



RUGBY FOOTBALL UNION

BREEAM Pre-Assessment

Twickenham Stadium – East Stand Extension

Aug 2016





Date: 03/08/2016
Issue: Rev E
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MAINERASSOCIATES

BREEAM Pre-Assessment Report: Twickenham Stadium: East Stand Extension

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EXECUTIVE SUMMARY

Pre-Assessments have been completed for the Twickenham Stadium East Stand Extension in London. The Stadium will be assessed under the 2014 New Construction and 2014 Refurbishment and Fit-Out scheme, covering the appropriate areas of the new development. A BREEAM Very Good can be achieved on the development.

The table below indicates what actions are required and when with regard to additional studies. It is important that these items are completed at an early stage in order to ensure credits are achieved.

RIBA Stage Information							
RIBA Stage	1	2	3	4	5	6	7
	Preparation & Brief	Concept Design	Developed Design	Technical Design	Construction	Handover	In-use
BREEAM Stage	Pre-Assessment	Pre-Assessment & Design Stage	Design Stage	Design Stage	Design Stage & Post Construction Stage	Post Construction Stage	Post Construction Stage & BREEAM In-Use
Ecology	LE - Ecologist Appointment	LE - Ecologist Report					
Consultation		Man 01 - Consultation (Project Delivery & Third Party)		Man 01 - Consultation Feedback			
Sustainability Champion		Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion
Security		Hea 06 - Security Study					
LZCs & Passive Design		Ene 04 - Passive Design Analysis & LZC Study					
Adaption to Climate Change		Wst 05 - Adaption to Climate Change Study					
Functional Adaptability		Wst 06 - Functional Adaptability Study		Wst 06 - Functional Adaptation measures included within the design			
Travel Plan		Tra 05 - Transport Assessment & Travel Plan	Tra 05 - Transport Assessment & Travel Plan				
Material Efficiency	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life		

1.0 INTRODUCTION

Mainer Associates have been appointed by the RFU to undertake the BREEAM Pre-Assessment of the proposed Twickenham Stadium East Stand Extension in London.

The development is to include the expansion of the Twickenham RFU Stadium which will comprise six stories, increasing the hospitality offering at the ground.

During Design- and Post-Construction Stage the Twickenham development could be assessed using the Bespoke version of BREEAM where the whole building could be assessed as one, or the building could be split in two covering new build and refurbishment elements separately. At this stage we are assessing the development under two separate assessments.

The BREEAM Pre-Assessment for the Twickenham Stadium, therefore, has been completed separating the assessment into a New Built and Refurbished area. This was accomplished using BREEAM 2014 New Construction and BREEAM Refurbishment schemes. We explored the building's potential to achieve both a BREEAM Very Good as well as a BREEAM Excellent rating under both versions.

The New Built area was assessed as a Retail building type, sub-category 'restaurant', and it was assumed that the Refurbished area will go through full refurbishment. The BREEAM Refurbishment and Fit-Out scheme is divided into 4 parts: Fabric and Structure, Core Services, Local Services and Interior Design. This is a modular framework that allows the project team to only focus on areas that will be refurbished. We have set up our Pre-Assessment including all 4 parts.

2.0 BREEAM 2014

BREEAM New Construction scheme can be used to assess and rate the environmental impacts arising from a newly constructed building development (including external site areas), and its ongoing operation, at the following life cycle stages:

- Design Stage (DS) - leading to an Interim BREEAM certified rating
- Post-Construction Stage (PCS) – leading to a Final BREEAM certified rating

The DS assessment and interim certified BREEAM rating confirms the building's performance at the design stage of the life cycle. Assessment and certification will ideally occur prior to the beginning of operations on site. The certified BREEAM rating at this stage is labelled as 'interim' because it does not represent the building's final, new construction BREEAM performance.

To complete an assessment at this stage the design must be advanced to a point where the relevant design information is available to enable the BREEAM Assessor to evaluate and verify the building's performance against the criteria defined in this scheme document. The interim DS assessment will therefore be completed and certified at the scheme design or detailed design stages.

The PCS assessment and BREEAM rating confirms the final 'as-built' performance of the building at the new construction stage of the life cycle. A final PCS assessment is completed and certified after practical completion of the building works.

There are two approaches to assessment at the post-construction stage:

- A post-construction review of an interim design-stage assessment
- A post-construction assessment

A post-construction review serves to confirm that the building's 'as built' performance and rating is in accordance with that certified at the interim design stage. Where an interim DS assessment has not been carried out i.e. certified, and a BREEAM assessment and rating is required, a full post construction stage assessment can be conducted.

The BREEAM rating benchmarks for new construction projects assessed using the 2014 version of BREEAM are as follows:

BREEAM Rating	% score
OUTSTANDING	≥ 85
EXCELLENT	≥ 70
VERY GOOD	≥ 55
GOOD	≥ 45
PASS	≥ 30
UNCLASSIFIED	< 30

3.0 EVIDENCE REQUIREMENTS

Evidence should not necessarily need to be prepared specifically for the purpose of the BREEAM assessment. In many instances, the assessor should be able to source readily available and prepared project information for the purpose of demonstrating compliance. For this reason, BREEAM aims to avoid being prescriptive on the type of evidence required, although some issues do require specific documents to be provided.

The assessor and project team will find that many assessment issues require more than one piece or type of information to demonstrate compliance with one criterion, or alternatively, one piece of information may be sufficient to demonstrate compliance with multiple criteria.

To assist project teams and the BREEAM assessor in their collation of building information at each stage of assessment, the different types of documentation that can be used as evidence of compliance are listed below.

These evidence types fall broadly into three categories:

1. General evidence type;
2. Specific evidence type;
3. Other evidence type.

For some assessment issues, the assessor is likely to require a mixture of general and specific evidence types.

General evidence includes a broad list of defined building information commonly produced for a building project. One or a mix of these types of building information can be used to demonstrate compliance for one or more of the BREEAM issues and criteria, as deemed appropriate by the BREEAM assessor for the stage of assessment.

General BREEAM evidence types are listed in Table - 9, and are not specifically listed in the 'Evidence' section found within each BREEAM issue. Note, not all general evidence types will be appropriate for all issues and it is the responsibility of the assessor to ensure that the evidence provided specifically demonstrates compliance and is fully referenced in the Assessment reporting tool.

Specific evidence is defined building information that must be provided to verify compliance with the relevant criteria for the BREEAM credit sought. In all cases it will be the only type of evidence that will be accepted by BRE Global Ltd for that particular issue/criteria. Where specific evidence is not provided and appropriately referenced in the assessment report, the Quality Assurance checks will identify non-conformity and certification will be delayed. An example of specific evidence would be a copy of the building regulations output document from the approved software for BREEAM issue Ene 01, and this is listed in the evidence table for this issue.

When required, specific evidence is defined and listed for each BREEAM issue in the 'Evidence' section for both final and interim stages of assessment. Although the 'Evidence' section lists the specific evidence required to demonstrate compliance with particular criteria, simply submitting this evidence may not be sufficient to demonstrate full compliance. Additional 'general evidence types' may also be required. For example Mat 01; to demonstrate compliance with criteria 1-5 at the design stage, a copy of the Mat 01 Calculator tool is listed in

the 'Evidence' table. However, in addition to the Mat 01 tool, further evidence is required to demonstrate how the inputs for this tool have been determined, i.e. general evidence types such as building specifications or drawings etc., confirming the material specifications to be used. Note, not all BREEAM issues will have specific evidence requirements.

Other types of evidence can still be used to demonstrate compliance where an information type provided by a client/design team is not listed in Table - 9 or the 'Evidence' section for each issue. To avoid non-conformities and delays in certification, undefined alternative types of evidence must demonstrate credible, robust and traceable assurance to the same level as, or better than, specified or general evidence types. If in doubt, please contact BREEAM prior to accepting such evidence.

The tables below provide guidance on what the BRE accepts as evidence:

Ref	Document/evidence type	Description/notes
E1	As constructed information	Information produced at the end of a project to represent what has been constructed. This will comprise a mixture of 'as built' information/drawings and surveys from specialist subcontractors and the 'final construction issue' from design team members.
E2	Building information model (BIM)	The BIM (or BIM files) used for the project containing relevant information/evidence of compliance.
E3	BRE Global correspondence reference number	For example the reference number for a BRE Global response to an assessor's technical query.
E4	BREEAM assessor's site inspection report	A formal report based on the BREEAM assessor's own survey of the site/building to confirm compliance with BREEAM criteria. An assessor's site inspection report will be distinct from their formal BREEAM assessment report, serving as a form of evidence of compliance in its own right, and it may include photographs taken by the assessor as part of the survey.
E5	Building contract(s)	The building contract (or excerpts/clauses from it) between the client and the contractor for the construction of the project. In some instances, the building contract may contain design duties for specialist subcontractors and/or design team members.
E6	Certificates of compliance (third party)	Examples include ISO 14001, BES 6001, FSC (Forest Stewardship Council), EPC (environmental profile certificate), EPD (environmental product declaration), Considerate Constructors etc.
E7	Communication records	Formal communication records between/from relevant project stakeholders and/or other third parties confirming an appointment, action or outcome. This may be in the form of a letter, meeting minutes, email correspondence, publication or another form of media (see also additional guidance on following pages).

