BREEAM® NOR

TECHNICAL MANUAL
SD5076NOR

BREEAM-NOR v6.1 new construction

NORWEGIAN GREEN BUILDING COUNCIL
GRØNN BYGGALLIANSE

1 Preface

1.1 Disclaimer

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ISBN 978-82-692810-5-7

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1.4 Acknowledgments

BREEAM-NOR for New Construction has been made possible through the continued efforts of many dedicated NGBC members, the strategic advisory Group, The Technical reference groups, BREEAM Assessors and AP's, many dedicated BRE Group staff members, and those who have responded to our consultation calls and meetings or provided feedback in other ways. Several. NGBC also reserve a special thank you to those who support BREEAM by continuing to specify and apply the method and contribute toward a sustainable built environment.

1.5 Cover image

The front page shows the new metropolitan emergency room in Oslo (completed 2023, which is certified as Excellent. Photo: Tove Lauluten for Oslobygg

1.6 Norwegian Green Building Council

Norwegian Green Building Council (NGBC), in Norwegian called NGBC is a non-profit membership organisation established in 2010 owned by members from the entire Norwegian construction and real estate industry. A list of members can be found at www.byggalliansen.no.

NGBC's mission is to improve the sustainability and quality of the built environment by encouraging the use of environmental assessments tools to transform the way buildings are planned, designed, constructed, maintained and operated. NGBC is designated by BRE Global Ltd. to operate BREEAM-NOR

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2 Introduction

2.1 About this technical manual

This document is the technical manual for the BREEAM-NOR New Construction v6.1. It describes an environmental performance standard against which new buildings and buildings undergoing refurbishment and fit-out in Norway can be assessed and achieve a BREEAM-NOR New Construction rating.

The scheme document and the information detailed within is intended for use by:

a. Trained, qualified and licensed BREEAM-NOR Assessors, when assessing an asset´s BREEAM performance for certification.
b. Approved BREEAM-NOR AP's who will provide guidance for the project team and the contractors and
c. Provide guidance for the client and the project team throughout the design and construction process.

BREEAM-NOR Assessors uses the manual in accordance with the procedural and operational requirements of BREEAM-NOR (as described in the BREEAM-NOR Operations Manual, SD5075NOR available on www.byggalliansen.no) under the terms and conditions of a BREEAM-NOR licence.

BREEAM-NOR APs should use the document as a project tool and shall clarify their interpretations with the BREEAM-NOR Assessor for the assessment.

This document should be used by others for reference purposes only.

2.2 Changes to this BREEAM scheme document

This technical manual is subject to revision and can be reissued from time to time by NGBC. A schedule of the publication date for each issue of this document is provided below.

Any additions to this document that necessitate its reissue will be highlighted throughout the text (note: deletions are not identified in the updated issue). A detailed list of all additions and deletions made to each issue is available separately. BREEAM-NOR Assessors can download this list of changes from the Assessor webpage. The list of changes is also available to other parties on request; please email tech@byggalliansen.no.

Scheme document	Issue number	Date of issue
SD5076NOR	6.0.	28.02.2022
SD5076NOR	6.1	21.11.2023

2.3 What is BREEAM?

BREEAM (Building Research Establishment's Environmental Assessment Method) is an internationally recognised measure and mark of a building's sustainable qualities. Since its launch in 1990, BREEAM has certified over 599 000 buildings and is now active in more than 90 countries around the world. Wherever they are, these buildings are immediately identifiable as having been planned, designed, constructed and operated in accordance with best practice sustainability principles.

BREEAM works to raise awareness amongst owners, occupants, designers and operators of the benefits of taking a life cycle approach to sustainability. It also helps them to successfully and cost effectively adopt solutions, and facilitates market recognition of their achievements.

Using independent, licensed assessors, BREEAM examines scientifically based criteria covering a range of issues in sections that evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, land use, ecology and management processes. Buildings are rated and certified on a scale of 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'. Refer to the scoring and rating section to see how a BREEAM rating is calculated.

2.4 Benefits of using BREEAM

BREEAM challenges the perception still held by many that good quality, sustainable buildings are significantly more costly to design and build than those that simply adhere to mandatory (regulatory) requirements.

A growing body of research[1] evidence demonstrates that sustainable options often add little or no capital cost to a development project. Where they do incur additional costs, these can frequently be paid back through lower running expenses and ultimately lead to savings over the life of the building.

The greater efficiency and quality associated with sustainability are also helping to make such building more commercially successful. There is growing evidence, for example, that BREEAM-rated buildings provide increased rates of return for investors, and increased rental rates and sales premiums for developers and owners[2].

Research studies have also highlighted the enhanced value and quality of sustainable buildings. Achieving the standards required by BREEAM requires careful planning, design, specification and detailing, and a good working relationship between the client and project team. Using BREEAM as a tool throughout the project can also facilitate innovation, resulting in potential cost savings and adding value by producing better buildings and better conditions for building users.

2.5 Aims of BREEAM

- To mitigate the life cycle impacts of buildings on the environment
- To enable buildings to be recognised according to their environmental benefits
- To provide a credible, environmental label for buildings
- To stimulate demand and create value for sustainable buildings, building products and supply chains.

2.6 Objectives of BREEAM

- To provide market recognition of buildings with a low environmental impact
- To ensure best environmental practice is incorporated in the planning, design, construction and operation of buildings and the wider built environment
- To define a robust, cost effective performance standard surpassing that required by regulations
- To challenge the market to provide innovative, cost effective solutions that minimise the environmental impact of buildings
- To raise awareness among owners, occupants, designers and operators of the benefits and value of buildings with a reduced life cycle impact on the environment
- To allow organisations to demonstrate progress towards corporate environmental objectives.
- BREEAM is developed and operated to meet the following underlying principles:
- Ensure environmental quality through an accessible, holistic and balanced measure of environmental impacts.
- Use quantified measures for determining environmental quality.
- Adopt a flexible approach that encourages and rewards positive outcomes, avoiding prescribed solutions.
- Use robust science and best practice as the basis for quantifying and calibrating a cost effective and rigorous performance standard for defining environmental quality.
- Reflect the social and economic benefits of meeting the environmental objectives covered.
- Provide a common international framework of assessment that is tailored to meet the 'local' context including regulation, climate and sector.
- Integrate building professionals in the development and operational processes to ensure wide understanding and accessibility.
- Adopt third party certification to ensure independence, credibility and consistency of the label.
- Adopt existing industry tools, practices and other standards wherever possible to support developments in policy and technology, build on existing skills and understanding, and minimise costs.
- Align technically and operationally with relevant international standards, including the suite of standards on the 'Sustainability of Construction Works' prepared by the European Committee for Standardisation Technical Committee CEN/TC 350.

