protected in at least one country. If a timber species used in the development is on Appendix III it can be included as part of the assessment as long as the timber is not obtained from the country(ies) seeking to protect this species (see additional information for further details).  
 FERN - European NGO campaigning for forests - [www.fern.org](http://www.fern.org); ProForest - [www.ProForest.net](http://www.ProForest.net); WWF - [www.panda.org](http://www.panda.org); UK Tropical Forest forum [www.forestforum.org.uk](http://www.forestforum.org.uk); Greenpeace Ancient Forest Campaign [www.greenpeace.org.uk](http://www.greenpeace.org.uk); Forests Forever Campaign [www.forestsfuture.org.uk](http://www.forestsfuture.org.uk); UK Woodland Assurance Scheme - [www.forestry.gov.uk/ukwas](http://www.forestry.gov.uk/ukwas); Wood for Good [www.woodforgood.com](http://www.woodforgood.com); TFT - Tropical Forest Trust publication "*Good Wood, Good Business*" – [www.tropicalforesttrust.com](http://www.tropicalforesttrust.com); "*Good Wood Guide*", Friends of the Earth/ Flora and Fauna International, 2002 - [www.goodwoodguide.com](http://www.goodwoodguide.com); "*The Environment in Your Pocket*", DEFRA, 2001. "*Certification of Forest Products*", BRE, 1999. Briefing Sheet – The UK's Footprint: "*The UK Timber Industry and its Impact on the World's Forest*", Friends of the Earth, 2000. Saving the Wood, Building for a Future (Autumn 2001); EU Eco-Management and Audit Scheme (EMAS); [www.emas.org.uk/aboutemas/mainframe.htm](http://www.emas.org.uk/aboutemas/mainframe.htm); [http://europa.eu.int/comm/environment/emas/index\\_en.htm](http://europa.eu.int/comm/environment/emas/index_en.htm); International Standards for Organisation (ISO) [www.iso.org/iso/en/ISOOnline.frontpage](http://www.iso.org/iso/en/ISOOnline.frontpage); Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); <http://www.cites.org/>; EU Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan; <http://europa.eu.int/>; SGS timber tracking programme [http://www.sgs.com/forest\\_services\\_?servicelId=8535&lobId=5548](http://www.sgs.com/forest_services_?servicelId=8535&lobId=5548); TFT – Tropical Forest Trust <http://www.tropicalforesttrust.com/>; UK Government Timber Procurement Policy "*Definition of 'legal' and 'sustainable' for timber procurement*", Second Edition, CPET, 2006
  
9. CIBSE Applications Manual AM11 "Building energy and environmental modelling", CIBSE, 1998. CIBSE Guide A "Environmental Design", 7th Edition, Issue 2, CIBSE, 2007. BRE's Environmental Design Guide for Naturally Ventilated and Daylit Offices. Report 345. CIBSE Guide J "Weather, solar and illuminance data", CIBSE, 2002.

10. The Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007. See [www.opsi.gov.uk/si/si2007/20071669.htm](http://www.opsi.gov.uk/si/si2007/20071669.htm);
11. The Building Regulations Part: See [www.planningportal.gov.uk](http://www.planningportal.gov.uk);
12. Energy Performance Certificates and Display Energy Certificates: See [www.communities.gov.uk/documents/planningandbuilding/pdf/748603.pdf](http://www.communities.gov.uk/documents/planningandbuilding/pdf/748603.pdf) ;
13. Display Energy Certificates: See [www.communities.gov.uk/epbd](http://www.communities.gov.uk/epbd)
14. Further guidance can be obtained by reference to below:
  - [www.hvca.org.uk](http://www.hvca.org.uk)
  - [www.bre.co.uk](http://www.bre.co.uk)
  - [www.cibse.org](http://www.cibse.org)
  - [www.bsria.co.uk](http://www.bsria.co.uk)
  - CIBSE Commissioning Codes
    - CCA - Air Distribution Systems (1996)
    - CCB – Boiler Plant (2002)
    - CCC – Automatic Controls (2001)
    - CCR – Refrigeration Systems (2002)
    - CCW – Water Distribution Systems (2003)
    - CCL – Lighting (2003)
    - CCM – Commissioning Management (2003)
  - BSRIA Commissioning Guides
    - AG 1/91 - Commissioning of VAV systems in Buildings
    - AG 20/95 – Commissioning of Pipework Systems
    - TM 1/88 – Commissioning HVAC Systems
    - AG 3/89.3 – Commissioning of Air Systems in Buildings
    - AG 1/2001 – Pre-commissioning Cleaning of Pipework Systems
    - AG 2/89.2 – Commissioning of Water Systems in Buildings
    - AG5/2002 – Commissioning Management
15. Legionnaires' disease - The control of legionella bacteria in water systems". Approved Code of Practice and guidance, 3rd ed. HSE, 2000. AG 10/94.1 "Efficient humidification in buildings", KM Bennett, BSRIA. TM13 "Minimising the risk of Legionnaires disease", CIBSE, 2002. Health and Safety Executive: Legionnaires disease: <http://www.hse.gov.uk/legionnaire>.
16. The National Charrette Institute is a non-profit educational institution that helps communities achieve healthy transformation through collaborative planning processes that harnesses the talents and energies of all interested parties to create and support a buildable plan: [www.charretteinstitute.org](http://www.charretteinstitute.org); Planning for Real is a participative planning initiative: [www.nifonline.org.uk](http://www.nifonline.org.uk); For a guide to