Ref	Document/evidence type	Description/notes
E8	Communication strategy	The strategy that sets out when the project team will meet, how they will communicate effectively and the protocols for issuing information between the various parties, both informally and at information exchanges.
E9	Computer aided modelling results/outputs	Examples include thermal modelling, flooding, life cycle assessment, life cycle costing, ventilation modelling etc.
E10	Construction specification	The specification for the project/building. ¹
E11	Construction stage data/information	For example, purchase orders, metering data, log books, commissioning records/reports etc.
E12	Contractual tree	A diagram that clarifies the contractual relationship between the client and the parties undertaking the roles required on a project.
E13	Cost information	Project costs, including the cost estimate and life cycle costs.
E14	Design drawings ²	Developed Design and Technical Design, including the coordinated architectural, structural and building services design. Site plans, drainage designs.
E15	Design programme	A programme setting out the strategic dates in relation to the design process. It is aligned with the Project Programme but is strategic in its nature, due to the iterative nature of the design process, particularly in the early stages.
E16	Design responsibility matrix	A matrix that sets out who is responsible for designing each aspect of the project and when. This document sets out the extent of any performance specified design.
E17	Feasibility study	Studies undertaken to test the feasibility of the Initial Project Brief for the site or in a specific context and to consider how site-wide issues will be addressed.
E18	Final project brief	The Initial Project Brief amended so that it is aligned with the Concept Design and any briefing decisions made during this stage.
E19	Other third party information	For example, maps, public transport timetables, product data/details, manufacturers' literature, government/EU standards or codes, EU labelling.
E20	Professional services contract	An agreement to provide professional or consulting services such as designing, feasibility studies, or legal or technical advice.

Ref	Document/evidence type	Description/notes
E21	Professional specialist reports	Professional reports resulting from specialist surveys/studies/test results, e.g. contaminated land, ecology, flood risk assessment, surface water run-off report, site investigation, acoustics, indoor air quality plan, low and zero carbon technologies study, transportation analysis, commissioning reports, passive design analysis report, free cooling analysis report, life cycle assessment, landscape and habitat management plan etc.
E22	Project Execution or Quality Plan	The Project Execution Plan is produced in collaboration with the project lead and lead designer, with contributions from other designers and members of the project team. The Project Execution Plan sets out the processes and protocols to be used to develop the design.
E23	Project programme	The overall period for the briefing, design, construction and post completion activities of a project.
E24	Project roles table	A table that sets out the roles required on a project as well as defining the stages during which those roles are required and the parties responsible for carrying out the roles.
E25	Project strategy	The strategies developed in parallel with the Concept Design to support the design and, in certain instances, to respond to the Final Project Brief as it is concluded. Examples include strategies for sustainability, acoustics, handover, maintenance and operational, fire engineering, building control, technology, health and safety, construction, travel plan, sustainable procurement plan.
E26	Risk assessment	The risk assessment considers the various design risks and other risks on a project and how each risk will be managed and the party responsible for managing each risk.
E27	Schedule of services	A list of specific services and tasks to be undertaken by a party involved in the project which is incorporated into their professional services contract.
E28	Strategic or initial project brief	The brief prepared following discussions with the client to ascertain the project objectives, the client's business case and, in certain instances, in response to site feasibility studies.

Written commitments at the interim stage of the assessment – Design Stage

At the interim design stage of assessment it is permissible to use letters or emails to demonstrate intent to comply with BREEAM criteria (provided they meet the requirements for communication records). Such evidence must also make clear the actions and evidence (or an understanding thereof) that will be undertaken and provided to ensure the project's ongoing compliance, particularly at the final stage of assessment, i.e. post construction. This is to ensure that the party who makes the commitment is clearly aware of the actions and evidence that needs to be supplied to demonstrate compliance with BREEAM at the final stage of assessment.

For example, in many circumstances it would not be acceptable for the design team to copy and paste the BREEAM criteria into a formal commitment. The commitment should specifically detail how criteria are to be achieved in the context of the assessment, and often copying and pasting the BREEAM criteria will not provide this detail.

While letters of commitment can play a role in demonstrating compliance, they are not a replacement for more formal and established types of project information. The assessor must not award credits where they have a reason to doubt the validity or intent of written commitments, or where it is not unreasonable to expect formal design or specification information to be available to confirm compliance.

Written commitments at the final stage of the assessment – Post Construction

As stated in the Scope section, there are two types of assessment that can be carried out at the post construction stage, a post construction review of a design stage assessment, or a post construction assessment (where no design stage assessment has been carried out). The 'Final post construction stage' column of the evidence table in each issue assumes that a design stage assessment has been completed. Where a design stage assessment has not been completed, the assessor will need to review both the 'Interim design stage' and 'Final post construction stage' evidence listed in the evidence table and ensure sufficient evidence is submitted with the assessment to demonstrate compliance with the criteria.

Evidence supplied at the post construction stage must be reflective of the completed building and must therefore demonstrate what has actually been implemented. For example, if sub-meters have been specified at the design stage, evidence at the post construction stage would need to demonstrate that these have actually been installed. Appropriate evidence may be a site inspection report with supporting photographs or as built drawings showing the location of the sub-meters.

Letters of commitment cannot be used to demonstrate compliance at the final, post construction stage of assessment. The only exception to this is where the criteria require an action to take place post construction, i.e. after handover and possibly during the building operation. An example could be a written commitment from the building owner/occupier making a commitment to conduct post occupancy evaluation. As with written commitments at the design stage, the BREEAM assessor must not award BREEAM credits where they have a reason to doubt the validity or intent of written commitments or where it is not unreasonable to expect formal documentation, e.g. a schedule of services and/or professional services contract.

4.0 CREDIT SUMMARY – NEW BUILT

The following table demonstrates the number of credits available within the **BREEAM New Construction 2014 scheme**, and how many of those have been achieved during the Pre-Assessment stage. The table details credits achieved under a Very Good scenario.

Other than assumptions, we were able to identify areas where credits are likely to be achieved or lost:

- **Transport (Tra 01-05):** The Twickenham Stadium is located in the urban area of London. Having used an online tool designed to determine the Accessibility Index of sites in London, it is our current understanding the 3 credits could be achieved under Tra 01.

Considering the urban location of the development, it is also likely that amenities (food store, cash point, post box) will be available within the required distance (normally 500m).

- It is our current understanding that the site is likely to be in an area with Low Flood Risk. (**Pol 03 – Surface Water Run-Off**). This is demonstrated via the FRA produced as part of the application:

The following table details the credits that can be achieved at Pre-Assessment stage for the Twickenham Stadium East Stand extension:

	Available	Achieved	
Management			
Man 01 - Project brief and design	4	4	
Man 02 - Life cycle cost and service life planning	4	1	LCA too late and too costly. To maximise the benefit of this exercise, this should have already been undertaken. To include this now would mean a re-evaluation of the entire scheme as the LCA exercise is being completed.
Man 03 - Responsible construction practices	6	6	
Man 04 - Commissioning and handover	4	3	Thermographic survey too risky at this stage. Due to the nature of the interconnected spaces, both new build and refurbished, there are many instances where air leakage paths could arise. We are committing to air-leakage testing but the awarding of the Thermographic survey credit is based on the implementation of works following the testing which could also be cost prohibitive.
Man 05 - Aftercare	3	3	
Management Totals:	21	17	
Health and Well-being			
Hea 01 - Visual Comfort	5	2	At this stage daylighting and view out criteria unlikely to be met due to the nature of the space and the deep floor plates required.
Hea 02 - Indoor Air Quality	5	2	The nature of the spaces involved mean that natural ventilation is not possible. Additionally, intakes and extracts, while meeting Building Regulations, are unlikely to meet the criteria outlined in BREEAM.
Hea 04 - Thermal comfort	3	3	
Hea 05 - Acoustic Performance	3	2	It is unlikely that the reverberation times associated with this credit will be achieved.
Hea 06 - Safety and Security	2	1	Site access too complex to achieve the safe access requirements. There will be some instances where deliveries will cross the cycling access to the cycle storage.
Health & Wellbeing Totals:	18	10	
Energy			