[1] Delivering sustainable buildings: Savings and payback (FB 63), Yetunde Abdul and Richard Quartermaine, Published IHS, August 2014
[2] Reports by Maastricht University and Schneider Electric - see http://www.breeam.org/page.jsp?id=224

- Engage with a representative range of stakeholders to inform ongoing development in accordance with the underlying principles and the pace of change in performance standards (accounting for policy, regulation and market capability).
- The aims, objectives and principles of BREEAM are embodied within a Core Technical Standard owned and managed by BRE Global Limited. This is applied through a suite of BREEAM schemes covering aspects of the built environment life cycle.

2.7 Who is behind BREEAM and BREEAM-NOR?

BREEAM is managed and continually developed by BRE Global and supported in certain countries by a number of National Scheme Operators (NSOs). NSO's (like NGBC) are independent organisations who develop and own country specific 'local' schemes that are affiliated to BREEAM.

The founder and owner of the BREEAM brand, BRE Global, is the NSO for the UK. BRE Global also develops and manages the pan-country scheme, BREEAM International. BRE Global is an independent, third-party approvals and certification organisation that is part of the BRE Group. The BRE Group is owned by the BRE Trust, a UK registered research and education charity that works to advance knowledge, innovation and communication in the built environment. The Trust uses all profits made by the Group to fund new research and education programmes.

The operation of BREEAM is overseen by an independent Governing Body and a Standing Panel for Peer & Market Review. The Governing Body represents stakeholders to ensure that BRE Global acts correctly and impartially, and treats customers fairly. The Standing Panel provides access to a range of experts that ensure scientific, technical and market robustness, and that BREEAM's development is open to external and independent scrutiny.

The United Kingdom Accreditation Service (UKAS) have accredited BRE Global Ltd against ISO/IEC 17065 'Conformity assessment - Requirements for bodies certifying products, processes and services'. This can be verified on the UKAS website, and includes BREEAM Scheme SD123 'Environmental assessments of the built environment – certification of the process'.

BRE Global Ltd is also certified to ISO 9001 'Quality management systems – Requirements' for all its BREEAM related activities. BREEAM-NOR is developed by NGBC. NGBC is currently operating BREEAM-NOR under license from BRE Global Ltd. NGBC has developed its own management system to be in line with BRE requirements and in accordance with the framework agreement with BRE.

2.8 The BREEAM family

BREEAM has expanded from a single scheme focusing on individual, UK buildings at the design stage, to a family of international schemes that encompass the whole life cycle of buildings from masterplanning of communities to new constructions, through to in-use and refurbishment of existing buildings.
All BREEAM schemes have a common set of strategic principles and requirements that define an integrated approach to designing, managing, evaluating and certifying the environmental, social and economic impacts of the built environment. It ensures that while BREEAM remains a highly flexible approach, all of the individual schemes share a robust scientific and performance basis.

3 BREEAM-NOR New Construction

The primary aim of the New Construction scheme is to mitigate the negative impacts of new buildings on the environment and improve the positive social and economic impacts of the building over its lifetime. The BREEAM-NOR process allows this to be done in a cost effective, independent and scientifically authoritative manner.

3.1 How to apply the New Construction scheme

Careful timing of the use of BREEAM-NOR is key to cost effectively optimising the building's environmental performance and achieving the desired rating.

A BREEAM-NOR rating reflects the overall performance of the building. This means that the client, design team, principal contractor and BREEAM-NOR Assessor, as well as other specialist disciplines, all have an important role to play in achieving the desired performance level. However, orientating the brief towards sustainability needs to primarily come from the client. To facilitate this, clients and their project teams should preferably engage with a BREEAM Assessor (and/or BREEAM AP) no later than the BREEAM Pre-Assessment Stage (Step 2 in Figure Int-02) – and ideally sooner.

Appointing a BREEAM-NOR Assessor or Accredited Professional early in the project will make it much easier to gain the target rating, whilst retaining the flexibility of design decisions, budgets and potential solutions. Clients can find a list of assessors and Accredited Professionals on the www.byggalliansen.no and on the Green Book Live website www.greenbooklive.com[3] Once an assessor is appointed they can register the project with NGBC at www.byggalliansen.no.

It is worth noting that some BREEAM-NOR credits cannot be achieved if they are not addressed in accordance with specified project work stages. The applicable Bygg 21 Fasenorm step is specified within each of the relevant BREEAM-NOR issues[4].

