

Briefing Paper

Assessing the Performance of Sustainable Buildings in China

Synergies between BREEAM and the Chinese Assessment Standard for Green Building (Three Star)

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Introduction

Since its launch in 1990, BREEAM has set scientifically robust standards that go beyond regulation and standard practice in minimising sustainability risks for buildings and has encouraged solutions that maximise the benefits to stakeholders including investors, developers, designers and occupiers. It does this as part of a balanced and broad ranging evaluation of a project's impacts and benefits that avoids over-emphasis on single aspects of performance at the expense of others.

Originally developed to meet a need from developers in the United Kingdom (UK), the method has been used as the basis for the development of many locally derived schemes including LEED (US) and Green Star (Australia). A number of international versions of BREEAM are currently operated by BRE or its partner National Scheme Operators and in total the schemes have been used in over 75 countries worldwide. This allows a degree of international comparison whilst allowing local flexibility to accommodate differences in climate, economic opportunities, technological and constructional variations and local needs and priorities.

The Chinese property market is growing rapidly and given the importance of China as a global economic powerhouse it is increasingly important that development is carried out in the most sustainable way possible. Environmental problems are severe in many of China's

cities and regions. In addition, the social changes that are occurring have the potential to create problems for many years to come if they are not tackled. For this reason the Chinese government has set targets and in many cases has mandated environmental sustainability assessments under their Assessment Standard for Green Building (Three Star), verified through the Ministry of Housing and Urban-Rural Development of the People's Republic of China (MOHURD). Whilst this performs a valuable task in raising local practice and improving building design and construction, the method is not internationally recognised, creating difficulties when it comes to demonstrating performance improvements to international property markets.

BRE's BREEAM International methods are increasingly being used to provide this global credibility within the Chinese property sector as they are widely understood and respected by global property players. For this reason BRE has carried out a detailed comparison of its BREEAM International New Construction 2016 standard with the 2014 version of the Three Star standard. This document sets out the alignments that currently exist between the two standards. This work has highlighted significant areas of overlap between the two standards. For building projects undertaking certification against both standards, this will help to improve the efficiency and cost effectiveness of assessments.

Purpose of this document

This document sets out the areas where Three Star requirements and evidence align with those required under the BREEAM International New Construction 2016 standard. It provides assistance and guidance for those seeking to obtain a BREEAM rating alongside a Three Star rating by setting out the areas where evidence prepared to meet Three Star can be used to help demonstrate compliance under BREEAM.

The synergies identified in this document can be used to achieve significant reductions in cost and time in the assessment process where both Three Star and BREEAM assessments are being carried out. This allows buildings to be assessed without the need for duplication in evidence. It provides a clear route to dual certification that streamlines the process of complying with the local standards and achieving an

internationally accepted rating of whole building performance that is understood and respected by the international business community globally.

This document is based on current methodologies for the two standards. BRE is continuing to evaluate Three Star with the aim of identifying areas where mutual recognition may be possible in the future. At present this is not the case given the different natures of the assessment criteria and quality assurance processes employed by the two standards. BRE intend to update this document as the standards are significantly updated. BREEAM standards are typically updated on a 3 to 4 year cycle.

About BRE

BRE was established in 1921 as the Building Research Establishment – a Government owned and operated research body focused on improving quality and understanding in the construction sector following the First World War. Since 1997 it has had the status of a non-governmental organisation owned by the BRE Trust, a registered charity that is dedicated to research and education in the built environment. BRE is an international body and is one of the world's leading centres of excellence providing independent and impartial, research-based advisory, testing, certification and training expertise in every aspect of the built environment. It offers a wide range of industry tools, guidance and training products and services.

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About BREEAM

BREEAM (Building Research Establishment Environmental Assessment Method) is the world's first sustainability rating scheme for the built environment. It is an internationally recognised measure of sustainability for master planning, infrastructure, buildings and communities, covering all stages of an asset's life, including new construction, in-use and refurbishment. Through its application and use, BREEAM helps clients to measure and reduce the impacts of their buildings and in doing so, create higher value, lower risk assets that are better for people and the environment.

BREEAM building level assessments cover technical issues across ten categories as follows:

1. Management - encourages the sustainable management of design, construction, commissioning and operational processes
2. Health and Wellbeing - addresses the comfort, health and safety of occupants, visitors and others within the vicinity
3. Energy - encourages the sustainable use of energy in the asset
4. Transport - encourages sustainable means of transport for the users of the asset
5. Water - encourages the sustainable use of water in the asset
6. Materials - encourages the sustainable procurement and use of materials
7. Waste - encourages the sustainable management of construction and operational waste
8. Land Use and Ecology - encourages sustainable land use, habitat protection/creation and ecological improvement for the asset site and surrounding areas/habitats
9. Pollution - addresses the prevention and control of pollution associated with the asset location and use
10. Innovation - encourages the use of innovative solutions to improve the sustainability performance of the asset

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About the Chinese Assessment Standard for Green Building (Three Star)

The Chinese Assessment Standard for Green Building (Three Star) has been developed by the Chinese Ministry of Housing and Urban-Rural Development (MOHURD) and is operated on their behalf by the Chinese Society for Urban Studies for 3 Star rated buildings and local building control bodies across China for 1 and 2 star rated buildings. It includes an evaluation system for both public and residential buildings. The standard is divided into a design evaluation method and an operational evaluation method, both of which can result in certification. The evaluation system has eight assessment categories as follows:

1. Land Saving and Outdoor Environment
2. Energy Saving and Energy Utilisation
3. Water Saving and Water Resource Utilisation
4. Material Saving and Material Resource Utilisation
5. Indoor Environmental Quality
6. Construction Management
7. Operation Management
8. Promotion and Innovation

The indicators in each category are divided into mandatory/pre-requisite and optional/scoring items. The evaluation system also has additional bonus items covered by the Promotion and Innovation category. Green Buildings are assessed as 1 Star, 2 Star or 3 Star rated buildings. Whilst the lower ratings are certified through the local regulatory systems, all Three Star buildings are independently evaluated through a network of appointed independent experts in green buildings to give additional credibility to the rating claims.