Ene 01 - Reduction of energy use and carbon emissions	12	6	With the enhanced U Values; the inclusion of the CHP and the PV, we are now achieving the mandatory minimum associated with Excellent.
Ene 02 - Energy Monitoring	2	2	
Ene 03 - External Lighting	1	1	
Ene 04 - Low carbon design	3	2	There is no free cooling built into the design proposals at present. This may be targeted at a later date once detailed design commences. ME Engineers are looking at potential options for achieving this.
Ene 05 - Energy Efficient Cold Storage	2	0	This issue is simply down to cost / benefit analysis. The cost of achieving this has been set between £60,000-£120,000.
Ene 06 - Energy Efficient Transportation Systems	3	3	
Ene 08 - Energy Efficient Equipment	2	0	Potential although 5% reduction may be impossible here, unregulated energy use is likely to be fairly low and a 5% reduction will be extremely difficult to achieve and prove. The RFU and the design team are looking at this to see if this can be picked up.
Energy Totals:	25	13	
Transport			
Tra 01 - Public Transport Accessibility	5	2	A proportion of the development is in PTAL 3 and PTAL 1b. We believe the BRE will accept the higher PTAL 3 confirmation but have reduced the credits to two until such time as this is confirmed.
Tra 02 - Proximity to amenities	1	1	
Tra 03 - Cyclist facilities	2	0	The number and type of cycle storage spaces is too great for this to be feasible.
Tra 05 - Travel Plan	1	1	
Transport Totals:	9	5	
Water			
Wat 01 - Water Consumption	5	3	The design team are looking at ways to push this further without being detrimental to public hygiene. Heavy use on peak days must be considered.
Wat 02 - Water Monitoring	1	1	
Wat 03 - Leak Detection	2	2	
Water Totals:	8	6	
Materials			
Mat 01 - Life Cycle Impacts	5	2	At this stage an assessment of the materials being used indicates 2 credits is likely although 3 may be achievable once the final calculations have been undertaken during the detailed design stages.
Mat 02 - Hard Landscaping and Boundary Protection	1	0	Impossible to confirm at this stage due to the availability of recycled aggregates at the time of construction.
Mat 03 - Responsible Sourcing of Materials	4	3	Impossible to confirm at this stage as this will be down to the procurement of materials at the time of construction. We have targeted an extra credit over where we initially scored the assessment. This requirement will be passed on to the contractor.
Mat 04 - Insulation	1	1	
Mat 05 - Designing for durability and resilience	1	1	
Mat 06 - Material efficiency	1	1	
Materials Totals:	13	8	
Waste			
Wst 01 - Construction Waste Management	4	3	Three credits here are already very onerous already.
Wst 02 - Recycled Aggregates	1	0	It is impossible to confirm at this stage whether recycled aggregates will be available at the time of construction. They also cannot, in most instances, be used in the amounts required for structural elements of multi-storey buildings.
Wst 03 - Operational Waste	1	1	

Wst 05 - Adaptation to climate change	1	0	The issue with this is timing. The exercise needed to have been done by Stage 2 and this is already complete.
Wst 06 - Functional adaptability	1	1	
Waste Totals:	8	5	
Land Use and Ecology			
LE 01 - Site Selection	2	1	There is no contamination on site, therefore, the second credit cannot be achieved.
LE 02 - Ecological Value of Site and Protection of Ecological Features	2	1	The site has been allocated as have 'low ecological value'.
LE 03 - Minimising impact on existing site ecology	2	2	It is assumed that there will '0' change in ecological value which results in two credits being awarded.
LE 04 - Enhancing site ecology	2	1	The recommendations from the ecologist will be implemented and there will be no negative change in ecological value.
LE 05 - Long Term Impact on Biodiversity	2	2	The contractor will be required to adhere to certain recommendations within the ecology report and assign a 'biodiversity champion'.
Land Use & Ecology Totals:	10	7	
Pollution			
Pol 01 - Impact of Refrigerants	3	0	Given there is wide use of refrigerants, this is unlikely to be achieved. We have asked the design team to review this. The potential to install leak detection is limited due to the re-use of existing plant.
Pol 02 - NOx emissions	3	1	
Pol 03 - Surface Water Run Off	5	2	This is based on the FRA.
Pol 04 - Reduction of Night Time Light Pollution	1	1	External lighting will be designed in line with ILP guidance meeting the credit requirements.
Pol 05 - Noise Attenuation	1	1	
Pollution Totals:	13	5	
Innovation			
Man 03 - Responsible construction practices	1	1	We have improved this since the first issue. We will include a requirement to achieve this in the contract prelims.
Man 05 - Aftercare	1	0	
Hea 01 - Visual Comfort	1	0	
Hea 02 - Indoor Air Quality	2	0	
Ene 01 - Reduction of energy use and carbon emissions	5	0	
Wat 01 - Water Consumption	1	0	
Mat 01 - Life Cycle Impacts	3	0	
Mat 03 - Responsible Sourcing of Materials	1	0	
Wst 01 - Construction Waste Management	1	0	
Wst 02 - Recycled Aggregates	1	0	
Wst 05 - Adaptation to climate change	1	0	
AI - Approved Innovation	1	0	
Innovation Totals:	19	1	
OVERALL SCORE TOTALS:		60.5%	
EXCELLENT RATING MANDATORY CREDITS			All achieved at the pre-assessment stage

The above information demonstrates that a Very Good rating (60.5%) can be achieved. Achieving an Excellent rating (70%) has been explored, however, at this stage it is deemed unachievable due to the reasons outlined above. We can also confirm that, at this stage, all the mandatory elements of an Excellent rating are targeted even though the overall score is not sufficient for this to be achieved.

5.0 CREDIT SUMMARY – REFURBISHMENT AND FIT-OUT

The following table demonstrates the number of credits available within the BREEAM Refurbishment and Fit-Out 2014 scheme, and how many of those have been achieved during the Pre-Assessment stage. The table below details credits achieved under a Very Good scenario.

Other than assumptions, we were able to identify areas where credits are likely to be achieved or lost:

- **Transport (Tra 01-05):** The Refurbished development is also located in the urban area of London. Having used an online tool designed to determine the Accessibility Index of sites in London it is our current understanding the 3 credits could be achieved under Tra 01.

Considering the urban location of the development, it is also likely that amenities (food store, cash point, post box) will be available within the required distance (generally 500m).

- It is our current understanding that the site is likely to be in an area with Low Flood Risk. (**PoI 03 – Surface Water Run-Off**). This is demonstrated via the FRA produced as part of the application:

The following table details the credits achieved at Pre-Assessment Stage for the Twickenham Stadium:

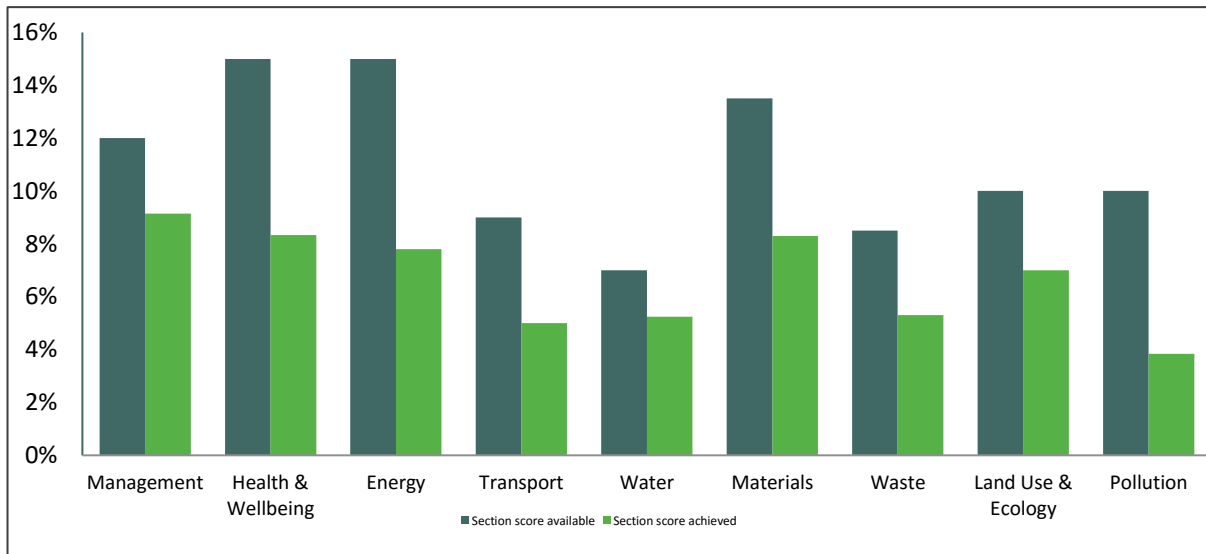
	Available	Target	
Management			
Man 01 - Project brief and design	4	4	
Man 02 - Life cycle cost and service life planning	4	1	LCA too late and too costly. To maximise the benefit of this exercise, this should have already been undertaken. To include this now would mean a re-evaluation of the entire scheme as the LCA exercise is being completed.
Man 03 - Responsible construction practices	7	7	
Man 04 - Commissioning and handover	4	3	Thermographic survey too risky at this stage. Due to the nature of the interconnected spaces, both new build and refurbished, there are many instances where air leakage paths could arise. We are committing to air-leakage testing but the awarding of the Thermographic survey credit is based on the implementation of works following the testing which could also be cost prohibitive.
Man 05 - Aftercare	3	3	
Management Totals:	21	18	
Health and Well-being			
Hea 01 - Visual Comfort	7	2	At this stage daylighting and view out criteria unlikely to be met due to the nature of the space and the deep floor plates required.
Hea 02 - Indoor Air Quality	5	2	The nature of the spaces involved mean that natural ventilation is not possible. Additionally, intakes and extracts, while meeting Building Regulations, are unlikely to meet the criteria outlined in BREEAM.
Hea 04 - Thermal comfort	3	3	
Hea 05 - Acoustic Performance	3	2	It is unlikely that the reverberation times associated with this credit will be achieved.
Hea 06 - Safety and Security	1	1	Site access too complex to achieve the safe access requirements. There will be some instances where