neighbourhood renewal and various resources see [www.renewal.net](http://www.renewal.net). The Design Quality Indicator is a method to assess the design quality of buildings [www.dqi.org.uk](http://www.dqi.org.uk). Design Quality Matrix (DQM) can also be used to facilitate the consultation process, more information is available from:  
<http://www.auditcommission.gov.uk/Products/NATIONAL-REPORT/D7701D4F-C130-4BA6-B10D-6D0644BDAA98/PFITechnicalqualityreportBRE.pdf>

17. The Commission for Architecture and the Built Environment has various publications See the Commission for Architecture and the Built Environment (CABE) [www.cabe.org.uk](http://www.cabe.org.uk)
18. Carbon Reduction Commitment
19. Site Waste Management Plans – Statutory Instrument 2008 NO.314
20. **CIBSE**: <http://www.cibse.org/>; **EuroACE**: The European Alliance of Companies for Energy Efficiency in Buildings was set up to help the EU meet its Kyoto Commitments; <http://www.euroace.org/>; **NHER**: National Home Energy Rating <http://www.nher.co.uk/>; **RICS**: The Royal Institution of Chartered Surveyors Visit: <http://www.rics.org/>; **SBEM**: Developed for DCLG (formerly ODPM) by BRE, the Simplified Building Energy Model (SBEM) is the default method for carrying out these calculations. Building designers and consultants, and other interested professionals, will need to familiarise themselves with the new compliance method; <http://www.ncm.bre.co.uk/> to download the SBEM software; **EPBD Buildings Platform**: Additional support activity to the full and continued implementation of the Energy Performance of Buildings Directive in the 25 Member States as well as Bulgaria and Romania. See <http://www.buildingsplatform.org/>; **ENPER-EXIST**: Focuses directly on implementation of EPBD and its affect on existing buildings, to improve knowledge on practical implementation (particularly certification), technical specifications and lack of knowledge of building stock. <http://www.enper-exist.com/index.html>; **CLG** Energy Performance of Buildings Directive Visit: <http://www.communities.gov.uk/epbd>; **BRE** Building Research Establishment Ltd, Visit: <http://www.bre.co.uk/>;
21. Communities and Local Government (CLG):  
[www.communities.gov.uk/planningandbuilding/?view=Search+results&query=Energy+Performance+Certificates&contentType=all&sites=planning&quickSearch=true&resultsPerPage=20&x=28&y=6](http://www.communities.gov.uk/planningandbuilding/?view=Search+results&query=Energy+Performance+Certificates&contentType=all&sites=planning&quickSearch=true&resultsPerPage=20&x=28&y=6)