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How to use this document

Table 2 sets out in detail the synergies between BREEAM International New Construction 2016 and Three Star (2014 version) requirements and evidence. It maps all of the Three Star standard's clauses against specific BREEAM criteria providing guidance on the degree to which evidence collected for Three Star can be used in BREEAM assessments.

Given the differences in the assessment and quality assurance processes between BREEAM and Three Star, it is not currently possible for BREEAM to accept certification against Three Star as evidence of compliance with its requirements, although this is an outcome that we will be working to achieve in the future. At present, design teams and other stakeholders will need to submit all evidence to the BREEAM International Assessor for review in the normal way. The aim is to minimise the amount of additional evidence that is required to demonstrate compliance with BREEAM and the guidance indicates the degree of additional evidence that will currently be required.





In addition to setting out areas of significant alignment, the table also identifies areas where the broad aims of the Three Star and BREEAM

issues are the same but methodological differences mean that there is no direct comparison between BREEAM and Three Star requirements. In these instances it is likely that compliance with Three Star issues will aid in achieving BREEAM credits but this cannot be guaranteed. In such cases, evidence produced for Three Star may be helpful in a BREEAM assessment but additional information will be required. It should, however, be possible to avoid unnecessary duplication of assessment evidence and/or calculations.

It should be noted that buildings assessed as 3 Star rated under Three Star are likely to find it much easier to demonstrate compliance with BREEAM. Those rated as 1 or 2 Star are likely to require considerably more additional evidence.

Table 2 provides details of the alignment for each clause in the 2014 version of the Assessment Standard for Green Building (Three Star) and the BREEAM International New Construction 2016 standard. The level of alignment has been classified as defined in Table 1.

Table 1 - Alignment classification

Symbol	Alignment classification	Alignment details
	Good alignment	Evidence used to certify under Three Star can be used as evidence of compliance with the specified BREEAM criterion/criteria. Verification will be required by the BREEAM assessor but no further evidence is likely to be necessary. Note: This is unlikely to occur where buildings have been rated as 1 or 2 Star under Three Star.
	Partial alignment	Evidence used to certify under Three Star can be used as evidence of partial compliance with the specified BREEAM criterion/criteria. Verification will be required by the BREEAM assessor and further evidence will be required to demonstrate full compliance with BREEAM requirements. Note: This is unlikely to occur where buildings have been rated as 1 or 2 Star under Three Star.
	General alignment	The outcomes and methodologies are broadly aligned but there are material differences between the requirements of the standards. For instance the required performance levels or calculation methods may be different. It may be possible that the evidence collected for Three Star can be used for a BREEAM assessment, although additional evidence will be required to demonstrate compliance with the specified BREEAM criterion/criteria.
	Not addressed	This classification applies where Three Star requirements are not covered in BREEAM New Construction or BREEAM covers the issue in a completely different way or are outside the scope of BREEAM New Construction (e.g. cover the operational/in-use performance of buildings).

Figures 1 and 2 provide an overview of the alignment between the Three Star requirements and the BREEM criteria.

Figure 1: Percentage of Three Star standard clauses aligned with BREEM International New Construction 2016 criteria

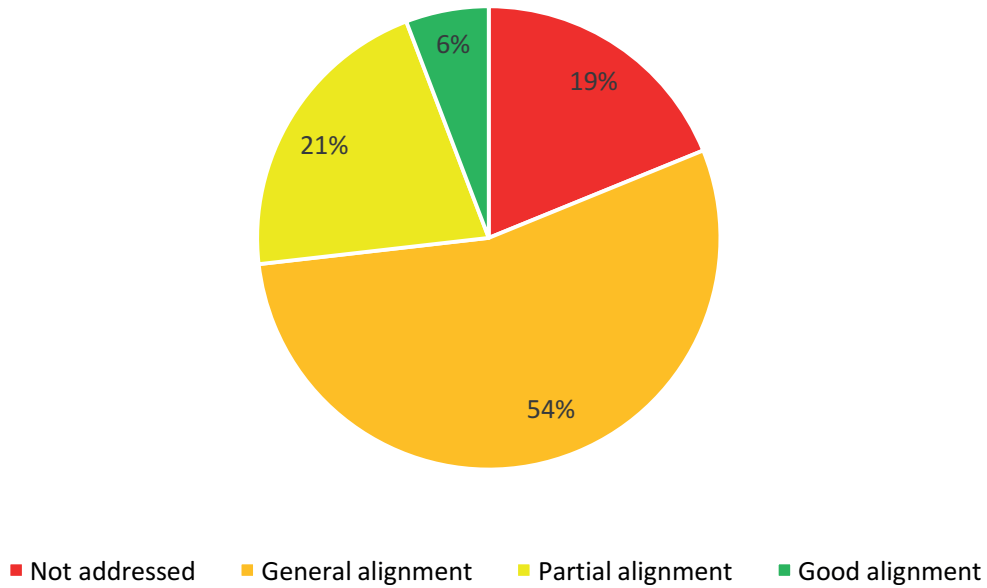


Figure 2: Percentage of Three Star standard clauses for each category aligned with BREEM International New Construction 2016 criteria