			deliveries will cross the cycling access to the cycle storage.
Health & Wellbeing Totals:	19	10	
Energy			
Ene 01 - Reduction of energy use and carbon emissions	15	6	With the enhanced U Values; the inclusion of the CHP and the PV, we are now achieving the mandatory minimum associated with Excellent.
Ene 02 - Energy Monitoring	2	2	
Ene 03 - External Lighting	1	1	
Ene 04 - Low carbon design	3	2	There is no free cooling built into the design proposals at present. This may be targeted at a later date once detailed design commences. ME Engineers are looking at potential options for achieving this.
Ene 06 - Energy Efficient Transportation Systems	3	3	
Ene 08 - Energy Efficient Equipment	2	0	Potential although 5% reduction may be impossible here, unregulated energy use is likely to be fairly low and a 5% reduction will be extremely difficult to achieve and prove. The RFU and the design team are looking at this to see if this can be picked up.
Energy Totals:	26	13	
Transport			
Tra 01 - Public Transport Accessibility	5	2	A proportion of the development is in PTAL 3 and PTAL 1b. We believe the BRE will accept the higher PTAL3 confirmation but have reduced the credits to two until such time as this is confirmed.
Tra 02 - Proximity to amenities	1	1	
Tra 03 - Cyclist facilities	2	0	The number and type of cycle storage spaces is too great for this to be feasible.
Tra 05 - Travel Plan	1	1	
Transport Totals:	9	5	
Water			
Wat 01 - Water Consumption	5	3	The design team are looking at ways to push this further without being detrimental to public hygiene. Heavy use on peak days must be considered.
Wat 02 - Water Monitoring	1	1	
Wat 03 - Leak Detection	2	2	
Wat 04 - Water Efficient Equipment	1	1	
Water Totals:	9	7	
Materials			
Mat 01 - Life Cycle Impacts	6	3	At this stage an assessment of the materials being used indicates 3 credits is likely.
Mat 03 - Responsible Sourcing of Materials	4	3	Impossible to confirm at this stage as this will be down to the procurement of materials at the time of construction. We have targeted an extra credit over where we initially scored the assessment. This requirement will be passed on to the contractor.
Mat 04 - Insulation	1	1	
Mat 05 - Designing for durability and resilience	1	1	
Mat 06 - Material efficiency	1	1	
Materials Totals:	13	8	
Waste			
Wst 01 - Construction Waste Management	7	5	Five credits here are already very onerous already.
Wst 02 - Recycled Aggregates	1	0	It is impossible to confirm at this stage whether recycled aggregates will be available at the time of construction. They also cannot, in most instances, be used in the amounts required for structural elements of multi-storey buildings.
Wst 03 - Operational Waste	1	1	
Wst 05 - Adaptation to climate change	1	0	The issue with this is timing. The exercise needed to have been done by Stage 2 and this is already complete.

Wst 06 - Functional adaptability	1	1	
Waste Totals:	11	7	
Land Use and Ecology			
LE 02 - Ecological Value of Site and Protection of Ecological Features	1	1	The site has been allocated as have 'low ecological value'.
LE 04 - Enhancing site ecology	1	1	It is assumed that there will '0' change in ecological value which results in two credits being awarded.
LE 05 - Long Term Impact on Biodiversity	2	2	The recommendations from the ecologist will be implemented and there will be no negative change in ecological value.
Land Use & Ecology Totals:	4	4	
Pollution			
Pol 01 - Impact of Refrigerants	3	0	Given there is wide use of refrigerants, this is unlikely to be achieved. We have asked the design team to review this. The potential to install leak detection is limited due to the re-use of existing plant.
Pol 02 - NOx emissions	3	1	
Pol 03 - Surface Water Run Off	5	4	This is based on the FRA.
Pol 04 - Reduction of Night Time Light Pollution	1	1	
Pol 05 - Noise Attenuation	1	1	
Pollution Totals:	13	8	
Innovation			
Man 03 - Responsible construction practices	1	1	
Man 05 - Aftercare	1	0	
Hea 01 - Visual Comfort	1	0	
Hea 02 - Indoor Air Quality	2	0	
Ene 01 - Reduction of energy use and carbon emissions	5	0	
Wat 01 - Water Consumption	1	0	
Mat 01 - Life Cycle Impacts	3	0	
Mat 03 - Responsible Sourcing of Materials	1	0	
Wst 01 - Construction Waste Management	1	0	
Wst 02 - Recycled Aggregates	1	0	
Wst 05 - Adaptation to climate change	1	0	
AI - Approved Innovation	1	0	
Innovation Totals:	19	0	
OVERALL SCORE TOTALS:		65.07%	

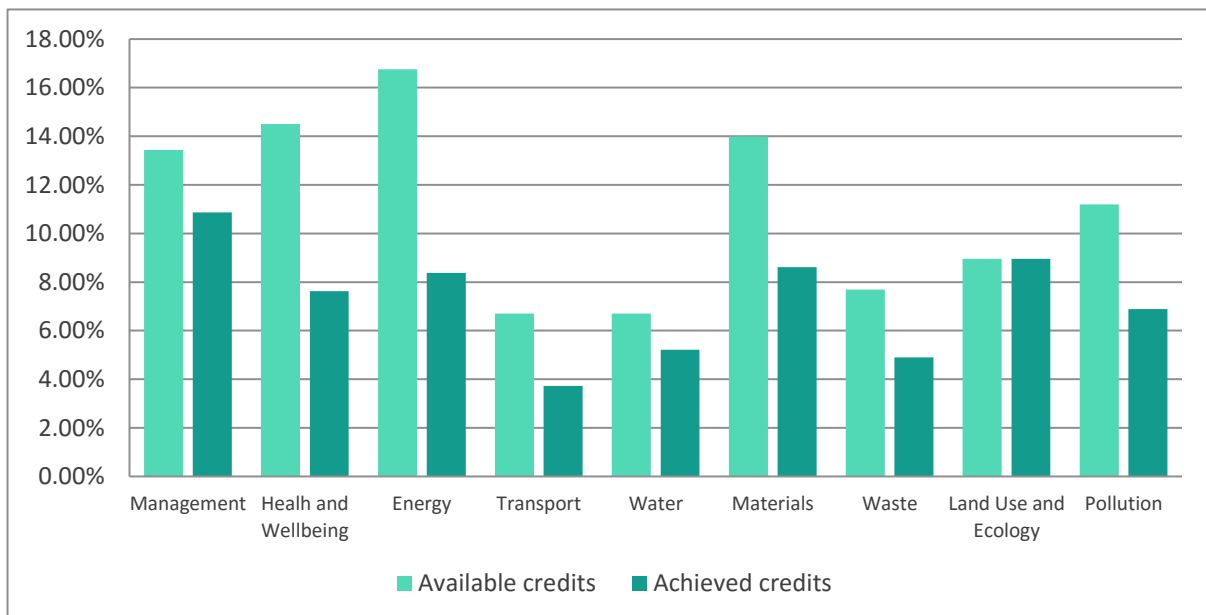
The above information demonstrates that a Very Good rating (65.07%) can be achieved. Again Excellent ratings have been deemed unachievable at this stage due to site constraints.

6.0 SUMMARY OF RESULTS



The graph above demonstrates the credits achieved for the New Built area of the Twickenham Stadium. The dark green bars represent the available score for each category, whereas the light green bars represent the score achieved at Pre-Assessment Stage. The total scores is:

- Very Good (left): 60.5%



The graph above demonstrate the credits achieved for the Refurbishment area of the Twickenham Stadium. The light green bars represent the available score for each category, whereas the dark green bars represent the score achieved at Pre-Assessment Stage. The total score is:

- Very Good: 65.07%

7.0 CONCLUSION

As outlined in this report, a BREEAM rating of Very Good can be achieved for the Twickenham Stadium development in London.