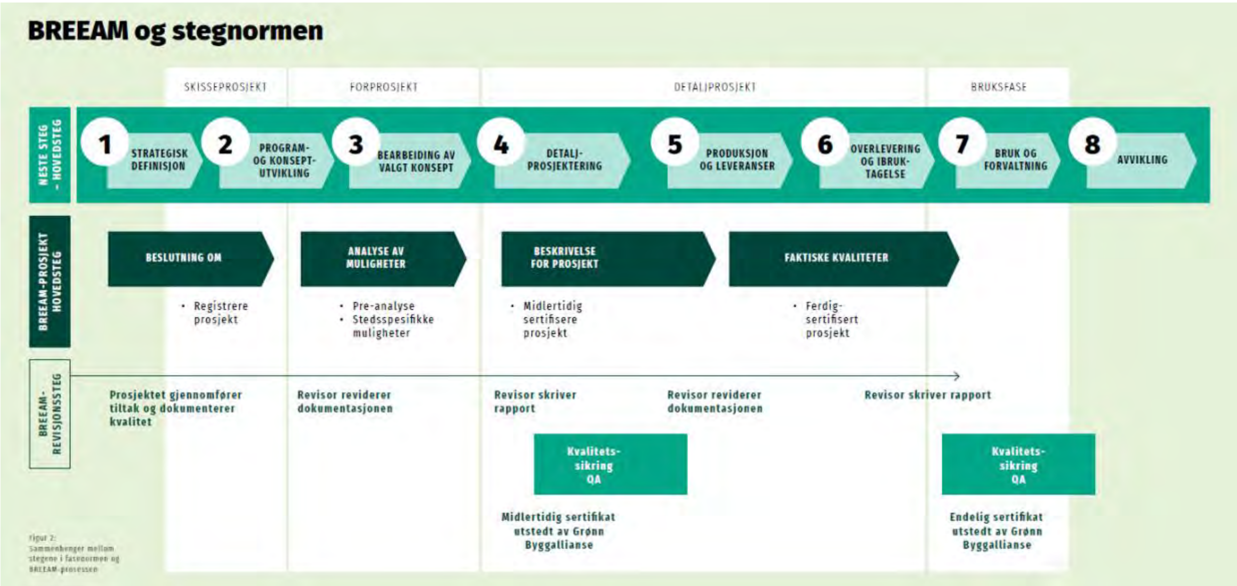


Figure Int-01: BREEAM-NOR assessment and certification stages in relation to the project work stages.

3.2 Verifying a building's certified BREEAM-NOR rating

The BREEAM-NOR certificate provides formal verification that the assessor has assessed a building in accordance with the scheme's requirements, and its quality standards and procedures. A BREEAM-NOR certificate therefore provides assurance to any interested party that a building's BREEAM-NOR rating, at the time of certification, accurately reflects its performance against the BREEAM-NOR standard.

All BREEAM-NOR certified buildings are listed on www.byggalliansen.no and Green Book Live at www.greenbooklive.com (along with a directory of licensed BREEAM-NOR Assessors/Accredited Professionals).

Anyone wishing to verify the BREEAM-NOR rating of a building can do so by either checking a building's BREEAM-NOR certificate, which will contain the certification mark (see Figure Int-03 below), or by searching Green Book Live for a specific listing.

3 Green Book Live is a free-to-use, publicly available online database designed to help specifiers and end users identify products and services that can help to reduce their impact on the environment.

4 FASENORMEN «NESTE STEG» – Bygg21

Figure Int-02: BREEAM-NOR Certification mark

3.3 Maintaining a certified building's performance in use

To maintain the building's performance in use, and to help building managers and users reduce the running costs of their building, regular auditing against BREEAM In-Use Part 1 (Asset Performance), Part 2 (Management Performance) are recommended in the first three years of occupation (with regular reviews to maintain the 'In-Use' rating).

The certified performance of all BREEAM assessed buildings are listed by life cycle stage on the Green Book Live listing website. This is to provide evidence and assurance to the market of the business benefits of building, operating and maintaining buildings to high environmental standards and, it is envisaged, support the drivers for change in the way buildings are procured and operated. This in turn will help meet international obligations and targets on climate change.

Details of the BREEAM In-Use scheme can be found at www.breeam.org/inuse and a list of BREEAM In-Use Auditors is available from www.greenbooklive.com.

3.4 Using BREEAM-NOR Scheme Documents

Scheme documents are produced to enable qualified and licensed BREEAM-NOR Assessors to complete assessments in a quality controlled, rigorous manner.

They will also help BREEAM-NOR Accredited Professionals (AP) to undertake project team facilitation, in terms of defining, monitoring and achieving the desired BREEAM-NOR rating. In addition, it is a reference guide for clients and members of the project team whose proposed building is being BREEAM-NOR assessed.

Note: BREEAM-NOR Scheme Documents are controlled documents and they are only valid on the day they are printed.

Scheme Documents are split in to six parts:

1. Introduction to BREEAM and BREEAM-NOR
2. Scope of the BREEAM-NOR Scheme Document
3. Scoring and rating
4. Assessment criteria
5. Checklists
6. Appendices (A-F)

3.4.1 Scope

The Scope section describes the types of building and stages of assessment that each version of the scheme can be applied to. The scope section can be used by clients, AP's and BREEAM-NOR Assessors to check whether it is the correct BREEAM-NOR Scheme Document to use for their project.

3.4.2 Scoring and rating

The Scoring and rating section outlines the BREEAM-NOR rating benchmarks, the process of establishing national environmental weightings and minimum BREEAM-NOR standards. It also describes how performance and

BREEAM-NOR ratings are calculated from the individual BREEAM-NOR assessment issues and 'credits', including 'Innovation credits.

3.4.3 Assessment criteria

The assessment criteria section includes the assessment issues categorised in ten environmental sections of sustainability (see Table Int-01). Each issue defines a level of performance (the assessment criteria) against which the assessed building demonstrates compliance (using appropriate evidence) in order to achieve the corresponding number of available BREEAM-NOR credits.

The majority of BREEAM-NOR issues are tradable, meaning that a client/design team can pick and choose which to target in order to build their BREEAM-NOR score and achieve the desired BREEAM-NOR rating. Several BREEAM-NOR issues have minimum standards meaning that to achieve a particular BREEAM-NOR rating certain credits or criteria must be achieved (BREEAM-NOR's minimum standards are outlined in section 3 'Scoring and rating').

Each BREEAM-NOR issue is structured as follows:

1. Issue information: contains the assessment issue reference, title, number of credits available for meeting the defined level of performance, whether the issue forms part of BREEAM-NOR's minimum standards.
2. Aim: outlines the objective of the issue and the impact it intends to mitigate.
3. Fully fitted/ shell and core: indicates how the issue is to be used when assessing fully fitted, shell and core and shell only buildings.
4. Building type specific notes: describes any special conditions that must be taken into account when assessing certain building types.
5. Assessment criteria: outlines the good/best practice performance level benchmark(s) and criteria. Where the building complies with the assessment criteria, as determined by the BREEAM-NOR Assessor, the relevant number of BREEAM-NOR credits can be awarded. Some issues have Exemplary Level Criteria; where a building demonstrates that it meets Exemplary Level Criteria additional BREEAM-NOR credits can be awarded for innovation (refer to the 'Innovation' chapter for more detail).
6. Methodology: includes a description of any methodology used to determine the number of credits achieved for a given level of building performance. It includes, for example, calculation procedures or guidance on how to relate non-BREEAM schemes, standards or qualifications referenced to the assessment criteria.
7. Evidence: outlines type of information that must be provided by the design team/client and given to the BREEAM-NOR assessor. This enables the assessor to verify in a robust and rigorous manner the building's performance against the assessment criteria and award the relevant number of BREEAM-NOR credits (refer to Appendix F for further information on BREEAM-NOR's evidence requirements).
8. Definitions: includes definitions of terms used in an issue.
9. Additional information: contains any further information relevant to the application of the assessment criteria, or sources of additional information that may be of use in addressing the issue.