22. See Defra:  
[http://www.defra.gov.uk/defrasearch/search\\_results.jsp?template=&category=environment&query=Environmental+Liabilities+Directive&doctype=&date=&batchsize=20&database=Internet\\_Files%2B](http://www.defra.gov.uk/defrasearch/search_results.jsp?template=&category=environment&query=Environmental+Liabilities+Directive&doctype=&date=&batchsize=20&database=Internet_Files%2B); Environment Agency, NetRegs,  
[http://www.netregs.gov.uk/netregs/legislation/380525/964277/?lang=\\_e](http://www.netregs.gov.uk/netregs/legislation/380525/964277/?lang=_e), also  
 Enviromental Liability Directive (2004/35/CE - 21 April 2004); The Parliamentary  
 Committee for Environment, Food and Rural Affairs: [www.parliament.uk](http://www.parliament.uk); The Ends  
 Directory:  
<http://www.endsdirectory.com/index.cfm?action=articles.view&articleID=200404>.
23. See Defra as above The Carbon Trust,  
<http://www.carbontrust.co.uk/climatechange/policy/CRC.htm>; Environment  
 Agency, NetRegs, <http://www.netregs.gov.uk/netregs/legislation/>; Denton Wilde  
 Sapte. September 2007. The Carbon Reduction Commitment.  
<http://www.dentonwildesapte.com/assets/1/19611CRC.pdf>; The London School of  
 Economics: Carbon Reduction Commitment Proposal (formerly the Energy  
 Performance Commitment), <http://www.lse.ac.uk/collections/environment/crc.htm>
24. The London Plan: <http://www.london.gov.uk/thelondonplan/thelondonplan.jsp>.
25. See NBS Products on NBS website <http://www.thenbs.com/products/index.asp>;  
 NBS Building; NBS Engineering Services; NBS Landscape; NBS Scheduler; NBS  
 Domestic Specification
26. "Providing for cyclists - A code of practice", Sustrans/cyclists' Public affairs  
 group/CTC 1997; Transport for London Street Management "Cycle Parking  
 Standards TfL Proposed Guidelines", TfL; "London Cycling Design Standards",  
 Transport for London, 2005; BS 5489-1 :2003 Code of practice for the design of  
 road lighting "Lighting of roads and public amenity areas", BSI; "Metric handbook  
 – planning and design data", Adler, Architectural Press 3rd Ed. 2007.
27. LTN 2/04 – "Adjacent and Shared Use Facilities for Pedestrians and Cyclists", DfT,  
 2005;  
[www.dft.gov.uk/consultations/archive/2004/ltnwc/ltn204adjacentandsharedusefa1692?page=1](http://www.dft.gov.uk/consultations/archive/2004/ltnwc/ltn204adjacentandsharedusefa1692?page=1);  
 Local Transport Note 2194: "Directional Information Signs" - Interim  
 Design Note, DfT; Information Sheet FF04 "Shared Use Routes", Sustrans, 1998.

BS5489-1:2003 "Lighting of roads and public amenity areas", BSI. Lighting Guide 6 (LG6) - "The outdoor environment", CIBSE, 1992.

28. See Carbon Trust – CTV027, Metering: Introducing the techniques and Technology for energy data management. GT004, Degree Days for Energy Management – a practical introduction. CTG008, Monitoring and Targeting Techniques to help organisations control and manage their energy use. The Routemaster on the ESTA website: [www.esta.org.uk](http://www.esta.org.uk)
29. "New CFC's, HCFCs, HFC's and halons, Professional and practical guidance on substances that deplete the ozone layer", CIBSE, 2000. "Code of practice for the minimisation of refrigerant emissions from refrigerating systems, Institute of Refrigeration", Institute of Refrigeration, 1995. "Thermal Guidelines for Data Processing Environments", ASHRAE, 2004. BS EN378-1:2000 "Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Basic requirements, definitions, classification and selection criteria", BSI, 2000. Institute of Refrigeration: [www.ior.org.uk](http://www.ior.org.uk); F-gas regulations: <http://www.defra.gov.uk/environment/climatechange/uk/fgas/pdf/fluorgasreg-guidance.pdf>
30. "Code of practice for the minimisation of refrigerant emissions from refrigerating systems", Institute of Refrigeration, 1995. Guidance Note 01 – "New CFC's, HCFC's, HFC's and halons, Professional and practical guidance on substances that deplete the ozone layer", CIBSE, 2000. GPG 178 "Cutting the Cost of Refrigerant Leakage", Carbon Trust, 1997. BSEN 378 1-4 "Refrigerating Systems and Heat Pumps – Safety and Environmental Requirement, British Standards Institution"; British Standards Institute, 2000.