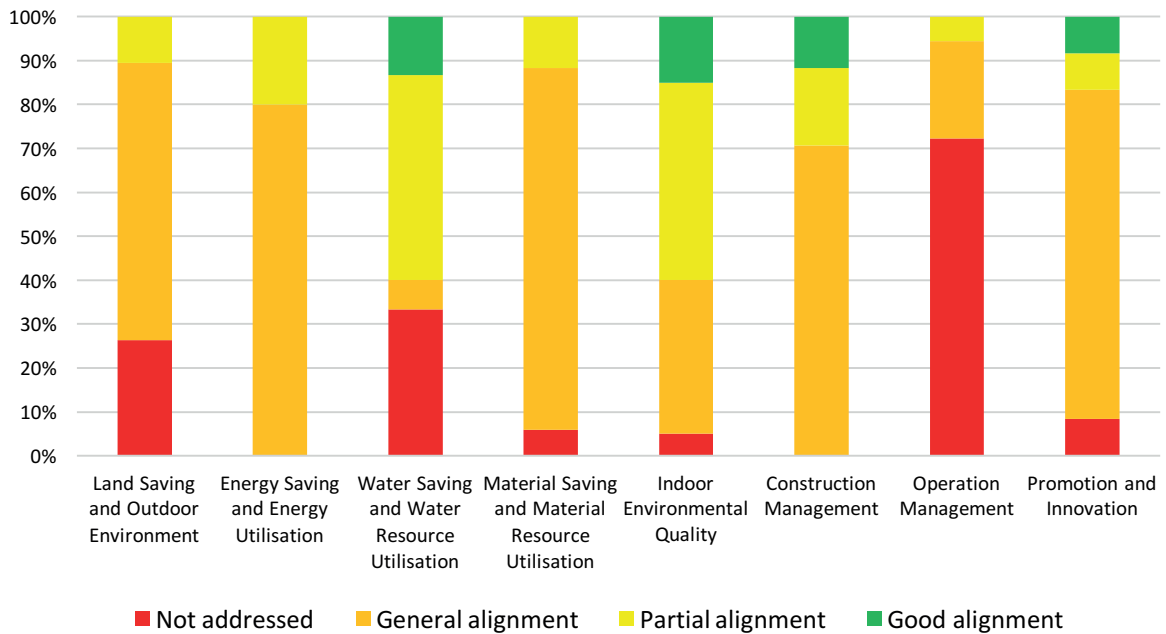


Table 2 - Alignment between BREEAM International New Construction 2016 and Three Star 2014 requirements

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes	
Land Saving and Outdoor Environment	Prerequisite Items	4.1.1	Local urban-rural planning requirements	Man 01 Project brief and design Criterion 3	●	Planning information collected for Three Star could potentially contribute to achieving performance against the BREEAM stakeholder consultation (project delivery) requirements, although additional information on the other consultation issues would be required to demonstrate compliance.	
		4.1.2	Natural and man-made hazards and pollutants	Hea 07 Hazards Criteria 1-2 LE 01 Site selection Criteria 2-4 Pol 03 Surface water run-off Criteria 1-3	●	Information collected for Three Star could potentially contribute to achieving performance against the BREEAM Hea 07 hazards, LE 01 contaminated land and Pol 03 flood resilience requirements, although additional information would be required to demonstrate compliance with these issues.	
		4.1.3	Air and noise pollution sources	Hea 02 Indoor air quality Criterion 5 Hea 05 Acoustic performance Criterion 1	●	Pollution information collected for Three Star could potentially contribute to achieving performance against the BREEAM Hea 02 ventilation and Hea 05 prerequisite acoustic requirements, although additional information would be required to demonstrate compliance with these issues.	
			4.1.4	Sunlight design	Hea 01 Visual comfort Criterion 4	●	Sunlight information collected for Three Star could potentially contribute to achieving performance against the BREEAM daylighting requirements although additional information would be required to demonstrate compliance with the daylighting methodology.
			4.2.1	Economic and intensive use of land	None	-	BREEAM New Construction does not cover this issue.
		Land Use	4.2.2	Provision of green space	None	-	BREEAM New Construction does not cover this issue.
			4.2.3	Utilisation of underground space	None	-	BREEAM New Construction does not cover this issue.
			4.2.4	Light pollution	Pol 04 Reduction of night time light pollution Criteria 1-4	●	Lighting information collected for Three Star could potentially contribute to achieving performance against the BREEAM light pollution requirements, although additional information would be required in terms of lighting curfews and safety and security lighting.
		Outdoor Environment	4.2.5	External noise	Hea 05 Acoustic performance Criterion 1 Pol 05 Reduction of noise pollution Criteria 1-5	●	Noise information collected for Three Star could potentially contribute to achieving performance against the BREEAM Hea 05 prerequisite acoustic and Pol 05 noise pollution requirements, although additional information would be required to demonstrate compliance with these issues.
			4.2.6	Wind environment	None	-	BREEAM New Construction does not cover this issue.
		4.2.7	Heat island effect	None	-	BREEAM New Construction does not cover this issue.	
	Transportation Facility and Public Service	4.2.8	Connectivity to public transport facilities	Hea 06 Accessibility Criteria 3 and 6 Tra 01 Public transport accessibility Criteria 1-2	▲	Walking distance and footpath information collected for Three Star can be used to demonstrate compliance with the BREEAM Hea 06 safe access and Tra 01 accessibility index requirements, although additional information will be required to calculate the accessibility index.	
		4.2.9	Barrier-free footpath design	Hea 06 Accessibility Criteria 1-16	●	Access information collected for Three Star could potentially contribute to achieving performance against the BREEAM safe access and inclusive and accessible design requirements, although additional information would be required to demonstrate compliance with these issues.	