During Design and Post-Construction Stages the development could be assessed using BREEAM Bespoke version or as two separate assessments (New Build / Refurbishment), however, due to project timescales the Pre-Assessment was completed using BREEAM New Construction and BREEAM Refurbishment schemes, separating the New Built and Refurbished areas of the development.

- The New Built area achieved 60.5% and a Very Good rating.
- The Refurbished area achieved 65.07% and a Very Good rating.

In addition to the information above, we have provided a list of survey requirements in Appendix A, as well as a table demonstrating at what RIBA stage these surveys should be undertaken. These can be sent directly on to specialist organisation already working on the scheme to ensure that current work and future instructions incorporate the requirements of BREEAM. This will help avoid unnecessary additional costs later in the project programme.

APPENDIX A – SURVEY / REPORT REQUIREMENTS

The table below demonstrates when different surveys should be carried out:

RIBA Stage Information							
RIBA Stage	1	2	3	4	5	6	7
	Preparation & Brief	Concept Design	Developed Design	Technical Design	Construction	Handover	In-use
BREEAM Stage	Pre-Assessment	Pre-Assessment & Design Stage	Design Stage	Design Stage	Design Stage & Post Construction Stage	Post Construction Stage	Post Construction Stage & BREEAM In-Use
Ecology	LE - Ecologist Appointment	LE - Ecologist Report					
Consultation		Man 01 - Consultation (Project Delivery & Third Party)		Man 01 - Consultation Feedback			
Sustainability Champion		Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion	Man 01 - Sustainability Champion
Security		Hea 06 - Security Study					
LZCs & Passive Design		Ene 04 - Passive Design Analysis & LZC Study					
Adaption to Climate Change		Wst 05 - Adaption to Climate Change Study					
Functional Adaptability		Wst 06 - Functional Adaptability Study		Wst 06 - Functional Adaptation measures included within the design			
Travel Plan		Tra 05 - Transport Assessment & Travel Plan	Tra 05 - Transport Assessment & Travel Plan				
Material Efficiency	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life	Mat 06 - Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and end of life		

Management 01 – STAKEHOLDER PARTICIPATION

Not all the items here will need to be included at this stage as some elements will be undertaken during the detailed design stage.

1. Prior to completion of the Concept Design (RIBA Stage 2 or equivalent), the project delivery stakeholders (see definition below) have met to identify and define their roles, responsibilities and contributions for each of the key phases of project delivery.

Project delivery stakeholders are:

The purpose of criterion 1 is to reflect the need to consider the input of all the major project stakeholders from the earliest practical stage, to ensure smooth and successful delivery of the project's sustainability objectives. Project delivery stakeholders therefore include the client, the building occupier (where known), the design team and the principal contractor. With regards to contractors' involvement, it ensures their input in terms of formulating sustainable design solutions, commenting/inputting on the practicality and build ability of (one or more) design solutions and their impact on programming, cost etc.

BREEAM recognises that traditionally for some projects, the contractor for the works might not be appointed at the early stages of the project and therefore compliance with criterion 1 would not be possible. In these instances, to ensure the aim of the criteria is upheld, criterion 1 will be met provided that a suitably experienced person with substantial construction/contracting experience in projects similar to the proposed works is involved prior to appointment of the contractor. A suitably experienced person could be a contractor appointed as a consultant for this stage or a construction project manager.

2. In defining the roles and responsibilities for each key phase of the project, the following must be considered:

- a. End user requirements
- b. Aims of the design and design strategy
- c. Particular installation and construction requirements/limitations
- d. Occupiers' budget and technical expertise in maintaining any proposed systems
- e. Maintainability and adaptability of the proposals
- f. Requirements for the production of project and end user documentation
- g. Requirements for commissioning, training and aftercare support.

3. The project team demonstrate how the project delivery stakeholder contributions and the outcomes of the consultation process have influenced or changed the Initial Project Brief, including if appropriate, the Project Execution Plan, Communication Strategy, and the Concept Design.

3. The project team demonstrate how the project delivery stakeholder contributions and the outcomes of the consultation process have influenced or changed the Initial Project Brief, including if appropriate, the Project Execution Plan, Communication Strategy, and the Concept Design.

4. Prior to completion of the Concept Design stage, all relevant third party stakeholders have been consulted by the design team and this covers the minimum consultation content (see definition below).

The minimum consultation content of the consultation plan will be dependent on the building but would typically include the following:

1. Functionality, build quality and impact (including aesthetics).
2. Provision of appropriate internal and external facilities (for future building occupants and visitors/users).
3. Management and operational implications.
4. Maintenance resources implications.
5. Impacts on the local community, e.g. local traffic/transport impact.
6. Opportunities for shared use of facilities and infrastructure with the community/appropriate stakeholders, if relevant/appropriate to building type.
7. Compliance with statutory (national/local) consultation requirements.
8. Inclusive and accessible design.

In the case of educational building types, minimum content also includes:

<p>9. How the building/grounds could best be designed to facilitate learning and provide a range of social spaces appropriate to the needs of pupils, students and other users. In the case of building types containing technical areas or functions, e.g. laboratories, workshops etc., minimum content also includes:</p> <p>10. The end users broad requirements for such facilities, including appropriate sizing, optimisation and integration of equipment and systems.</p>
<p>5. The project must demonstrate how the stakeholder contributions and outcomes of the consultation exercise have influenced or changed the Initial Project Brief and Concept Design.</p>
<p>6. Prior to completion of the detailed design (RIBA Stage 4, Technical Design or equivalent), consultation feedback has been given to, and received by, all relevant parties.</p>

Management 01 – SUSTAINABILITY CHAMPION

<p>Man 01 – SUSTAINABILITY CHAMPION (DESIGN)</p>
<p>In order to achieve the first credit a Sustainability Champion is required to be appointed to facilitate the setting and achievement of BREEAM performance targets for the project. The design stage Sustainability Champion should be appointed to perform this role during the feasibility stage (Stage 1, Preparation and Brief stage, as defined by the RIBA Plan of Work 2013 or equivalent).</p>
<p>The defined BREEAM performance target(s) are required to be formally agreed (examples of formal agreements include a contract or letters of appointment with the architect and with other relevant project team members) between the client and design/project team no later than the Concept Design stage (RIBA Stage 2 or equivalent).</p>
<p>To achieve this credit at the interim design stage assessment, the agreed BREEAM performance target(s) must be demonstrably achieved by the project design. This must be demonstrated via the BREEAM assessor's design stage assessment report.</p>
<p>Man 01 – SUSTAINABILITY CHAMPION (MONITORING PROGRESS)</p>
<p>A Sustainability Champion is appointed to monitor progress against the agreed BREEAM performance target(s) throughout the design process and formally report progress to the client and design team.</p>
<p>In order to do this the Sustainability Champion must attend key project/design team meetings during the Concept Design, Developed Design and Technical Design stages, as defined by the RIBA Plan of Work 2013, reporting during, and prior to, completion of each stage, as a minimum.</p>

Health and Wellbeing 06 – SAFE ACCESS

In order to achieve the first credit, the following items are required to be implemented:

Where external site areas form part of the assessed development the following apply:

- Dedicated cycle paths provide direct access from the site entrance(s) to any cycle storage provided, without the need to deviate from the cycle path and, if relevant, connect to off-site cycle paths (or other appropriate safe route) where these run adjacent to the development's site boundary.
- Footpaths on-site provide direct access from the site entrance(s) to the building entrance(s) and connect to public footpaths off-site (where existing), providing practical and convenient access to local transport nodes and other off-site amenities (where existing).
- Where provided, drop-off areas are designed off/adjoining to the access road and provide direct access to pedestrian footpaths, therefore avoiding the need for the pedestrian to cross vehicle access routes.
- Dedicated pedestrian crossings are provided where pedestrian routes cross vehicle access routes, and appropriate traffic calming measures are in place to slow traffic down at these crossing points.
- For large developments with a high number of public users or visitors, pedestrian footpaths must be signposted to other local amenities and public transport nodes off-site (where existing).
- The lighting for access roads, pedestrian routes and cycle lanes is compliant with the external lighting criteria defined in Hea 01 Visual comfort, i.e. in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas.

Where vehicle delivery access and drop-off areas form part of the assessed development, the following apply:

- Delivery areas are not directly accessed through general parking areas and do not cross or share pedestrian and cyclist routes and other outside amenity areas accessible to building users and general public.
- There is a dedicated parking/waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking.
- Parking and turning areas are designed for simple manoeuvring according to the type of delivery vehicle likely to access the site, thus avoiding the need for repeated shunting.
- There is a dedicated space for the storage of refuse skips and pallets away from the delivery vehicle manoeuvring area and staff/visitor car parking (if appropriate given the building type/function).