## B APPENDIX: PROJECT CHECKLIST

PROJECT CHECKLIST:						
Item Nos	Checklist Item for Action	KPI Reference	BREEAM Reference	Completed Date dd/mm/yyyy	Comments / Further Actions	Programme Completion Date dd/mm/yyyy
1.	Site contamination survey	0.10.5	Man 5, 6 / LE2			
2.	Ecology survey report /recommendations	17.00.4	Man 5, 6			
3.	Arboricultural survey / report	0.10.5				
4.	Flood risk assessment	0.10.5	Pol 5			
5.	Deleterious materials survey report	0.10.5				
6.	Site Waste Management Plan commissioned/measurement of approximate waste commenced at RIBA B/C	0.05.1 /0.10.2 / 3.0	Man 2 / Wst 1			
7.	Sustainability consultant					
8.	Commissioning engineer appointed	0.10.1	Man 1			
9.	Acoustician commissioned	0.10.2	HEA 13,14/Pol 5			
10.	BREEAM assessor appointed	0.10.2				
11.	Arrange BREEAM Pre-Assessment Workshop for development team	0.10.2	NA			
12.	Refer to BRE Green Guide for materials specification	5.01,5,6,7	Mat 1 - 7			
13.	Early appointment of Bldg Services Engineer to undertake preliminary thermal model/CO <sub>2</sub> emission reductions	0.10.2				
14.	Preparation of simple building users guide & consult with stakeholders	0.10.4	Man 4			

# APPENDIX C

ICL Pre-assessment Checklist:								This
checklist is based upon the BREEAM Education criteria intended for use in the early stages of a project to establish design team targets and aide determining project budgets. It will not provide a definitive BREEAM score and should not be used for such.								checklist
Ref	Title	Applicable √	Credits Ava	Score weighting	Site/Bldg	(Start here) Pre-ass score	(insert probable score here) Ultimate Predicted Score	(insert unachievable score here) Scores Not Possible
<b>Management</b>								
Man1	Commissioning		2	1.20%	Site	0	0	0
Man2	Considerate Constructors		2	1.20%	Site	0	0	0
Man3	Construction Site Impacts		4	2.40%	Site	0	0	0
Man4	Building User Guide		1	0.60%	Building	0	0	0
Man5	Site Investigation		0	0.00%	Site	0	0	0
Man6	Consultation		2	1.20%	Site	0	0	0
Man7	Shared Facilities		0	0.00%	Site	0	0	0
Man8	Security		1	0.60%	Site	0	0	0
Man9	Publication of Building Information		1	0.60%	Building	0	0	0
Man10	Development as a learning resource		0	0.00%	Building	0	0	0
Man11	Ease of Maintenance		0	0.00%	Building	0	0	0
Man12	Life Cycle Costing		2	1.20%	Building	0	0	0
Man13	Good Corporate Citizen		0	0.60%	Building	0	0	0
<i>Total Credits Available</i>			15	9.60%				
<i>Credits Achieved</i>						0	0	0
<i>% Achieved</i>						0.00%	0.00%	0.00%