3.4.4 Checklists

The Checklists support the criteria within some of the BREEAM-NOR issues. They are separated from the criteria to allow assessors to use them with the project team as standalone documents.

3.4.5 Appendices

The Appendices provide supporting information relevant to either the scope of the scheme or its assessment criteria.

Table Int-01: BREEAM-NOR New Construction v6.1 sections and assessment issues

BREEAM-NOR v6 sections and issues	
Management	Health and wellbeing
Man 01 Project brief and design Man 02 Life cycle cost and service life planning Man 03 Responsible construction practices Man 04 Commissioning and handover Man 05 Aftercare	Hea 01 Visual comfort Hea 02 Indoor air quality Hea 03 Thermal comfort Hea 05 Acoustic performance Hea 06 Safe and healthy surroundings Hea 08 Private space
Energy	Transport

Ene 01 Building energy performance Ene 02 Energy monitoring Ene 03 External lighting Ene 05 Energy efficient cold storage Ene 06 Energy efficient transportation systems Ene 07 Energy efficient laboratory systems Ene 08 Energy efficient equipment	Tra 01 Transport assessment and travel plan Tra 02 Sustainable transport measures
Water	Materials
Wat 01 Water consumption Wat 02 Water monitoring Wat 03 Water leak detection and prevention Wat 04 Water efficient equipment	Mat 01 Environmental impacts from construction products - LCA and GHG calculations Mat 02 Environmental impacts from construction products – Product requirements Mat 03 Responsible sourcing of construction products Mat 05 Designing for durability and climate adaptation Mat 06 Material efficiency and reuse Mat 07 Design for disassembly and adaptability
Waste	Land use and ecology
Wst 01 Construction waste management Wst 03 Operational waste Wst 04 Speculative finishes	LE 01 Site selection LE 02 Ecological risks and opportunities LE 03 Managing impacts on ecology LE 04 Ecological change and enhancement LE 05 Long-term ecological management and maintenance LE 06 Climate adaptation LE 07 Flooding and storm surge LE 08 Local surface water handling
Pollution	Innovation
Pol 01 Impact of refrigerants Pol 02 Local air quality Pol 04 Reduction of night-time light pollution Pol 05 Reduction of noise pollution	New technology process and practices

3.5 Scope of BREEAM-NOR New Construction

The BREEAM-NOR New Construction schemes can be used to assess the sustainability of new buildings over their life cycle, at the design and construction stages of a project. 'New Construction' (NC) is defined as a development that results in a new standalone structure, or a new extension to an existing structure, which will come into use for the first time when the works are completed.

Prior to the launch of a refurbishment scheme for buildings, clients may continue to apply BREEAM-NOR and certify refurbishment and fit out projects using the method. For guidance please see appendix C.

BREEAM-NOR New Construction has been developed for use in Norway only.

3.6 Building types that can be assessed

Table Int-02 display the building types that can be assessed without additional tailoring with BREEAM-NOR New Construction

Table Int-02: Building types that can be assessed by BREEAM-NOR New Construction.

Building type	Description
Commercial	
Office	- General office buildings - Offices with research and development areas (i.e. category 1 labs only)
Industrial	- Industrial unit – warehouse storage or distribution - Industrial unit – process, manufacturing or vehicle servicing
Retail	- Shop or shopping centre - Retail park or warehouse

	- 'Over the counter' service provider, e.g. financial, estate and employment agencies and betting offices - Showroom - Restaurant, café and drinking establishment - Food takeaway
Public (non-housing)	
Education	- Preschool - Primary and Secondary Schools and sixth form colleges - Further education or vocational colleges - Higher education institutions
Healthcare	- Teaching or specialist hospitals - General acute hospitals - Community and mental health hospitals - Doctor´s surgery - Health centres and clinics
Prison	- High security prison - Standard secured prison - Young offender institution and juvenile prisons - Local prison - Holding centre
Law Court	- Law courts - Court buildings - Family courts - Youth courts - Combined courts
Multi-residential accommodation or supported living facility	
Residential institution (long term stay)	- Residential care home - Sheltered accommodation - Residential college or school (halls of residence) - Local authority secure residential accommodation - Military barracks
Residential	
Residential	- Individual dwelling and collection of individual dwellings/dwelling types - Mullti-residential buildings, for example apartment blocks
Other	
Residential institution (short term stay)	- Hotel, hostel, boarding and guest house - Secure training centre - Residential training centre
Non-residential institution	- Art gallery, museum - Library - Day centre, hall, civic or community centre - Place of worship
Assembly and leisure	- Cinema - Theatre, music or concert hall - Exhibition or conference hall - Indoor or outdoor sports, fitness and recreation centre (with or without pool)
Other	- transportation hub (coach or bus station and above ground rail station) - Research and development (category 2 or 3 laboratories - non-higher education) - Crèche - Fire stations - Visitor centres
Bespoke	- Building types that are not listed in this table must undergo a scoping and tailoring exercise to facilitate an assessment and rating. For an individual project this involves NGBC selecting appropriate issues from the existing pool of assessment issues to provide criteria against which the building can be assessed. This is sometimes known as a 'bespoke' assessment. Further guidance on the 'bespoke' process can be found in NGBC's website www.byggalliansen.no

3.6.1 Mixed use developments/building types

Typically, developments which consist of a number of separate buildings of differing functional types, e.g. office and retail, will require an assessment and therefore BREEAM-NOR rating and certificate for each individual building. Further information on mixed- use assessments can be found in Appendix B – Mixed-use developments and similar buildings (or units).

3.6.2 Similar buildings (or units) on the same site

It is possible to assess a number of separate but similar buildings, or individual units within a larger building development, within one BREEAM-NOR assessor's report. Further information on these assessments can be found in Appendix B.

3.7 Assessment of shell and core/shell only buildings

Shell and core and shell only new buildings, can be assessed using BREEAM-NOR NC. Further details on the application of the scheme to these types of building can be found in Appendix D and in the issues.