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes	
Land Saving and Outdoor Environment	Transportation Facility and Public Service	4.2.10	Bicycle and car parking	Hea 06 Accessibility Criteria 1-11 Tra 03a Alternative modes of transport Option 5 Tra 03b Alternative modes of transport Option 5 Tra 04 Maximum car parking capacity Criterion 1	●	Parking information collected for Three Star could potentially contribute to achieving performance against the BREEAM Hea 06 safe access, Tra 03 cycle storage and Tra 04 car parking requirements, although additional information would be required to demonstrate compliance with these issues.	
		4.2.11	Provision of public services	Hea 06 Accessibility Criterion 14 Tra 02 Proximity to amenities Criteria 1-2	▲	Walking distance and shared facilities information collected for Three Star can be used to demonstrate compliance with the BREEAM Hea 06 inclusive and accessible design and Tra 02 proximity to amenities requirements, although additional information will be required in terms of distances to other amenities.	
	Premise Design and Premise Ecology	Protection of landscape and ecological features	4.2.12	Protection of landscape and ecological features	LE 02 Ecological value of site and protection of ecological features Criteria 1-3 LE 04 Enhancing site ecology Criteria 1-3 LE 05 Long term impact on biodiversity Criteria 1-3	●	Land use and ecology information collected for Three Star could potentially contribute to achieving performance against the BREEAM LE 02 protection of ecological features, LE 04 enhancing site ecology and LE 05 long term impact on biodiversity requirements, although additional information would be required to demonstrate compliance with these issues.
			4.2.13	Green rainwater infrastructure	Pol 03 Surface water run-off Criteria 4-16	●	Drainage and runoff information collected for Three Star could potentially contribute to achieving performance against the BREEAM surface water run-off requirements, although additional information would be required to demonstrate compliance (e.g. peak rate of run-off calculations, allowance for climate change, maintenance agreements, etc).
			4.2.14	Surface and roof rainfall run-off	Pol 03 Surface water run-off Criteria 4-16	●	Runoff information collected for Three Star could potentially contribute to achieving performance against the BREEAM surface water run-off requirements, although additional information would be required to demonstrate compliance (e.g. peak rate of run-off calculations, allowance for climate change, maintenance agreements, etc).
			4.2.15	Planting strategy	LE 04 Enhancing site ecology Criteria 1-3 LE 05 Long term impact on biodiversity Criteria 1-3	●	Planting information collected for Three Star could potentially contribute to achieving performance against the BREEAM LE 04 enhancing site ecology and LE 05 long term impact on biodiversity requirements, although additional information would be required to demonstrate compliance with these issues.
		National energy efficiency design standards	5.1.1	National energy efficiency design standards	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Information collected for Three Star (e.g. thermal performance of building elements, heating and cooling efficiencies etc) could potentially be used to contribute to the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
			5.1.2	Use of electricity for HVAC and humidification	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	BREEAM does not prohibit the use of electricity for heating or cooling. However, meeting the Three Star requirement will help towards achieving the BREEAM energy performance requirements as these are based on minimising operational energy demand, primary energy consumption and CO2 emissions.
			5.1.3	Energy sub-metering	Ene 02a Energy monitoring (non-residential) Criteria 1-5	●	Sub-metering information collected for Three Star could potentially contribute to achieving performance against the BREEAM sub-metering requirements, although additional information would be required to demonstrate compliance.
					Ene 02b Energy monitoring (residential)	■	Three Star requirements are not applicable to residential buildings.

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes
Energy Saving and Energy Utilisation	Construction and Building Envelope	5.1.4	Lighting power density	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Lighting power density information collected for Three Star could potentially be used to contribute to the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements. The Option 2 requirements specify lighting efficacies in luminaire lumens/Watt rather than lighting power density (Watt/m ²), so project teams would need to perform a conversion calculation in order to show compliance with the BREEAM requirements.
		5.2.1	Optimisation of building form	Ene 01 Reduction of energy use and carbon emissions Criterion 1 Ene 04 Low carbon design Criteria 1-3	●	Achieving the Three Star design optimisation requirements will help to contribute towards achieving performance against the Ene 01 Option 1 (Use of approved building energy calculation software) requirements. The design optimisation information can potentially be used as evidence in meeting the Ene 04 passive design analysis requirements.
		5.2.2	Openable windows	Hea 02 Indoor air quality Criterion 18	▲	Achieving the Three Star openable windows requirements would demonstrate compliance with the BREEAM openable windows area requirements, but additional evidence would be required to demonstrate that the design provides an adequate cross flow of air.
		5.2.3	Thermal performance of building envelope	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Thermal performance information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		5.2.4	Energy efficiency of cooling and heating systems	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Energy efficiency information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		5.2.5	Energy efficiency of HVAC equipment	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Energy efficiency information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		5.2.6	Optimisation of HVAC system	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3 Ene 04 Low carbon design Criteria 5-6	●	Energy efficiency information collected for Three Star will help to contribute towards achieving performance against the BREEAM Ene 01 Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements. If a free cooling strategy has been used, Three Star information will help to contribute towards achieving performance against the BREEAM Ene 04 free cooling requirements.
		5.2.7	Energy efficiency measures for HVAC system during transition seasons	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3 Ene 04 Low carbon design Criteria 5-6	●	Energy efficiency information collected for Three Star will help to contribute towards achieving performance against the BREEAM Ene 01 Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements. If a free cooling strategy has been used, Three Star information will help to contribute towards achieving performance against the BREEAM Ene 04 free cooling requirements.
		5.2.8	Energy efficiency measures for HVAC system for part loads	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Energy efficiency information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		5.2.9	Energy efficiency and control of lighting systems	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Lighting information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		5.2.10	Lighting power density	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Lighting information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		Lighting and Electrics	5.2.11	Energy efficiency of elevators and escalators	Ene 06 Energy efficient transport systems Criteria 1-6	▲
5.2.12	Energy efficient electrical equipment		Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Energy efficiency information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.	

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEM International New Construction 2016 assessment issue criteria	Alignment	Notes
Energy Saving and Energy Utilisation	Comprehensive Utilisation of Energy	5.2.13	Heat recovery systems	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	BREEM does not contain specific requirements with respect to heat recovery from exhaust air. However, meeting the Three Star requirement will help to contribute towards achieving performance against the BREEM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		5.2.14	Cold and heat storage systems	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	BREEM does not contain specific requirements with respect to cold and heat storage. However, meeting the Three Star requirement may help to contribute towards achieving performance against the BREEM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
Energy Saving and Energy Utilisation	Comprehensive Utilisation of Energy	5.2.15	Waste heat utilisation	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3 Ene 04 Low carbon design Criteria 7-8	▲	Waste heat information collected for Three Star can be used to demonstrate compliance with the Ene 04 low and zero carbon technologies requirements, but additional evidence would be required to demonstrate that a low/zero carbon feasibility study has been carried out. This information will also help to contribute towards achieving performance against the BREEM Ene 01 Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		5.2.16	Renewable energy sources	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3 Ene 04 Low carbon design Criteria 7-8	▲	Renewable energy information collected for Three Star can be used to demonstrate compliance with the Ene 04 low and zero carbon technologies requirements, but additional evidence would be required to demonstrate that a low/zero carbon feasibility study has been carried out. This information will also help to contribute towards achieving performance against the BREEM Ene 01 Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
Water Saving and Water Resource Utilisation	Prerequisite Items	6.1.1	Water resources plan	None	-	BREEM New Construction does not cover this issue.
		6.1.2	Water drainage systems	None	-	BREEM New Construction does not cover this issue.
	6.1.3	Water efficient equipment	Wat 01 Water consumption Criterion 3	*	The water efficiency information collected for Three Star can be used to demonstrate compliance with the BREEM requirements for efficiency of 'domestic-scale' water-consuming components.	
	6.2.1	Water consumption of building	Wat 01 Water consumption Criteria 1-3	▲	Information used to calculate the average daily water consumption of the building in Three Star can be used in the BREEM Wat 01 water calculator, although additional information may be required to fully populate the calculator.	
	6.2.2	Water leak prevention	Wat 02 Water monitoring Criteria 1-2	●	The water meter information collected for Three Star could potentially contribute to achieving performance against the BREEM water meter requirements, although additional information will be required to demonstrate that the meters enable connection to a water monitoring and management system.	
	6.2.3	Water supply pressure	None	-	BREEM New Construction does not cover this issue.	
	6.2.4	Water consumption measurement	Wat 02 Water monitoring Criteria 1-4	▲	Water meter information collected for Three Star can be used in to demonstrate compliance with the BREEM water monitoring requirements, although additional information will be required to demonstrate that the meters enable connection to a water monitoring and management system.	
	6.2.5	Water saving measures for public bathrooms	None	-	BREEM New Construction does not cover this issue.	
	6.2.6	Water efficient components	Wat 01 Water consumption Criterion 3	*	The water efficiency information collected for Three Star can be used to demonstrate compliance with the BREEM requirements for efficiency of 'domestic-scale' water-consuming components.	
	6.2.7	Water efficient irrigation	Wat 04 Water efficient equipment Criterion 2	▲	Irrigation information collected for Three Star can be used to demonstrate compliance with the BREEM water efficient equipment requirements, although additional information will be required to demonstrate that a meaningful reduction in the total water demand of the building has been achieved.	