<i>Section Weighting</i>			9.60%			0.00%	0.00%	0.00%
<b>Health and Wellbeing</b>								
Hea1	Daylighting		1	0.94%	Building	0	0	0
Hea2	View Out		1	0.94%	Building	0	0	0
Hea3	Glare Control		1	0.94%	Building	0	0	0
Hea4	High Frequency Lighting		1	0.94%	Building	0	0	0
Hea5	Internal & External Lighting Levels		1	0.94%	Building	0	0	0
Hea6	Lighting Zones & Control		1	0.94%	Building	0	0	0
Hea7	Potential for Natural Ventilation		1	0.94%	Building	0	0	0
Hea8	Indoor Air Quality		1	0.94%	Building	0	0	0
Hea9	Volatile Organic Compounds		2	1.88%	Building	0	0	0
Hea10	Thermal Comfort		1	0.94%	Building	0	0	0
Hea11	Thermal Zoning		1	0.94%	Building	0	0	0
Hea12	Microbial Contamination		0	0.00%	Building	0	0	0
Hea13	Acoustic Performance - Internal Noise Levels		2	1.88%	Building	0	0	0
Hea14	Acoustic Performance - Reverberation Times/Offices Spaces		0	0.00%	Building	0	0	0
Hea15	Outdoor spaces		1	0.94%				
Hea16	Drinking Water		0	0.00%	Building	0	0	0
Hea 17	Specification of Laboratory Fume Cupboards		1	0.94%	Building	0	0	0
Hea 18	Containment Level 2 & 3 Laboratory Areas		3	2.82%	Building	0	0	0
Hea 19	Arts in Health		0	0.00%	Building	0	0	0
<i>Total Credits Available</i>			19	17.9%				
<i>Credits Achieved</i>						0	0	0
<i>% Achieved</i>						0.00%	0.00%	0.00%
<i>Section Weighting</i>			17.9%			0.00%	0.00%	0.00%
<b>Energy</b>								
Ene1	Reduction of CO <sub>2</sub> Emissions		15	11.40%	Site	0	0	0
Ene2	Sub Metering of Substantial Energy Uses		1	0.76%	Building	0	0	0
Ene3	Sub Metering of Areas / Tenancy		1	0.76%	Building	0	0	0
Ene4	External Lighting		1	0.76%	Site	0	0	0
Ene5	Low or zero Carbon Technologies		3	2.28%	Building	0	0	0
Ene6	Building fabric performance & avoidance of air		1	0.76%	Building	0	0	0
Ene7	Cold Storage Equipment		3	2.28%	Building	0	0	0
Ene 8	Lifts		2	1.52%	Building	0	0	0
Ene 9	Escalators & travelling walkways		1	0.76%	Building	0	0	0
Ene10	Free Cooling		0	0.00%	Building	0	0	0
Ene11	Energy Efficient Fume Cupboards		1	0.76%	Building	0	0	0
Ene12	Swimming pool ventilation and heat loss		1	0.76%	Building	0	0	0
Ene13	Labelled lighting controls		0	0.00%	Building	0	0	0
Ene14	BMS		0	0.00%	Building	0	0	0
Ene15	Provision of Energy Efficient Equipment		1	0.76%	Building	0	0	0
Ene16	CHP Community Energy		0	0.00%	Building	0	0	0
Ene17	Multi-residential areas energy consumption		0	0.00%	Building	0	0	0
<i>Total Credits Available</i>			31	23.6%				
<i>Credits Achieved</i>						0	0	0
<i>% Achieved</i>						0.00%	0.00%	0.00%
<i>Section Weighting</i>			23.6%			0.00%	0.00%	0.00%