3.8 Building life cycle stages that can be assessed

The BREEAM-NOR NC schemes can be used to assess and rate the environmental impacts of newly constructed building developments (including external site areas) at the following life cycle stages:

1. Design Stage – leading to an Interim BREEAM-NOR certified rating
2. Post-Construction Stage – leading to a Final BREEAM-NOR certified rating

3.8.1 Design Stage (DS)

The DS assessment and interim certified BREEAM-NOR rating confirms the building's performance at the design stage. This will ideally occur before operations on site begin. The certified BREEAM-NOR rating at this stage is labelled as 'interim' because it does not represent the building's final, new construction BREEAM-NOR performance.

The design must be advanced to a point where sufficient information is available to enable the BREEAM-NOR 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 (ideally) at the scheme design or detailed design stages.

3.8.2 Post-Construction Stage (PCS)

The PCS assessment and BREEAM-NOR rating confirms the final 'as-built' performance of the building at the new construction stage. A final PCS assessment is completed and certified after practical completion of the building works.
The assessment takes the form of either a post-construction review of an interim design-stage assessment, or a full, 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, a full post-construction stage assessment can be conducted.

3.9 Outside the scope of BREEAM-NOR New Construction Schemes

BREEAM-NOR NC is not designed to assess infrastructure projects, community level masterplanning projects, or the refurbishment, fit-out, operation and deconstruction of existing building.
Information on assessing refurbishment and/or fit out projects can be found in Appendix C.

Existing buildings (occupied/unoccupied) can be assessed and certified using the BREEAM In-Use scheme. See www.byggalliansen.no for more details.

4 Scoring and rating BREEAM-NOR assessed buildings

The elements that determine the overall performance of a new construction project assessed using BREEAM-NOR are as follows:
1. BREEAM-NOR assessment issues and credits
2. BREEAM-NOR rating benchmarks
3. Minimum standards
4. Section weightings
5. Innovation credits
6. Step-related requirements

How these elements combine to produce a BREEAM-NOR rating is summarised below, followed by a description and example of the method of calculating a rating.

4.1 Issues and credits

BREEAM-NOR NC consists of a range of assessment issues spanning the ten technical sections.

Each issue addresses a specific building related environmental impact or occupant-related factor and has a number of 'credits' assigned to it. BREEAM-NOR credits are awarded when a building meets the best practice performance levels defined for that issue i.e. it has mitigated an environmental impact or, in the case of the health and wellbeing section, addressed an occupant-related issue, such as thermal comfort, access to daylight or quality of acoustics.

The number of credits available for an individual assessment issue will vary. Generally, the higher the number of credits on offer, the more important that issue is to mitigating a building's impact. Where there are multiple credits available, the number awarded is usually based on a sliding scale, where progressively higher standards of building performance are rewarded with a higher number of credits.

It is worth noting that assessing a building's performance against the BREEAM-NOR issues also provides users with a credible set of key building performance indicators for a range of embodied, operational and construction impacts. They can be used to define performance levels in support of specific organisational policy objectives for individual environmental issues. However, care should be taken when setting design targets using individual issues, as it can limit design flexibility and have an impact on project costs.

4.2 BREEAM-NOR rating benchmarks

The BREEAM rating benchmarks for new construction projects are described in Table Int-03:

Table Int-03: BREEAM-NOR rating benchmarks

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

A BREEAM-rating enables clients and other stakeholder to compare a building's performance with other buildings BREEAM rated at the same life cycle stage of assessment. In this respect each BREEAM rating broadly represents performance equivalent to:
1. Outstanding: Less than top 1% of new buildings (innovator)

2. Excellent: Top 10% of new buildings (best practice)
3. Very Good: Top 25% of new buildings (advanced good practice)
4. Good: Top 50% of new buildings (intermediate good practice)
5. Pass: Top 75% of new buildings (standard good practice)

An unclassified BREEAM-rating represents performance that is non-compliant with BREEAM, failing to meet either the BREEAM minimum standards for key environmental issues or the overall threshold score required for formal BREEAM certification.

4.3 Minimum standards

To ensure flexibility, most BREEAM-NOR credits can be traded to achieve the target BREEAM-NOR rating i.e.non-compliance in one area can be off-set through compliance in another.

However, to ensure that performance against fundamental sustainability issues is not over-looked in pursuit of a particular rating, BREEAM-NOR sets minimum standards of performance in key areas, e.g. energy, water and waste. It is important to bear in mind that these are minimum acceptable levels of performance and should not necessarily be viewed as levels that represent best practice for a BREEAM –NOR rating level.

To achieve a particular BREEAM-NOR rating, the minimum overall percentage score (given in Table Int-03) must be achieved, and the minimum standards applicable to that rating level complied with – these are detailed in Table Int-04.

Table Int-04: Minimum BREEAM-NOR standards by rating level

Issue	Comment	Pass	Good	Very Good	Excellent	Outstanding
Man 01 Project brief and design					Criterion 1-3	Criterion 1-3
Man 03 Responsible construction practices		Criterion 5-6	Criterion 5-6	Criterion 5-6 Criterion 7-9	Criterion 5-6 Criterion 7-9 Criterion 10-13	Criterion 5-6 Criterion 7-9 Criterion 10-13
Man 04 Commissioning and handover		Criterion 1-4	Criterion 1-4	Criterion 1-4 Criterion 8-9	Criterion 1-4 Criterion 8-9	Criterion 1-4 Criterion 8-9
Man 05 Aftercare	Depending on building type				Criterion 3/4	Criterion 3/4
Hea 01 Visual comfort	Prerequisite: Limitation of light flicker and daylight assessments	Criterion 1-3	Criterion 1-3	Criterion 1-3	Criterion 1-3	Criterion 1-3
Hea 02 Indoor air quality	Prerequisite: Indoor air quality (IAQ) plan	Criterion 1-2	Criterion 1-2	Criterion 1-2 Criterion 4	Criterion 1-2 Criterion 5	Criterion 1-2 Criterion 5
Ene 01 Building energy performance					Criterion 9-10 Criterion 11-12	Criterion 9-10 Criterion 11-12
Ene 07 Energy efficient laboratory systems	Where present in the building	Criterion 1-4	Criterion 1-4	Criterion 1-4	Criterion 1-4	Criterion 1-4
Tra 02 Transport assessment and travel plan					Criterion 1-5 Criterion 6	Criterion 1-5 Criterion 6
Wat 01 Water consumption					Criterion 1-3 (1 credit)	Criterion 1-3 (1 credit)
Mat 01 Environmental impacts of construction products - LCA and green house gas calculations	Prerequisite. Early-stage greenhouse gas calculation	Criterion1-2	Criterion 1-2	Criterion 1-2 Criterion 3 (1 credit)	Criterion 1-2 Criterion 3 (1 credit)	Criterion 1-2 Criterion 3 (2 credits)
Mat 02 Environmental impacts from	Prerequisite: Absence of	Criterion 1	Criterion 1	Criterion 1	Criterion 1	Criterion 1