Health and Wellbeing 06 – SECURITY OF SITE AND BUILDING

In order to achieve this credit a Suitably Qualified Security Specialist (SQSS) is required to conduct an evidence-based Security Needs Assessment (SNA) during or prior to Concept Design (RIBA Stage 2 or equivalent).

The project and site specific assessment of security needs (SNA) shall include:

1. A visual audit of the site and surroundings, identifying environmental cues and features pertinent to the security of the proposed development.
2. Formal consultation with relevant stakeholders, including the local Architectural Liaison Officer (ALO), Crime Prevention Design Advisor (CPDA) & Counter Terrorism Security Advisor (CTSA) (as applicable), in order to obtain a summary of crime and disorder issues in the immediate vicinity of the proposed development.
3. Identify risks specific to the proposed, likely or potential use of the building(s).
4. Identify risks specific to the proposed, likely or potential user groups of the building(s).
5. Identify any detrimental effects the development may have on the existing community.
6. The purpose of the assessment is to inform stakeholder decision-making and allow the identification and evaluation of security recommendations and solutions.

An individual achieving any of the following can be considered to be 'Suitably Qualified Security Specialist' for the purposes of compliance with BREEAM:

1. Crime Prevention Design Advisors (CPDA) or Architectural Liaison Officers (ALO), Counter Terrorism Security Advisor (CTSA); or
2. A specialist registered with a BREEAM-recognised third party accreditation scheme for security specialists.

3. A practising security consultant that meets the following requirements:
 - a. Minimum of three years relevant experience within the last five years. This experience must clearly demonstrate a practical understanding of factors affecting security in relation to construction and the built environment, relevant to the type and scale of the project being undertaken.
 - b. Hold a suitable qualification relevant to security.
 - c. Maintains (full) membership to a relevant professional body or accreditation scheme that meets the following:
 - i. Has a professional code of conduct, to which members must adhere; and
 - ii. Ongoing membership is subject to peer review.

When appointing the suitably qualified security specialist, consideration should be given to the appropriateness of the individual to carry out the security needs assessment, based on the size, scope and security needs of the development.

Organisations, associations or scheme operators who wish to have their membership recognised as a 'third party accreditation scheme for security specialist', should review their current status (and therefore their members) against the requirements above and, where they feel they are compliant, contact BRE Global with the relevant information/evidence.

The SQSS is required to develop a set of recommendations or solutions during or prior to Concept Design (RIBA Stage 2 or equivalent). These recommendations or solutions aim to ensure that the design of buildings, public and private car parks and public or amenity space are planned, designed and specified to address the issues identified in the preceding SNA.

The recommendations or solutions proposed by the SQSS are required to be implemented. Any deviation from those recommendations or solutions will need to be justified, documented and agreed in advance with a suitably qualified security specialist.

When confirming whether the recommendations or solutions set out by the suitably qualified security specialist(s) have been implemented at the post construction stage, it may be necessary for the assessor to use one or more of the following evidence types, supplied by the design team:

- Desk-based evidence e.g. manufacturer's literature/certificates etc.
- Site-based evidence e.g. site inspection report/photographs etc.

Energy 04 – PASSIVE DESIGN ANALYSIS

In order to achieve the Passive Design Analysis credit a compliant Thermal Comfort report must have been developed. The report is to demonstrate that the building design can deliver appropriate thermal comfort levels in occupied spaces.

The project team is required to carry out an analysis of the proposed building design/development to influence decisions made during Concept Design stage (RIBA Stage 2 or equivalent) and identify opportunities for the implementation of passive design solutions that reduce demands for energy consuming building services.

As a minimum, the passive design analysis should cover:

1. Site location
2. Site weather
3. Microclimate
4. Building layout
5. Building orientation
6. Building form
7. Building fabric
8. Thermal mass or other fabric thermal storage
9. Building occupancy type

10. Daylighting strategy
11. Ventilation strategy
12. Adaptation to climate change.

The building shall use passive design measures to reduce the total heating, cooling, mechanical ventilation and lighting loads and energy consumption in line with the findings of the passive design analysis and the analysis is required to demonstrate a meaningful reduction in the total energy demand as a result.

Energy 04 – FREE COOLING

In order to achieve this credit the Passive Design Analysis credit is required to be achieved.

The Passive Design Analysis is required to include an analysis of free cooling and identify opportunities for the implementation of free cooling solutions.

The building shall use ANY of the free cooling strategies listed below to reduce the cooling energy demand, (i.e. it does not use active cooling):

1. Night time cooling (which could include the use of a high exposed thermal mass)
2. Ground coupled air cooling
3. Displacement ventilation (not linked to any active cooling system)
4. Ground water cooling
5. Surface water cooling
6. Evaporative cooling, direct or indirect
7. Desiccant dehumidification and evaporative cooling, using waste heat
8. Absorption cooling, using waste heat
9. The building does not require any significant form of active cooling or mechanical ventilation (i.e. naturally ventilated).

Energy 04 – LOW AND ZERO CARBON TECHNOLOGIES

In order to achieve the third credit a feasibility study is required to be carried out by the completion of the Concept Design stage (RIBA Stage 2 or equivalent) by an energy specialist to establish the most appropriate recognised local (on-site or near-site) low or zero carbon (LZC) energy source(s) for the building/development.

An energy specialist is an individual who has acquired substantial expertise or a recognised qualification for undertaking assessments, designs and installations of low or zero carbon solutions in the commercial buildings sector and is not professionally connected to a single low or zero carbon technology or manufacturer.

A local LZC technology/technologies has/have been specified for the building/development in line with the recommendations of this feasibility study and this method of supply results in a meaningful reduction in regulated carbon dioxide (CO₂) emissions.

The LZC study should cover as a minimum:

1. Energy generated from LZC energy source per year
2. Carbon dioxide savings from LZC energy source per year
3. Life cycle cost of the potential specification, accounting for payback
4. Local planning criteria, including land use and noise
5. Feasibility of exporting heat/electricity from the system
6. Any available grants
7. All technologies appropriate to the site and energy demand of the development.
8. Reasons for excluding other technologies
9. Where appropriate to the building type, connecting the proposed building to an existing local community CHP system or source of waste heat or power OR specifying a building/site CHP system or source of

waste heat or power with the potential to export excess heat or power via a local community energy scheme.

The required amount of energy or CO₂ emissions reduction is not specified under BREEAM. However, it should not be a trivial amount. As a guide, the installation should contribute at least 5% of overall building energy demand and/or CO₂ emissions.

Transport 02 – PROXIMITY TO AMENITIES

One credit can be achieved for commercial and industrial building types under Tra 02 if the assessed building is located within 500 metres of, and accessible to a minimum of 3 different types of local amenities. These are likely to be frequently required and used by building occupants. As a minimum two of the following should be accessible to building occupants:

- a. Appropriate food outlet;
- b. Access to cash/ATM;
- c. Access to recreation/leisure facility for fitness/sports;

But should also include at least one of the following:

- d. Access to an outdoor open space (public or private, provided suitably sized and accessible to building users);
- e. Publicly available postal facility;
- f. Over the counter services associated with a Pharmacy;
- g. Public sector GP surgery or general medical Centre;
- h. Child care facility or school.

Where a building type is indicated to have core amenities at least two of these must be provided as a part of the total number required (please see amenities a.-c.). The remaining number of amenities required can be met using any other applicable amenities (including any remaining core amenities) (please see amenities d.-h.).

Materials 06 – MATERIAL EFFICIENCY

In order to achieve this credit opportunities should be identified, and appropriate measures investigated and implemented, to optimise the use of materials in building design, procurement, construction, maintenance and end of life.

The above should be carried out by the design/construction team in consultation with the relevant parties at each of the following RIBA stages:

- a. Preparation and Brief
- b. Concept Design
- c. Developed Design
- d. Technical Design
- e. Construction.

All parties (as relevant to the project stage) involved in the design, specification and/or construction of the building should be consulted. This includes but is not limited to, the following:

1. Client/developer
2. Cost consultant
3. Architect
4. Structural/civil engineers
5. Building services engineers - mechanical, electrical
6. Principal contractor
7. Demolition/strip-out contractor
8. Environmental consultant
9. Project management consultant
10. Materials/component manufacturers/suppliers.

The BRE recognises that this is a complex environmental and design issue, where solutions and approaches are largely influenced by building specific factors. The evidence required to demonstrate compliance will vary according to RIBA stage. A few examples have been provided below:

- reports (at Preparation and Brief stage) outlining the activity relating to material efficiency (ideas discussed, analysis and decisions taken);
- drawings or building information model (BIM), calculations showing reduction of material use through design (Concept Design/Developed Design stages);
- meeting notes, construction program, responsibilities schedule (indicating parties consulted).