	<b>Transport</b>							
Tra1	Provision of Public Transport		5	2.86%	Building	0	0	0
Tra2	Proximity to Key Amenities		1	0.57%	Site	0	0	0
Tra3	Cyclist Facilities		2	1.14%	Site	0	0	0
Tra4	Pedestrian & Cyclist Safety		2	1.14%	Site	0	0	0
Tra5	Travel Plan		1	0.57%	Site	0	0	0
Tra6	Maximum Car Parking Capacity		2	1.14%	Building	0	0	0
Tra7	Travel Information Point		1	0.57%	Building	0	0	0
Tra8	Deliveries and Manouvering		1	0.57%	Site	0	0	0
	<i>Total Credits Available</i>		15	8.57%				
	<i>Credits Achieved</i>					0	0	0
	<i>% Achieved</i>					0.00%	0.00%	0.00%
	<i>Section Weighting</i>		8.57%					
	<b>Water</b>							
Wat1	Water Consumption		3	2.25%	Building	0	0	0
Wat2	Water Meter		1	0.75%	Building	0	0	0
Wat3	Major Leak Detection		1	0.75%	Building	0	0	0
Wat4	Sanitary Supply Shut Off		1	0.75%	Building	0	0	0
Wat5	Water Recycling		1	0.75%	Building	0	0	0
Wat5	Irrigation Systems			0.75%	site	0	0	0
Wat6	Vehicle Wash		1	0.75%	Site	0	0	0
	<i>Total Credits Available</i>		8	6.75%				
	<i>Credits Achieved</i>					0	0	0
	<i>% Achieved</i>					0.00%	0.00%	0.00%
	<i>Section Weighting</i>		6.75%					
	<b>Materials</b>							
Mat1	Materials Specification - Major Building Elements		6	5.00%	Building	0	0	0
Mat2	Hard Landscaping & Boundary Protection		1	0.83%	Site	0	0	0
Mat3	Reuse of Building Façade		1	0.83%	Site	0	0	0
Mat4	Reuse of Building Structure		1	0.83%	Site	0	0	0
Mat5	Responsible Sourcing of Materials		3	2.50%	Building	0	0	0
Mat6	Insulation		2	1.67%	Building	0	0	0
Mat7	Designing for Robustness		1	0.83%	Building	0	0	0
	<i>Total Credits Available</i>		15	12.50%				
	<i>Credits Achieved</i>					0	0	0
	<i>% Achieved</i>					0.00%	0.00%	0.00%
	<i>Section Weighting</i>		12.50%					
	<b>Waste</b>							
Wst1	Construction Site Waste Management		4	5.00%	Site	0	0	0
Wst2	Recycled Aggregates		1	1.25%	Building	0	0	0
Wst3	Storage of Recyclable Waste		1	1.25%	Site	0	0	0
Wst4	Compactor / Baler		1	1.25%	Site	0	0	1
Wst5	Composting		1	1.25%	Building	0	0	0
Wst6	Floor Finishes		0	0.00%	Building	0	0	0
	<i>Total Credits Available</i>		8	10.00%				
	<i>Credits Achieved</i>					0	0	0
	<i>% Achieved</i>					0.00%	0.00%	0.00%
	<i>Section Weighting</i>		10.00%					
	<b>Land-Use and Ecology</b>							
LE1	Reuse of Land		1	1.00%	Building	0	0	0
LE2	Contaminated Land		1	1.00%	Site	0	0	0
LE3	Ecological Value of Land & Protection of Ecological Features		1	1.00%	Site	0	0	0
LE4	Mitigating Ecological Impact		2	2.00%	Site	0	0	0
LE5	Enhancing Site Ecology		3	3.00%	Site	0	0	0
LE6	Long Term Impact on Biodiversity		2	2.00%	Site	0	0	0
LE7	Consultati on with Students and Staff		0	0.00%	Site	0	0	0
LE8	Local Wildlife Partnerships		0	0.00%	Site	0	0	0
	<i>Total Credits Available</i>		10	10.00%				
	<i>Credits Achieved</i>					0	0	0
	<i>% Achieved</i>					0.00%	0.00%	0.00%
	<i>Section Weighting</i>		10.00%					
	<b>Pollution</b>							
Pol1	Refrigerant GWP - Building Services		1	0.91%	Building	0	0	0
Pol2	Preventing Refrigerant Leaks		2	1.82%	Building	0	0	0
Pol3	Refrigerant GWP - Cold Storage		1	0.91%		0	0	0
Pol4	Nox Emissions of Heating Source		3	2.73%	Building	0	0	0
Pol5	Flood Risk		3	2.73%	Site	0	0	0
Pol6	Minimising Watercourse Pollution		1	0.91%	Site	0	0	0
Pol7	Reduction of Night Time Light Pollution		1	0.91%	Building	0	0	0
Pol8	Noise Attenuation		1	0.91%	Building	0	0	0
	<i>Total Credits Available</i>		13	11.83%				
	<i>Credits Achieved</i>					0	0	0
	<i>% Achieved</i>					0.00%	0.00%	0.00%
	<i>Section Weighting</i>		11.83%					
<b>Total Credits Achieved / Not achieved / To Be Achieved</b>						0	0	0
<b>Average Weighting All Sections</b>						0.00%	0.00%	0.00%