construction products – Product requirements	environmental toxins					
Mat 03 Responsible sourcing of construction products	Prerequisite: Legal and sustainable timber	Criterion 1	Criterion 1	Criterion 1	Criterion 1	Criterion 1
Mat 05 Designing for durability and climate adaptation	Prerequisite: Risk analysis	Criterion 6-8*	Criterion 6-8*	Criterion 6-8*	Criterion 6-8	Criterion 6-8
Mat 06 Material efficiency and reuse					Criterion 1-3	Criterion 1-3
Mat 07 Disassembly and adaptability					Criterion 2-6	Criterion 2-6
Wst 01 Construction site resource management		Criterion 4 (Minimum requirement)	Criterion 4 (Minimum requirement)	Criterion 1-2 Criterion 4 (Minimum requirement)	Criterion 1-2 Criterion 4 (2 credits)	Criterion 1-2 Criterion 3 (1 credit) Criterion 4 (2 credits)
Wst 03a/b Operational waste					1 credit	1 credit
LE 01 Site selection					Criterion 2	Criterion 2
LE 02 Ecological risks and opportunities	Prerequisite: Statutory obligations			Criterion 2-4	Criterion 2-4	Criterion 2-4
LE 04 Ecological change and enhancement	Prerequisite: Managing negative impacts on ecology					Criterion 1-2 Criterion 3-4
LE 06 Climate adaptation					Criterion 1-6	Criterion 1-6

*Compliance with criterion 6-8 is sufficient. It is not needed to show compliance to the prerequisite in Mat 05.

4.4 Category weightings

Each of the technical sections within BREEAM-NOR has an associated weighting. Weightings provide a means of defining, and therefore ranking, the relative impact of the sustainability issues covered in BREEAM-NOR. BREEAM-NOR uses a weighting system derived from a combination of consensus-based weightings, ranking by a panel of experts. These are used to determine the relative values of the sections used in BREEAM-NOR, and their contributions to an overall BREEAM-NOR score.

The category weighing in BREEAM-NOR is described in Table Int 05. The table shows how weightings may vary depending on the project type. Each of the environmental sections below consists of a differing number of assessment issues and BREEAM credits (as described elsewhere and defined in detail in the technical sections of this scheme document.

Table Int-05: Category weightings in BREEAM-NOR NC

Category	Weighting (%)		
	Fully fitted out	Shell and Core	Shell Only
MANAGEMENT	13%	13%	13%
HEALTH AND WELLBEING	16%	9%	8%
ENERGY	14%	12%	7%
TRANSPORT	10%	12 %	15%
WATER	4%	4%	1%
MATERIALS	17%	20%	24%
WASTE	7%	8%	9%
LAND USE AND ECOLOGY	15%	17%	21%
POLLUTION	4%	5%	2%
INNOVATION	10%	10%	10%

4.5 Innovation credits

One of BREEAM-NOR's aims is to support innovation in the construction industry. The scheme does this by making additional credits available to recognise sustainability related benefits or performance levels that are currently not recognised by standard BREEAM-NOR assessment issues.

In this way BREEAM-NOR rewards buildings that go beyond best practice in terms of a particular aspect of sustainability, i.e. where the building or its procurement has demonstrated innovation.

Awarding credits for innovation enables clients and design teams to boost their buildings' BREEAM-NOR performance and, in addition, helps to support the market for new innovative technologies and design or construction practices.

There are two ways in which BREEAM-NOR awards innovation credits to recognise innovation in building design and procurement.

4.5.1 Exemplary level

The first is by meeting exemplary performance criteria defined in an existing BREEAM-NOR issue, i.e. going beyond the standard BREEAM-NOR assessment criteria and therefore best practice.

Note: not all assessment issues have exemplary performance criteria.

4.5.2 Innovative

The second route is where an application is made to NGBC by the BREEAM-NOR Assessor to have a particular building technology or feature, design or construction method or process recognised as 'innovative'. If the application is successful and building compliance is subsequently verified, an Innovation credit can be awarded.

An additional 1% can be added to a building's overall score for each innovation credit achieved. The maximum number of innovation credits that can be awarded for any one building is ten. Innovation credits can be awarded regardless of the building's final BREEAM-NOR rating, i.e. they are awardable at any BREEAM-NOR rating level.

4.6 Step-related credits

Building 21's phase norm - the next step - is a common framework to support the implementation of construction projects in Norway. The phase norm describes the construction process over time, in eight steps from start to completion. BREEAM-NOR is based on this division of a construction project. Step-related requirements are described in each issue. Table Int-06 provides an overview of the issues that have criteria related to steps in the phase norm. A complete overview of the specific criteria this applies to can be found in the guidance document «How to succeed better with your BREEAM project"[5].