Pollution 03 – FLOOD RISK ASSESSMENT

For two credits: Where a site-specific flood risk assessment (FRA) confirms the development is situated in a flood zone that is defined as having a low annual probability of flooding (in accordance with current best practice national planning guidance). The FRA must take all current and future sources of flooding into consideration.

For one credit: Where a site-specific FRA confirms the development is situated in a flood zone that is defined as having a medium or high annual probability of flooding and is not in a functional floodplain (in accordance with current best practice national planning guidance). The FRA must take all current and future sources of flooding into consideration (see definition below).

Sources of flooding: The Flood Risk Assessment (FRA) must detail the risk of flooding from the following sources:

1. Fluvial (rivers)
2. Tidal
3. Surface water: sheet run-off from adjacent land (urban or rural)
4. Groundwater: most common in low-lying areas underlain by permeable rock (aquifers)
5. Sewers: combined, foul or surface water sewers
6. Reservoirs, canals and other artificial sources.

Please see Other information section which provides more detail on the above sources of flooding. The content of the FRA should be based on historic trends, but should also account for predicted changes to the climate which may impact on the flood risk to the site in future.

AND

To increase the resilience and resistance of the development to flooding, one of the following must be achieved:

- a. The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600mm above the design flood level of the flood zone in which the assessed development is located (please see definition below);

600mm threshold: It is accepted that, for buildings located in medium and high risk flood zones, areas of the car park and site access may be allowed to flood and therefore fall below the 600mm threshold. In such cases the credit is still achievable provided safe access to the site, and the groundfloor of the building can be maintained (i.e. they are 600mm above the design flood level) to ensure the building and site do not become an 'island' in the event of a flood.

Where the development has been permitted and the ground levels of the topography/infrastructure immediately adjacent to the site fall below the 600mm threshold, the credit can still be awarded, provided there are no other practical solutions for access to the site above this level and the assessed building, and access to it, meet the assessment criteria. As much of the external site area as possible (or as required by an appropriate statutory body) should be designed at or above the threshold.

For buildings located in medium or high flood risk zones, any areas used to store sensitive, historical, hazardous, valuable and perishable materials, e.g. radioactive materials, microbiological facilities, server rooms, libraries, etc., must be located above the 600mm threshold.

OR

b. The final design of the building and the wider site reflects the recommendations made by an appropriate consultant in accordance with the hierarchy approach outlined in section 5 of BS 8533:2011.

Waste 01 - PRE-DEMOLITION AUDIT

Where existing buildings on the site will be demolished a pre-demolition audit of any existing buildings, structures or hard surfaces is completed to determine if, in the case of demolition, refurbishment/reuse is feasible and, if not, to maximise the recovery of material from demolition for subsequent high-grade/value applications. The audit must be referenced in the Site Waste Management Plan and cover:

- a. Identification of the key refurbishment/demolition materials.
- b. Potential applications and any related issues for the reuse and recycling of the key refurbishment and demolition materials.

Waste 05 – ADAPTATION TO CLIMATE CHANGE

In order to achieve this credit a climate change adaptation strategy appraisal is required to be conducted for structural and fabric resilience by the end of Concept Design (RIBA Stage 2 or equivalent), in accordance with the following approach:

- a. Carry out a systematic (structural and fabric resilience specific) risk assessment to identify and evaluate the impact on the building over its projected life cycle from expected extreme weather conditions arising from climate change and, where feasible, mitigate against these impacts. The assessment should cover the following stages:
 - i. Hazard identification
 - ii. Hazard assessment
 - iii. Risk estimation
 - iv. Risk evaluation
 - v. Risk management

The Methodology will include the following:

Hazard identification

1. Review the evidence/information from relevant bodies to identify and understand the expected impacts of increased extreme weather events for climate change on the building.
2. Identify likely hazards (see Waste 05 Adaptation to climate change).

Hazard assessment

1. Identify the scale of the hazards identified.

Risk estimation

1. Identify the risk presented by these hazards to the building and the likely impact of the hazards taking into account the following aspects as a minimum:
 - a. Structural stability
 - b. Structural robustness
 - c. Weather proofing and detailing
 - d. Material durability
 - e. Health and safety of building occupants and others
 - f. Impacts on building contents and business continuity

Risk evaluation

1. Evaluate the potential impact of these risks on the building
2. Determine the tolerable risk threshold
3. Check the sensitivity of the risk assessment
4. Identify areas where the risks are unacceptable in health and safety, life cycle assessment and financial terms

Risk management

1. Identify risk reduction measures
2. Mitigate the hazards as far as is practically feasible
3. Adapt the design/specification to incorporate the measures identified by the risk assessment in the final design

Waste 06 – FUNCTIONAL ADAPTABILITY

A building-specific functional adaptation strategy study is required to be undertaken by the client and design team by Concept Design (RIBA Stage 2 or equivalent), which includes recommendations for measures to be incorporated to facilitate future adaptation.

This should consider:

1. The potential for major refurbishment, including replacing the façade;
2. Design aspects that facilitate the replacement of all major plant within the life of the building, e.g. panels in floors/walls that can be removed without affecting the structure, providing lifting beams and hoists;
3. The degree of adaptability of the internal environment to accommodate changes in working practices;
4. The degree of adaptability of the internal physical space and external shell to accommodate change in-use;
5. The extent of accessibility to local services, such as local power, data infrastructure etc.

Functional adaptation measures have been adopted in the design by Technical Design stage (RIBA Stage 4 or equivalent) in accordance with the functional adaptation strategy recommendations, where practical and cost effective. Omissions have been justified in writing to the assessor.

The implementation will be specific to the building and scope of the project, but information should be made available to the BREEAM assessor covering:

1. The feasibility for multiple/alternative building uses and area functions, e.g. related to structural design of the building;
2. Options for multiple building uses and area functions based on design details, e.g. modularity;
3. Routes and methods for major plant replacement, e.g. networks and connections have flexibility and capacity for expansion;
4. Accessibility for local plant and service distribution routes, e.g. detailed information on building conduits and connections infrastructure;
5. The potential for the building to be extended, horizontally and/or vertically.

LE 02-05 - ECOLOGY

The following would need to be completed by the ecologist:

The following sets out the requirements for the ecologist's qualifications and the content of the ecological report required under BREEAM credits LE 02, LE 03, LE 04 & LE 05.

Section A: Contact Details

Ecologist's Details	
Company Name	
Company Address	
Contact Name	
Contact Telephone Number	
Ecology Report Reference	
Client/Developer Details	
Company Name	
Company Address	
Contact Name	
Contact Telephone Number	
Section B1: Ecologist's Qualifications	
1. Do you hold a degree (or equivalent qualification, eg N/SVQ level 5) in ecology or related subject?	Yes / No
If yes please provide details;	
2. Are you a practising ecologist with a minimum of 3 years relevant experience within the last 5 years? <i>Relevant experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment and will include acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures, eg ecological impact assessments</i>	Yes / No
If yes please provide details;	
3. Are you bound by a profession code of conduct and subject to peer review? <i>I.e a full member of one of the following organisations will be deemed suitable: Chartered Institute of Water and Environmental Management (CIWEM); Institute of Ecology and Environmental Management (IEEM); Institute of Environmental Management and Assessment (IEMA); Landscape Institute (LI)</i>	Yes / No
If yes please provide details;	
<i>If NO has been answered for any question in Section B1 then the BREEAM requirement for a 'suitably qualified ecologist' has not been met. The ecology report CANNOT be used to assess the BREEAM Ecology credits unless it is verified by an individual who is 'suitably qualified' (Section B2)</i>	
Section B2: Report Verification	