Overall Credit Allocation	Env Weighting			Now	TODAY	Not Possible
Management	12.00%			0.00%	0.00%	0.00%
Health & Wellbeing	15.00%			0.00%	0.00%	0.00%
Energy	19.00%			0.00%	0.00%	0.00%
Transport	8.00%			0.00%	0.00%	0.00%
Water	6.00%			0.00%	0.00%	0.00%
Materials	12.50%			0.00%	0.00%	0.00%
Waste	7.50%			0.00%	0.00%	0.00%
Land Use & Ecology	10.00%			0.00%	0.00%	0.00%
Pollution	10.00%			0.00%	0.00%	0.00%
	<b>100.00%</b>			<b>0.00%</b>	<b>0.00%</b>	<b>0.00%</b>

## D APPENDIX:

### Clarification on calculating NOx Data:

1. Highly insulated building - where the heating load for a highly insulated/exemplar environmental building is less than or equal to 7% of the heat load for a Building Regulations-compliant building of the same size and type, figures used for calculating the percentage of total heat demand must be based on the output from an *approved energy modelling software*.
2. NOx data provided in different units - where data is provided in different units, or at a level of excess oxygen greater than zero, the manufacturer/supplier should be asked to convert this to comply with the requirements of this specification.
3. Grid electricity - building's with space heating fuelled by electricity from the National Grid, however small the incidence is on the overall consumption, will not achieve the NOx output range specified as power stations emit NOx at an average rate of approximately 1200 mg/kWh. This figure is a UK average and therefore also applies to areas with a higher proportion of renewable sources like Scotland.
4. Electricity from a renewable source - where electricity used by the heating system is sourced from a zero emission renewable source such as PVs, wind etc, there are no resulting emissions. This source of heating can therefore be counted as having zero NOx emissions.
5. Heat pumps - heat pumps powered by grid electricity indirectly produce emission rates higher than those required by BREEAM and are therefore typically unable to meet the design criteria. However, the energy saved by using certain types of heat pumps is recognised in thermal modelling process.
6. District heating
7. - district heating systems that incinerate waste usually have high NOx emission rates, these will require careful design considerations in the early stages.
8. Heat recovery - heat recovery can be considered as having zero NOx emissions for the purpose of this credit.
9. Combined Heat & Power – CHP will also require careful design consideration to ascertain the NOx emission levels from CHP. See below.

10. Biomass - biomass systems are recognised as low carbon systems, however they can produce a significant amount of NOX and so may not achieve this the specified criteria; biomass systems are recognised as reducing the impact of fossil fuel depletion by employing a renewable combustion fuel source.
11. More than one heating system – where more than one heating source is employed on a project the NOx emission levels will require careful modelling.
12. Green Tariff Commitments - the use of a green tariff to supply electricity to heat the building or power heat pumps are not recognised as complying with the requirements of this specification due to the uncertainty that this electricity will be zero emission.
13. Additional Information & Relevant definitions:
  - Approved energy modelling software - . Should be a methodology approved by NCM
  - NOx reacts with heat and sunlight to produce ozone that can cause serious respiratory problems. It also reacts with water to produce acid rain which has a detrimental effect on ecosystems.
  - Dry NOx Levels: the NOx emissions (mg/kWh) resulting from the combustion of a fuel at 0% excess oxygen levels.
  - Calculating NOx emission levels from Combined Heat & Power (CHP) systems; where CHP systems are present or specified, only the heat-related emissions are considered for this credit.
  - The NOx emissions are allocated to heat and electricity in line with the respective power outputs. This is done using a NOx emission rate for the electrical output equivalent to the current rate for grid electricity, and allocating the remaining NOx to the heat output. Only the heat-related component is then compared with the credit scale. The following formula should be used to determine this:

$$X = (A - B) / C$$

Where:

X = NOx emissions per unit of heat supplied (mg/kWh heat)

A = NO<sub>x</sub> emissions per unit of electricity generated (mg/kWh elec) i.e. the NO<sub>x</sub> emitted

by the CHP system per unit of electricity generated. This figure should be obtained from the installer/supplier of the system.

B = NO<sub>x</sub> emissions per unit of electricity supplied from the grid (mg/kWh elec) this should be assumed to be 1200mg/kWh elec

C = Heat to Electricity Ratio of the CHP scheme.

The above methodology determines the net NO<sub>x</sub> emissions from CHP-generated electricity compared with central generation of electricity and allocates this amount to the heat production. Where X is calculated to be negative, it should be assumed to be zero. Where heat is provided by more than one system, an average NO<sub>x</sub> emission rate should be used based on the ratio of power outputs from each source, i.e. multiply the emissions of each boiler by the percentage of heat demand it supplies and total these values. This is likely to be the case where a CHP system has been sized on the base power demand rather than the heat demand and therefore a secondary heating system is required. The following formula can be used:

$$\text{Average NO}_x \text{ Emission Rate} = (N_1 \times (H_1/H_T)) + (N_2 \times (H_2/H_T)) \dots + (N_n \times (H_n/H_T))$$