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEM International New Construction 2016 assessment issue criteria	Alignment	Notes
Water Saving and Water Resource Utilisation		6.2.8	Water efficient cooling equipment	Wat 04 Water efficient equipment Criterion 2	▲	Water saving technology information collected for Three Star can be used to demonstrate compliance with the BREEM water efficient equipment requirements, although additional information will be required to demonstrate that a meaningful reduction in the total water demand of the building has been achieved.
		6.2.9	Other water efficient technologies	Wat 04 Water efficient equipment Criterion 2	▲	Water saving technology information collected for Three Star can be used to demonstrate compliance with the BREEM water efficient equipment requirements, although additional information will be required to demonstrate that a meaningful reduction in the total water demand of the building has been achieved.
		6.2.10	Non-traditional water sources	Wat 01 Water consumption Criteria 4-5 Wat 04 Water efficient equipment Criterion 2	▲	Non-traditional water source information collected for Three Star can be used in the BREEM Wat 01 water calculator, although additional information will be required to demonstrate that such systems are specified and installed in accordance with national best practice standards. Where greywater and/or rainwater is used for vehicle washing purposes in a Three Star project, this information can be used to demonstrate compliance with the BREEM Wat 04 water efficient equipment requirements, although additional information will be required to demonstrate that a meaningful reduction in the total water demand of the building has been achieved.
Material Saving and Material Resource Utilisation	Non-traditional Water Source Utilization	6.2.11	Non-traditional water source for cooling	Wat 04 Water efficient equipment Criterion 2	▲	Non-traditional cooling water information collected for Three Star can be used to demonstrate compliance with the BREEM water efficient equipment requirements, although additional information will be required to demonstrate that a meaningful reduction in the total water demand of the building has been achieved.
		6.2.12	Water features	None	■	BREEM New Construction does not cover this issue.
		7.1.1	Restricted construction materials	Hea 02 Indoor air quality Criterion 1	●	The restricted/banned materials information collected for Three Star may help to contribute towards achieving performance against the BREEM requirements that prohibit the use of asbestos in buildings.
		7.1.2	Hot rolled ribbed steel bars	None	■	BREEM New Construction does not cover this issue.
		7.1.3	Architectural modelling elements	Mat 06 Material efficiency Criteria 1-2	●	Information collected for Three Star could help to contribute towards achieving performance against the BREEM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.
		7.2.1	Building shape	Mat 06 Material efficiency Criteria 1-2	●	Building shape information collected for Three Star could help to contribute towards achieving performance against the BREEM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.
Saving material design		7.2.2	Foundation and structure optimisation	Mat 06 Material efficiency Criteria 1-2	●	Structural optimisation information collected for Three Star could help to contribute towards achieving performance against the BREEM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.
		7.2.3	Integrated design of civil engineering and decoration	Mat 06 Material efficiency Criteria 1-2	●	Information collected for Three Star could help to contribute towards achieving performance against the BREEM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.
		7.2.4	Reusable partition walls	Wst 06 Functional adaptability Criteria 1-2	●	Reusable partition wall information collected for Three Star could help to contribute towards achieving performance against the BREEM functional adaptability requirements, but additional evidence would be required with respect to identifying other opportunities for adaptability.
		7.2.5	Prefabricated construction elements	Mat 06 Material efficiency Criteria 1-2	●	Prefabricated parts information collected for Three Star could help to contribute towards achieving performance against the BREEM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.
		7.2.6	Integrated design of kitchens and bathrooms	Mat 06 Material efficiency Criteria 1-2	●	Integrally designed kitchen and bathroom information collected for Three Star could help to contribute towards achieving performance against the BREEM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes		
Material Saving and Material Resource Utilisation	Material Selection	7.2.7	Locally sourced construction materials	Man 03 Responsible construction practices Criteria 18-19	●	Construction material transport distance for information collected for Three Star could help to contribute towards achieving performance against the BREEAM transport of construction materials and waste requirements, but additional evidence would be required with respect to construction waste transport distances.		
		7.2.8	Premixed concrete	Mat 06 Material efficiency Criteria 1-2	●	Premixed concrete information collected for Three Star could help to contribute towards achieving performance against the BREEAM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.		
		7.2.9	Ready-mixed mortar	Mat 06 Material efficiency Criteria 1-2	●	Ready-mixed mortar information collected for Three Star could help to contribute towards achieving performance against the BREEAM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.		
		7.2.10	High-strength structural materials	Mat 06 Material efficiency Criteria 1-2	●	High-strength structural material information collected for Three Star could help to contribute towards achieving performance against the BREEAM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.		
		7.2.11	High durability construction materials	Mat 05 Designing for durability and resilience Criterion 2	▲	Concrete and steel durability information collected for Three Star can be used to demonstrate compliance with the BREEAM Protecting exposed parts of the building from material degradation requirements, although additional information will be required to demonstrate that durability measures have been specified for other building elements.		
		7.2.12	Reusable or recyclable construction materials	Mat 01 Life cycle impacts Criteria 1-4	●	Reusable and recyclable construction material information collected for Three Star could help to contribute towards achieving performance against the BREEAM life cycle impacts requirements, but additional information would be required to populate the Mat 01 calculator.		
		7.2.13	Construction materials made from waste materials	Mat 01 Life cycle impacts Criteria 1-4 Wst 02 Recycled aggregates Criteria 1-2	●	Reusable and recyclable construction material information collected for Three Star could help to contribute towards achieving performance against the BREEAM Mat 01 life cycle impacts requirements, but additional information would be required to populate the Mat 01 calculator. The information could also help to contribute towards achieving performance against the BREEAM Wst 02 recycled aggregates requirements.		
		7.2.14	Durability of decorative materials	Mat 05 Designing for durability and resilience Criterion 2	▲	Durability information collected for Three Star can be used to demonstrate compliance with the BREEAM Protecting exposed parts of the building from material degradation requirements, although additional information will be required to demonstrate that durability measures have been specified for other building elements.		
		Indoor Environment Quality	Prerequisite Items	8.1.1	Indoor noise levels	Hea 05 Acoustic performance Criteria 2-3	▲	The noise level information collected for Three Star can be used to demonstrate compliance with the BREEAM requirements for indoor ambient noise levels, although confirmation will be required that a suitably qualified acoustician has carried out noise measurements.
				8.1.2	Sound insulation	Hea 05 Acoustic performance Criteria 4 and 8	▲	The sound insulation information collected for Three Star can be used to demonstrate compliance with the BREEAM requirements for sound insulation, although confirmation will be required that noise measurement/testing has been performed.
8.1.3	Internal lighting			Hea 01 Visual comfort Criteria 7-8	✱	The lighting information collected for Three Star can be used to demonstrate compliance with the BREEAM internal lighting requirements.		
8.1.4	Thermal design			Hea 02 Indoor air quality Criterion 4 Hea 04 Thermal comfort Criteria 1-3	▲	The fresh air ventilation rate information collected for Three Star can be used to demonstrate compliance with the BREEAM Hea 02 fresh air requirements, although a calculation to convert units may be required. Temperature range and humidity information collected for Three Star can be used to demonstrate compliance with the BREEAM Hea 04 thermal modelling requirements, although additional information will be required to demonstrate that thermal modelling has been performed in accordance with ISO 7730.		
8.1.5	Condensation			Man 04 Commissioning and handover Criterion 8	●	Thermal bridging information collected for Three Star could help to contribute towards achieving performance against the BREEAM testing and inspecting building fabric requirements, but additional information would be required in terms of airtightness/air leakage performance.		