<p>Details on verifying an ecology report for a BREEAM assessment</p> <ol style="list-style-type: none"> 1. The individual verifying the report must provide written confirmation that they comply with the definition of a 'suitably qualified ecologist' (Section B1) 2. The verifier of the report must confirm in writing they have read and reviewed the report and found it to: <ul style="list-style-type: none"> • Represent sound industry practice • Report and recommend correctly, truthfully, and objectively • Be appropriate given the local site conditions and scope of works proposed • Avoid invalid, biased, and exaggerated statements <p>Written confirmation from the third party verifier on all the points detailed under 1 and 2 above must be included in an appendix to this guidance (see Section E).</p> <p><i>If the appointed ecologist does not meet the requirements of a 'suitably qualified ecologist' and the report has not been verified by an individual who does meet these requirements, then the report CANNOT be used as evidence of compliance with the ecology credits in BREEAM.</i></p>	
<p>Section C: Site Survey</p>	
<p>1. Have the findings of the ecology report been based on data collected from a site survey? <i>The site visits and surveys must be conducted at appropriate times of the year when it is possible to determine the presence, or evidence of the presence, of different plant and animal species.</i></p>	<p>Yes / No</p>
<p>If yes please provide details to justify this (eg date and scope of site survey(s):</p>	
<p><i>If NO has been answered to question 1 of Section C then the ecology report CANNOT be used to determine compliance with the requirements of the relevant BREEAM credits (unless the site was cleared prior to purchase, refer to BREEAM Assessor)</i> <i>Note to ecologists and assessors: work should be prior to the initial site preparation works, ie between RIBA stages B and K</i></p>	
<p>Section D: Site Survey Details</p>	
<p>LE 02: Ecological value of land and protection of ecological features</p>	
<p>1. Is the land within the construction zone deemed by the suitably qualified ecologist to be of low ecological value based on a site survey? <i>The construction zone is defined as any land on the site which is being developed for buildings, hard standing, landscaping, site access, plus 3m boundary in either direction around these areas. It also includes an areas used for temporary site storage and buildings</i></p>	<p>Yes / No</p>
<p>If yes please provide a brief statement explaining how it has been deemed to be of low ecological value:</p>	
<p>2. Are there any features / areas of ecological value that fall within the site, but outside the <i>construction zone</i>? <i>If you have deemed this area to be of low ecological value then there will be no features of ecological value to protect. However, if there is a feature(s) or area(s) of low ecological value you wish to advise be retained and enhanced, e.g. a species-poor hedgerow to a species-rich hedgerow, then full details of the protection and enhancement advice should be entered under LE4 Enhancing Site Ecology</i></p>	<p>Yes / No</p>
<p>If yes, please provide a brief statement outlining the advice / recommendations given for protecting all existing features and areas of ecological value:</p>	

LE 03: Mitigating Ecological Impact																												
3. Are you able to provide the following information for before and after construction: <ul style="list-style-type: none"> Habitat types An estimate of the number of plant species present per habitat type (based on appropriate censusing techniques and confirmed planting regimes from a site survey)? 	Yes / No																											
a. If yes, please include a brief description of the landscapes and habitats surrounding the development site below:																												
b. The total site area (in m ²):																												
<i>This will be the same before and after development</i>																												
c. Please fill in the table below with site details before development :																												
<table border="1"> <thead> <tr> <th>Habitat Type</th> <th>Area of type (m²)</th> <th>No of plant species per habitat type</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	Habitat Type	Area of type (m ²)	No of plant species per habitat type																									
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d. Please fill in the table below with site details after development :																												
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<i>Habitat types will include natural areas, eg various grasslands and woodlands; as well as areas of the built environment, eg buildings, hard landscaping. The area of each habitat type when added together must always equal the total area of the development site</i>																												
4. Has the client/developer requested you carry out the calculation for LE3 Mitigating Ecological Impact and/or LE4 Enhancing Site Ecology (where relevant)? <i>The calculations must be carried out in line with the methodology provided in the current version of the relevant BREEAM scheme's technical guidance manual</i>	Yes / No																											
If yes, please provide all stages of calculations and state what the total change in ecological value is:																												
a. Calculation of ecological value before development:																												
b. Calculation of ecological value after development:																												
c. Change in ecological value (c=b-a):																												

LE 04: Enhancing Site Ecology	
5. Has the client/developer required you to provide advice and make recommendation for enhancing site ecology? <i>Note: these are to include, and go beyond, compliance requirements for all current EU and UK legislation relating to protected species and habitats</i>	Yes / No
If yes, please provide a brief statement outlining the advice/recommendations given on enhancing and protecting the ecological value of the site:	
LE 05: Long Term Impact of Biodiversity	
6. Were you appointed prior to commencement of development work activities on site?	Don't know / Yes / No
7. Has the client/developer given you the responsibility to confirm whether all current EU and UK legislation relating to protection and enhancement of ecology has been (or will be) complied with during the design and construction process?	Yes / No
If yes please provide details on all current EU and UK legislation that relates to the site:	
8. Has the developer/client appointed you to produce an appropriate landscape/site ecology management plan covering at least the first 5 years after project completion?	Yes / No
EITHER a. If yes, and the management plan has already been produced does it include the following: <ul style="list-style-type: none"> • Management of any protected features on site • Management of any new, existing or enhanced habitats • A reference to the current or future site level Biodiversity Action Plan 	Yes / No
OR b. If yes, but the management plan is still to be produced (due to it being too early in the design/construction phase), have you provided the following information to the developer/client: <ul style="list-style-type: none"> • Scope of management plan • Key responsibilities, and with whom these responsibilities lie, e.g. owner, landlord, occupier? 	Yes / No
If you have answered yes to either 8a or 8b please provide a brief explanation outlining the details	
9. Has the client/developer required you, as part of your responsibilities, to provide recommendations and advice to the 'Biodiversity Champion' to minimise detrimental impacts on site biodiversity?	N/A / Yes / No
If yes or N/A, please briefly explain your reasoning:	
Do your responsibilities to the client/developer include providing advice and recommendations for the protection of ecological features which they can incorporate into their workforce training?	N/A / Yes / No
If yes or N/A, please briefly explain your reasoning:	
10. Do your responsibilities to the client/developer include providing advice on the creation of a new ecologically valuable habitat, which is appropriate to	N/A / Yes / No

the local area and is either nationally, regionally, or locally important, or supports nationally, regionally, or locally important biodiversity?															
If yes or N/A, please briefly explain your reasoning:															
11. Do your responsibilities to the client/developer include providing advice and recommendations on when site works are to be avoided so as to minimise the disturbance to wildlife?	N/A / Yes / No														
If yes or N/A, please briefly explain your reasoning															
Section E: Schedule of Evidence															
Copies of the following documentation are required to support the above statements and act as evidence of compliance with the BREEAM ecology requirements: <ul style="list-style-type: none"> • The Suitably Qualified Ecologist's site/project specific report based on a site survey • Written confirmation from the verifier of the ecology report (where necessary) • Any supplementary documentation, eg maps, plans, drawings, letters/emails of correspondence, etc Please include these details along with the appropriate reference to each document in the table below															
<table border="1"> <thead> <tr> <th>Document</th> <th>Reference</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>		Document	Reference												
Document	Reference														
Section F: Statement of Verification															
I confirm the information provided on this document is truthful and accurate at the time of completion															
Name of ecologist															
Signature of ecologist															
Date															

Hea 05/Pol 05 - ACOUSTICS & NOISE

Where there are or will be noise-sensitive areas or buildings within 800m radius of the assessed development a noise impact assessment in compliance with BS 7445:1991 has been carried out and the following noise levels measured/determined:

- a. Existing background noise levels at the nearest or most exposed noise-sensitive development to the proposed development or at a location where background conditions can be argued to be similar.
- b. The rating noise level resulting from the new noise-source.

The noise impact assessment must be carried out by a suitably qualified acoustic consultant holding a recognised acoustic qualification and membership of an appropriate professional body.

The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development, is a difference no greater than +5dB during the day (0700hrs to 2200hrs) and +3dB at night (2300hrs to 0700hrs) compared to the background noise level.

Tra 05 - TRAFFIC & TRAVEL

A travel plan has been developed as part of the feasibility and design stages which considers all types of travel relevant to the building type and users.

The travel plan is structured to meet the needs of the particular site and takes into consideration the findings of a site-specific transport survey and assessment that covers the following (as a minimum):

- a. Where relevant, existing travel patterns and opinions of existing building or site users towards cycling and walking so that constraints and opportunities can be identified
- b. Travel patterns and transport impact of future building users
- c. Current local environment for walkers and cyclists (accounting for visitors who may be accompanied by young children)
- d. Disabled access (accounting for varying levels of disability and visual impairment)
- e. Public transport links serving the site
- f. Current facilities for cyclists

The travel plan includes a package of measures that have been used to steer the design of the development in order to meet the travel plan objectives and minimise car-based travel patterns. This is demonstrated via specific examples such as:

- a. Providing parking priority spaces for car sharers
- b. Providing dedicated and convenient cycle storage and changing facilities
- c. Lighting, landscaping and shelter to make pedestrian and public transport waiting areas pleasant
- d. Negotiating improved bus services, i.e. altering bus routes or offering discounts
- e. Restricting and/or charging for car parking
- f. Criteria for lobby areas where information about public transport or car sharing can be made available
- g. Pedestrian and cycle friendly (for all types of user regardless of the level of mobility or visual impairment) via the provision of cycle lanes, safe crossing points, direct routes, appropriate tactile surfaces, well-lit and signposted to other amenities, public transport nodes and adjoining offsite pedestrian and cycle routes.
- h. Providing suitable taxi drop-off/waiting areas.
- i. Ensuring that rural buildings are located with appropriate transport access to ensure that they adequately serve the local community (where procured to do so e.g. community centre).

Where appropriate to the building type, size and intended operation, the travel plan includes measures tailored to minimise the impacts of operational-related transport e.g. deliveries of supplies, equipment and support services to and from the site.

Where the building's final occupier is known, they confirm that the travel plan will be implemented post construction and supported by the building's management during building operation.