Where:

N<sub>1</sub> = NO<sub>x</sub> emissions rate for source 1

N<sub>2</sub> = NO<sub>x</sub> emissions rate for source 2

N<sub>n</sub> = NO<sub>x</sub> emissions rate for source n

H<sub>T</sub> = Total heat output from all sources

H<sub>1</sub> = Heat output from source 1

H<sub>2</sub> = Heat output from source 2

H<sub>n</sub> = Heat output from source n

Conversion factors

Manufacturers should be asked to supply dry NO<sub>x</sub> emissions data in mg/kWh. Where this is not possible the assessor may use the following conversion factors to convert figures in ppm, mg/MJ, mg/m<sup>3</sup> or wet NO<sub>x</sub>. It should be noted that these conversion factors assume worst case efficiencies and are likely to give conservative answers. This could have the effect of lowering the number of credits achieved.

- Figures in mg/m<sup>3</sup> should be multiplied by 0.857 in order to gain emissions in mg/kWh.
- A conversion may also be necessary for data not calculated at 0% excess oxygen (see below).
- Figures in mg/MJ should be divided by 3.6 in order to show emissions in mg/kWh (1 kWh = 3.6 MJ). A conversion may also be necessary for data not calculated at 0% excess oxygen (below).
- This specification is based on *dry NO<sub>x</sub>* values – almost all manufacturers will quote emissions in *dry NO<sub>x</sub>*. However if wet NO<sub>x</sub> figures are supplied, these should be converted to *dry NO<sub>x</sub>*. This can be done by multiplying the wet NO<sub>x</sub> figure by 1.75.

**Excess Oxygen Correction:** If a NO<sub>x</sub> emission rate is quoted by the manufacturer in mg/m<sup>3</sup> or ppm, then it should be established at what % excess oxygen this emission was measured. The greater the amount of excess oxygen in the flue gases at the time of measurement, the more “diluted” the NO<sub>x</sub>. It is therefore important to convert any emission rate back to 0% excess oxygen, the most frequently used rates supplied by manufacturers:

<b>% Excess O<sub>2</sub></b>	<b>Conversion (c)</b>
3 %	x 1.17
6%	x 1.40
15%	x 3.54

Conversion factor  $c = 20.9/(20.9 - x)$

Where  $x =$  % excess O<sub>2</sub> (NOT excess air) and 20.9 is the percentage of O<sub>2</sub> in the air.

## E APPENDIX – GLOSSARY OF TERMS

BRE - BUILDING RESEARCH ESTABLISHMENT

BREEAM - BUILDING RESEARCH ESTABLISHMENT ENVIRONMENTAL ASSESSMENT METHOD

SEDBUK - SEASONAL EFFICIENCY OF DOMESTIC BOILERS IN THE UK

SBEM - SIMPLIFIED BUILDING ENERGY MODEL IS A GOVERNMENT-DEFINED PROCESS IN ACCORDANCE WITH PART L BUILDING CONTROL REGULATIONS. IT IS A CALCULATION OF THE ENERGY PERFORMANCE OF NEW COMMERCIAL/ INDUSTRIAL/RETAIL BUILDINGS.

SDEA – STAFF AND EDUCATION DEVELOPMENT ASSOCIATION

GREEN GUIDE - BUILDING RESEARCH ESTABLISHMENT GREEN SPECIFICATION

EER - ENERGY EFFICIENCY RATIO.

CEPT - THE CENTRAL POINT OF EXPERTISE ON TIMBER PROCUREMENT

EPC - ENERGY PERFORMANCE CERTIFICATE (AN ASSESSMENT OF ENERGY EFFICIENCY)

DEC – DISPLAY ENERGY CERTIFICATE (DISPLAYS ACTUAL ENERGY USE)

BERR - DEPARTMENT FOR BUSINESS ENTERPRISE & REGULATORY REFORM

DECC - DEPARTMENT OF ENERGY AND CLIMATE CHANGE

NAC - NATION CALCULATION METHOD (SBEM)

NESTA - NATIONAL ENDOWMENT FOR SCIENCE, TECHNOLOGY AND ARTS

SOGGY - Sustainable Operations on the government Estate (Office of Government & Commence)

LCBP – LOW CARBON BUILDINGS PROGRAMME.