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEM International New Construction 2016 assessment issue criteria	Alignment	Notes
Indoor Environment Quality		8.1.6	Thermal insulation of roof and walls	Hea 04 Thermal comfort Criteria 1-3 Ena 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Insulation information collected for Three Star will help to contribute towards achieving performance against the BREEM Hea 04 thermal modelling requirements and the Ena 01 Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
		8.1.7	Concentration of pollutants in indoor air	Hea 02 Indoor air quality Criteria 12-16	▲	The pollutant concentration information collected for Three Star can be used to demonstrate compliance with the BREEM post-construction indoor air quality measurement requirements, although additional information will be required to demonstrate that sampling and analysis has been performed in accordance with the ISO 16000 series of standards.
		8.2.1	Indoor noise levels	Hea 05 Acoustic performance Criteria 2-3	▲	The noise level information collected for Three Star can be used to demonstrate compliance with the BREEM requirements for indoor ambient noise levels, although confirmation will be required that a suitably qualified acoustician has carried out noise measurements.
		8.2.2	Airborne and impact sound insulation	Hea 05 Acoustic performance Criteria 4-5 and 8-9	▲	The sound insulation information collected for Three Star can be used to demonstrate compliance with the BREEM requirements for sound insulation, although confirmation will be required that noise measurement/testing has been performed.
		8.2.3	Noise mitigation measures	Hea 05 Acoustic performance Criterion 1	●	Noise reduction measures information collected for Three Star can help to contribute towards achieving performance against the BREEM prerequisite requirements, although additional information will be required in terms of the appointment of a suitably qualified acoustician.
		8.2.4	Acoustic design	Hea 05 Acoustic performance Criterion 7	✱	The acoustic information collected for Three Star can be used to demonstrate compliance with the BREEM reverberation time requirements.
		8.2.5	View outside	Hea 01 Visual comfort Criteria 5-6	●	Window/view information collected for Three Star can help to contribute towards achieving performance against the BREEM view out requirements, although additional information will be required in terms of distances from windows and window opening sizes.
		8.2.6	Daylighting	Hea 01 Visual comfort Criterion 4	▲	The daylighting information collected for Three Star can be used to demonstrate compliance with the BREEM daylighting requirements, although additional information will be required in terms of uniformity ratio, view of sky and/or room depth.
		8.2.7	Improved daylighting and glare control	Hea 01 Visual comfort Criteria 2-4 and 7-9	●	Daylighting and glare control information collected for Three Star can help to contribute towards achieving performance against the BREEM daylighting, glare control and internal lighting requirements, although additional information will be required for each of these elements to achieve compliance.
		8.2.8	Solar shading	Hea 01 Visual comfort Criteria 2-3	●	Shading information collected for Three Star can help to contribute towards achieving performance against the glare control requirements, although additional information will be required with respect to a glare control strategy.
		8.2.9	Temperature controls	Hea 04 Thermal comfort Criterion 11	▲	The thermal controls information collected for Three Star can be used to demonstrate compliance with the BREEM thermal zoning and controls requirements, although additional information will be required in terms of the wider temperature control strategy.
		8.2.10	Natural ventilation	Hea 02 Indoor air quality Criteria 18-19	▲	The natural ventilation information collected for Three Star can be used to demonstrate compliance with the BREEM potential for natural ventilation requirements, although additional information will be required in terms of the provision of an adequate cross flow of air and user control on the supply of fresh air.
		8.2.11	Air distribution	Hea 02 Indoor air quality Criteria 4-5 Hea 04 Thermal comfort Criteria 1-3	●	Thermal environment and air supply and exhaust information collected for Three Star can help to contribute towards achieving performance against the BREEM Hea 02 ventilation and Hea 04 thermal modelling requirements, although additional information will be required for each of these elements to achieve compliance.
8.2.12	Indoor air quality monitoring system	Hea 02 Indoor air quality Criterion 7	✱	Air quality monitoring information collected for Three Star can be used to demonstrate compliance with the BREEM carbon dioxide/air quality sensor requirements.		
8.2.13	Carbon monoxide monitoring in underground parking	None	■	This issue is not covered by BREEM New Construction.		