Table Int-06 Issues with step-related requirements

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
Issue	**Strategic Definition**	**Preparation and Brief**	**Concept Design**	**Technical design**	**Construction**	**Handover and close-out**	**In Use**
Man 01 Project brief and design		X	X	X			
Man 02 Life cycle cost and service life planning		X		X			
Man 03 Responsible				X	X	X	

[5] Veileder_Slik-lykkes-du-bedre-med-ditt-BREEAM-prosjekt.pdf (byggalliansen.no)

construction practices							
Man 04 Commissioning and handover			X	X			
Man 05 Aftercare							X
Hea 01 Visual comfort			X				
Hea 05 Acoustic performance			X				
Hea 06 Safe and healthy surroundings			X				
Hea 08 Private space			X				
Ene 01 Building energy performance			X				
Ene 07 Energy efficient laboratory systems			X				
Tra 01 Transport assessment and travel plan			X				
Tra 02 Sustainable transport measures			X				
Mat 01 Environmental impacts from construction products - LCA and GHG calculations			X				
Mat 03 Responsible sourcing of construction products			X				
Mat 05 Designing for durability and climate adaptation		X	X	X	X		
Mat 06 Material efficiency and reuse		X	X	X	X		
Mat 07 Disassembly and adaptability			X	X			
Wst 01 Construction waste management			X				

LE 02 Ecological risks and opportunities		X	X					
LE 03 Managing impacts on ecology			X					
LE 06 Climate adaptation		X		X				
LE 07 Flooding and storm surge		X						
LE 08 Local surface water handling		X						

4.7 Calculating a building's BREEAM-NOR rating

A BREEAM-NOR Assessor must determine the BREEAM-NOR rating using the appropriate assessment tools and calculators. An indication of performance against the BREEAM-NOR scheme can also be determined using a BREEAM-NOR Pre-Assessment Estimator. The Pre-Assessment Estimator is available from the NGBC website www.byggalliansen.no.

The process of determining a BREEAM-NOR rating is outlined below and an example calculation for an assessment achieving a rating “Good” is included in Table Int-07:

1. For each environmental section the number of ‘credits’ awarded must be determined by the assessor in accordance with the criteria of each assessment issue (as detailed in the technical sections of this document).
2. The percentage of ‘credits’ achieved is then calculated for each section.
3. The percentage of ‘credits’ achieved in each section is then multiplied by the corresponding section weighting. This gives the overall environmental section score.
4. The section scores are then added together to give the overall BREEAM-NOR score. The overall score is then compared to the BREEAM-NOR rating benchmark levels and, provided all minimum standards have been met (refer to Table Int-08, the relevant BREEAM-NOR rating is achieved.
5. An additional 1% can be added to the final BREEAM-NOR score for each ‘innovation credit’ achieved (up to a maximum of 10%).

Table Int-07: Example BREEAM-NOR score and rating calculation

BREEAM-NOR Section	Credits Achieved	Credits Available*	% of Credits Achieved	Section Weighting*	Section score
Management	11	21	52%	0.13	7%
Health and wellbeing	11	18	61%	0.16	10%
Energy	10	21	47%	0.14	7%
Transport	8	13	61%	0.10	6%
Water	6	9	67%	0.04	3%
Materials	9	21	43%	0.17	7%
Waste	4	7	57%	0.07	4%
Land use & Ecology	6	18	33%	0.15	5%
Pollution	5	7	71%	0.04	3%
Innovation	0	0	0%	0.10	0%
Final BREEAM-NOR score					52%
BREEAM-NOR rating					GOOD

*This will vary depending on assessment type.

Table Int-08: Minimum standards for BREEAM-NOR ‘Good’ rating achieved?

Emne	Achieved?
Man 03 Responsible construction practices	✓
Man 04 Commissioning and handover	✓
Hea 01 Visual comfort	✓

Emne	Achieved?
Hea 02 Indoor air quality	✓
Ene 07 Energy efficient laboratory systems	✓
Mat 01 Environmental impacts of construction products - LCA and greenhouse gas calculations	✓
Mat 02 Environmental impacts from construction products – Product requirements	✓
Mat 03 Responsible sourcing of construction products	✓
Mat 06 Material efficiency and reuse	✓
Wst 01 Construction site resource management	✓

4.8 Producing case studies for BREEAM-NOR 'Excellent and Outstanding' rated buildings

Projects certified to the BREEAM-NOR 'Excellent' and 'Outstanding' rating should act as exemplars for the industry. If they are to do this, case studies of these projects are needed so that other project teams and clients can refer to them.
Prior to Final Certification the design team and client for BREEAM-NOR 'Excellent' and 'Outstanding' rated projects are asked to provide either a case study of the building or information to allow NGBC to produce a case study. This information will be requested at the final post construction stage and should be provided with the BREEAM-NOR assessor's Final Certification Report.
NGBC will publish the case study on their websites and share this with BRE Global to post on the Green Book Live website and in other BRE/BREEAM-related publications.

5 The EU taxonomy for sustainable finance and BREEAM-NOR

The EU taxonomy for sustainable finance will provide investors with a better basis for strategic investment choices and contribute to a more transparent market for sustainable investment. For an activity to be defined as sustainable, it must contribute significantly to the achievement of at least one of the six Annexes, and do no significant harm in accordance with the other Annexes. In addition, the activity must meet the minimum social safeguards. Since the minimum social safeguards require documentation at business level, these are not included in BREEAM-NOR, which is a certification scheme for buildings.

BREEAM-NOR is adapted to the taxonomy's Annex on mitigation of climate change[6]. The manual contains the taxonomy's technical criteria for significant improvement (Technical Screening Criteria - TSC) for climate change mitigation and the Do No Significant Harm criteria (DNSH). In some cases, the BREEAM-NOR v6.1 criteria will be stricter than the EU taxonomy criteria they reflect.

Since the EU taxonomy Annex 1 was published, the EU Commission has published guidelines on how some of the criteria should be understood (Draft commission notice)[7]. These interpretations are also included in BREEAM-NOR v6.1.

Building projects can use BREEAM-NOR as a guide to verify the EU taxonomy's requirements regardless of certification level. In table Int-09 (see below), an overview is shown of which subjects and criteria accommodate the criteria in the EU taxonomy. All the criteria in this table are entered as minimum requirements for the Excellent and Outstanding certification levels. This means that construction projects that meet the minimum requirements for level Excellent or Outstanding will be able to demonstrate compliance with the technical criteria laid down in the EU taxonomy, as these are formulated and understood at the time of publication.

Norwegian Green Building Council will update this manual and inform users if there are significant changes to the technical criteria laid down in the EU taxonomy. Norwegian Green Building Council has, to the extent that it is reasonable to expect, assessed which requirements follow from the EU taxonomy at the time of publication. Should it turn out that the requirements are not to be understood as Norwegian Green Building Council has expressed in this manual, or that the requirements change at a later date, Norwegian Green Building Council cannot be held

[6] resource.html (europa.eu)
[7] https://ec.europa.eu/finance/docs/law/221219-draft-commission-notice-eu-taxonomy-climate.pdf

responsible for any financial losses as a result of this, unless Norwegian Green Building Council has expelled gross negligence or intent.