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes			
Construction Management	Prerequisite Items	9.1.1	Green construction management	Man 01 Project brief and design Criteria 1-14	●	Management system information collected for Three Star can help to contribute towards achieving performance against the BREEAM project brief and design requirements, although additional information will be required to demonstrate compliance with these issues.			
		9.1.2	Environmental protection plan	Man 03 Responsible construction practices Criteria 3-4 and 8-9	●	Environmental protection information collected for Three Star can help to contribute towards achieving performance against the BREEAM environmental management and considerate construction requirements, although additional information will be required in accordance with the BREEAM checklists for these issues.			
		9.1.3	Health and safety management plan	Man 01 Project brief and design Criteria 2-3 Man 03 Responsible construction practices Criterion 2	●	Health and safety management information collected for Three Star can help to contribute towards achieving performance against the BREEAM Man 01 stakeholder consultation (project delivery) and Man 03 national health and safety legislation requirements, although additional information will be required to demonstrate compliance with these issues.			
	Environmental protection		9.1.4	Review of green building design documents	Man 01 Project brief and design Criteria 1-14	●	Design review information collected for Three Star can help to contribute towards achieving performance against the BREEAM project brief and design requirements, although additional information will be required to demonstrate compliance with these issues.		
			9.2.1	Dust protection measures	Man 03 Responsible construction practices Criteria 3-4	▲	Dust protection information collected for Three Star can help to contribute towards achieving performance against the BREEAM environmental management requirements, although additional information will be required in accordance with the BREEAM checklist for this issue.		
			9.2.2	Construction noise reduction measures	Man 03 Responsible construction practices Criteria 3-4	▲	Dust protection information collected for Three Star can help to contribute towards achieving performance against the BREEAM environmental management requirements, although additional information will be required in accordance with the BREEAM checklist for this issue.		
		Saving resources		9.2.3	Construction waste reduction and recycling plan	Wst 01 Construction waste management Criteria 1-11	●	Construction waste information collected for Three Star can help to contribute towards achieving performance against the BREEAM construction waste reduction and diversion of resources from landfill requirements, although additional information will be required to demonstrate compliance with these issues.	
				9.2.4	Construction energy efficiency	Man 03 Responsible construction practices Criteria 11-13 and 17-19	*	Energy monitoring information collected for Three Star can be used to demonstrate compliance with the BREEAM monitoring of site impacts requirements for energy consumption and transport of construction materials and waste.	
				9.2.5	Construction water efficiency	Man 03 Responsible construction practices Criteria 14-16	*	Water monitoring information collected for Three Star can be used to demonstrate compliance with the BREEAM monitoring of site impacts requirements for water consumption.	
			Process management		9.2.6	Premixed concrete waste reduction	Wst 01 Construction waste management Criteria 1-8	●	Concrete waste information collected for Three Star could potentially be used to contribute to the BREEAM construction waste reduction requirements, although additional information would be required with respect to other construction waste types.
					9.2.7	Reinforcing bar waste	Wst 01 Construction waste management Criteria 1-8	●	Steel waste information collected for Three Star could potentially be used to contribute to the BREEAM construction waste reduction requirements, although additional information would be required with respect to other construction waste types.
					9.2.8	Formwork	Wst 01 Construction waste management Criteria 1-8	●	Formwork information collected for Three Star could potentially be used to contribute to the BREEAM construction waste reduction requirements, although additional information would be required with respect to other construction waste types.
			9.2.9	Implementation of green building design	Man 01 Project brief and design Criteria 9-14 Man 03 Responsible construction practices Criteria 5-7	●	Information collected for Three Star could potentially be used to contribute to the BREEAM Man 01 and Man 03 sustainability champion requirements, although additional information would be required with respect to BREEAM performance targets.		

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes
Construction Management	Process management	9.2.10	Strictly control modification of designs	Man 01 Project brief and design Criteria 9-14 Man 03 Responsible construction practices Criteria 5-7	●	Information collected for Three Star could potentially be used to contribute to the BREEAM Man 01 and Man 03 sustainability champion requirements, although additional information would be required with respect to BREEAM performance targets.
		9.2.11	Construction tests	Man 03 Responsible construction practices Criteria 5-7 Man 04 Commissioning and handover Criteria 7-9	●	Information collected for Three Star could potentially be used to contribute to the BREEAM Man 03 sustainability champion and Man 04 testing and inspecting building fabric requirements, although additional information would be required to demonstrate compliance with these issues.
		9.2.12	Integration of construction and decoration works	Man 04 Commissioning and handover Criteria 10 and 11	●	Information collected for Three Star could potentially be used to contribute to the BREEAM handover requirements, although additional information would be required with respect to the building user guide and training content.
		9.2.13	Commissioning	Man 04 Commissioning and handover Criteria 1-6	▲	Commissioning information collected for Three Star can help to contribute towards achieving performance against the BREEAM commissioning requirements, although additional information will be required with respect to commissioning scheduling, monitoring and responsibilities.
	Prerequisite items	10.1.1	Operational management of energy, water and materials	None	■	This issue is outside the scope of a BREEAM New Construction assessment.
		10.1.2	Waste management system	Wst 03a Operational waste Criteria 1-6 Wst 03b Operational waste Criteria 1-6	●	Waste management information collected for Three Star could potentially be used to contribute to the BREEAM operational waste requirements, although additional information would be required including storage space size/volumes.
		10.1.3	Emissions of pollutants	None	■	This issue is outside the scope of a BREEAM New Construction assessment.
		10.1.4	Energy and water efficiency meet the design requirements	Man 05 Aftercare Criteria 2-6	●	Energy and water management information collected for Three Star could potentially be used to contribute to the BREEAM aftercare support, seasonal commissioning and POE requirements, although additional information would be required with respect to each of these issues.
		10.1.5	HVAC monitoring and control systems operate correctly	Man 05 Aftercare Criteria 2-6	●	Building management information collected for Three Star could potentially be used to contribute to the BREEAM aftercare support, seasonal commissioning and POE requirements, although additional information would be required with respect to each of these issues.
		10.2.1	Management system certification	None	■	This issue is outside the scope of a BREEAM New Construction assessment.
		10.2.2	Operating procedures and emergency plans	None	■	This issue is outside the scope of a BREEAM New Construction assessment.
	Management system	10.2.3	Energy management incentives	None	■	This issue is outside the scope of a BREEAM New Construction assessment.
		10.2.4	Green building information dissemination	Man 04 Commissioning and handover Criteria 10-11 Man 05 Aftercare Criteria 1 and 5	●	Building management information collected for Three Star could potentially be used to contribute to the BREEAM Man 04 handover and Man 05 aftercare support and POE requirements, although additional information would be required with respect to each of these issues.
10.2.5		Ongoing monitoring, maintenance and commissioning	Man 05 Aftercare Criterion 3	▲	Building management information collected for Three Star could potentially be used to contribute to the BREEAM seasonal commissioning requirements, although additional information would be required to demonstrate compliance with the BREEAM testing requirements.	
Technology management	10.2.6	Inspection and cleaning of HVAC systems	None	■	This issue is outside the scope of a BREEAM New Construction assessment.	
	10.2.7	Water consumption and quality monitoring	None	■	This issue is outside the scope of a BREEAM New Construction assessment.	

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes	
Operation Management		10.2.8	Operation of 'intelligent' systems	None	-	This issue is outside the scope of a BREEAM New Construction assessment.	
		10.2.9	Building management information system	None	-	This issue is outside the scope of a BREEAM New Construction assessment.	
		10.2.10	Pest control and chemical management	None	-	This issue is outside the scope of a BREEAM New Construction assessment.	
		10.2.11	Survival rate of planted or transplanted trees	None	-	This issue is outside the scope of a BREEAM New Construction assessment.	
		10.2.12	Cleanliness of waste storage areas	None	-	This issue is outside the scope of a BREEAM New Construction assessment.	
		10.2.13	Waste collection	None	-	This issue is outside the scope of a BREEAM New Construction assessment.	
	Performance promotion		11.2.1	Thermal performance of building envelope	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Thermal performance information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
			11.2.2	Energy efficiency of HVAC systems	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3	●	Energy efficiency information collected for Three Star will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
			11.2.3	Combined cooling heating power technology	Ene 01 Reduction of energy use and carbon emissions Criteria 1-3 Ene 04 Low carbon design Criteria 7-8	●	Combined cooling, heating and power information collected for Three Star can be used to demonstrate compliance with the Ene 04 low and zero carbon technologies requirements, but additional evidence would be required to demonstrate that a low/zero carbon feasibility study has been carried out. Additionally, this information will help to contribute towards achieving performance against the BREEAM Option 1 (Use of approved building energy calculation software) or Option 2 (Energy efficient design features) requirements.
			11.2.4	Water efficiency of sanitary appliances	Wat 01 Water consumption Criterion 3	✱	The water efficiency information collected for Three Star can be used to demonstrate compliance with the BREEAM requirements for efficiency of 'domestic-scale' water-consuming components.
			11.2.5	Resource efficient building structure	Mat 06 Material efficiency Criteria 1-2	●	Information collected for Three Star could help to contribute towards achieving performance against the BREEAM material efficiency requirements, but additional evidence would be required with respect to identifying other opportunities for material efficiency.
			11.2.6	Indoor air treatment	Hea 02 Indoor air quality Criteria 2 and 6	●	Information collected for Three Star could help to contribute towards achieving performance against the BREEAM indoor air quality plan and ventilation requirements, but additional evidence would be required with respect to these issues.
			11.2.7	Concentration of pollutants in indoor air	Hea 02 Indoor air quality Criteria 11-17	▲	The pollutant concentration information collected for Three Star can be used to demonstrate compliance with the BREEAM post-construction indoor air quality measurement requirements, although additional information will be required to demonstrate that sampling and analysis has been performed in accordance with the ISO 16000 series of standards.
Promotion and Innovation		11.2.8	Passive design measures	Ene 01 Reduction of energy use and carbon emissions Criteria 1-6 Ene 04 Low carbon design Criteria 1-6	●	Information collected for Three Star could help to contribute towards achieving performance against the BREEAM Ene 01 energy performance and Ene 04 passive design requirements, although additional information would be required to demonstrate compliance with these issues.	
		11.2.9	Previously developed land and reuse of existing buildings	Wst 01 Construction waste management Criterion 5 LE 01 Site selection Criteria 1-4	●	Information collected for Three Star could help to contribute towards achieving performance against the BREEAM Wst 01 pre-demolition audit and LE 01 previously developed land and contaminated land requirements, although additional information would be required to demonstrate compliance with these issues.	
		11.2.10	Building information modelling (BIM)	None	-	BREEAM New Construction does not cover this issue.	
		Innovation					

Three Star category	Three Star sub-category	Three Star standard clause	Three Star requirements	BREEAM International New Construction 2016 assessment issue criteria	Alignment	Notes
Promotion and Innovation	Innovation	112.11	Building carbon emission analysis	Mat.01 Life cycle impacts Criteria 1-4	●	Carbon emission information collected for Three Star could potentially help to contribute towards achieving performance against the BREEAM life cycle impacts requirements, although additional information would be required to populate the Mat 01 calculator.
		112.12	Other innovations	Inn 01 Innovation Criterion 2	●	Innovation information collected for Three Star could potentially be used to demonstrate compliance with the BREEAM approved innovation requirements, although a BREEAM innovation application would need to be submitted to and approved by BRE Global.



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