BREEAM-NOR related tools such as the pre-assessment estimator tool and the BREEAM-NOR Assessor Report can be used to map compliance. The tools are available on the NGBC website: [Om BREEAM-NOR – Grønn byggallianse (byggalliansen.no)].

Table Int-09 The EU taxonomy for sustainable finance and relation to issues and criteria in BREEAM-NOR

EU taxonomy criteria	Issue	Criterion
Substantial contribution to climate change mitigation		
The building's primary energy demand is at least 10% lower than the threshold set for the NZEB requirements identified in the national implementation of the energy directive.	Ene 01	9 and 12
For buildings larger than 5000 m^2: upon completion, the building resulting from the construction undergoes testing for air-tightness and thermal integrity (284), and any deviation in the levels of performance set at the design stage or defects in the building envelope are disclosed to investors and clients	Ene 01	10
For buildings larger than 5000 m^2: the life-cycle Global Warming Potential (GWP) of the building resulting from the construction has been calculated for each stage in the life cycle and is disclosed to investors and clients on demand	Man 01	3
Do No Significant Harm (DNSH) technical criteria		
Adaptationto climate change. Perform a risk analysis and implement proportionate measures based on best practice and most recent scenarios.	LE 06	1-6
Documenting that the building's sanitary equipment has a low water consumption. This is documented through product datasheets, a building certification or an existing EU product label.	Wat 01	2
Develop a protection management plan to avoid impact from the construction site related to preserving water quality and avoiding water stress. Risks are identified and addressed with the aim of achieving good water status and good ecological potential status.	Man 03 Legislation	5-9
At least 70% by weight of non-hazardous construction and demolition waste generated on site is prepared for reuse, recycling and other material recycling in accordance with the waste hierarchy and the EU Construction & Demolition Waste Management Protocol.	Wst 01	4
Operators limit waste generation in processes related to construction and demolition, in accordance with the EU Construction and Demolition Waste Management Protocol and taking into account best available techniques and using selective demolition to enable removal and safe handling of hazardous substances and facilitate reuse and high-quality recycling by selective removal of materials, using available sorting systems for construction and demolition waste.	Wst 01 Mat 06	1 and 4 1
Building designs and construction techniques support circularity and in particular demonstrate, with reference to ISO 20887 or other standards for assessing the disassembly or adaptability of buildings, how they are designed to be more resource efficient, adaptable, flexible and dismantleable to enable reuse and recycling.	Mat 07	2-6
Building components and materials used in the construction are in accordance with the EU regulations for hazardous substances (REACH).	Mat 02	1

Building components and materials used in the construction and which can come into contact with users are low-emitting with regard to formaldehyde and carcinogenic VOC's.	Hea 02	5
Where the new construction is located on a potentially contaminated site (brownfield site), the site has been subject to an investigation for potential contaminants, for example using standard ISO 18400 .	Legislation	-
Measures are taken to reduce noise, dust and pollutant emissions during construction or maintenance works.	Man 03 Legislation	5-6
An Environmental Impact Assessment (EIA) or screening has been completed. The required mitigation and compensation measures for protecting the environment are implemented. For sites located in or near biodiversity-sensitive areas, an appropriate assessment, where applicable, has been conducted and based on its conclusions the necessary mitigation measures are implemented.	LE 02 Legislation	2-4
The new construction is not built on sites that are defined as a. Arable land and crop land, b. Land of recognised high biodiversity value or habitat of endangered species, or c. Land matching the definition of forest.	LE 01 LE 02 Legislation	2 2-4

Management

Summary

This category encourages the adoption of sustainable management practices in connection with design, construction, commissioning, handover and aftercare. This ensures that robust sustainability objectives are set and followed through into the operation of the building. Issues in this section focus on embedding sustainability through the key stages of design, procurement and initial occupation, from the initial project brief stage to the appropriate provision of aftercare.

Category summary table

Issue	Credits	Aim
Man 01 project brief and design	5	The project management shall set and implement sustainability goals, with relevant measures and responsibilities for the entire project
Man 02 Life cycle cost and service life planning	3	To promote the business case for sustainable buildings and to deliver whole life value by encouraging the use of life cycle costing to improve design, specification, through-life maintenance and operation.
Man 03 Responsible construction practices	7	To recognize and encourage construction sites which are managed in an environmentally and socially considerate, responsible and accountable manner, and with lowest possible emissions
Man 04 Commissioning and handover	3	To encourage a properly planned handover and commissioning process of technical installations that reflects the needs of the building occupants
Man 05 Aftercare	3	To provide post-handover aftercare to the building owner or occupants during the first year of occupation to ensure the building operates and adapts, where relevant, in accordance with the design intent and operational demands

Man 01 Project brief and design

Number of credits available	Minimum standards				
	P	G	VG	E	O
5	–	–	–	Crit. 1–3	Crit. 1–3

Aim

The project management shall set and implement sustainability goals, with relevant measures and responsibilities for the entire project.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable Assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into five parts:

- Planning project delivery (1 credit)
- Greenhouse gas calculation for the whole life cycle of the building (1 credit)
- Third party stakeholder consultation (1 credit)
- BREEAM-NOR AP (step 2 and 3) (1 credit)
- BREEAM-NOR AP (step 4) (1 credit)

Planning project delivery - 1 credit

1. Prior to concept design, project delivery stakeholders (see definitions) must:
    a. Prepare an overview of constraints for the project (see Methodology)
    b. Decide on sustainability objectives and targets based on the constraints found under 1a. Examples of relevant objectives can be BREEAM rating, emission-free construction site, energy performance, user satisfaction, greenhouse gas reduction, climate adaptation, biological diversity, etc.
    c. Establish an overall step plan (see Method) based on the guide “Neste steg”, where steps 2–6 must be defined and the project adapted for the various parts of the building (e.g. load-bearing system, building envelope, technical facilities, etc.). The step at which critical assessments and decisions related to the sustainability goals and measures must be implemented, as well as who (roles/ consultants) must be involved, must be clearly shown The roles and responsibilities of the project delivery stakeholders shall also be addressed here.
    d. Integrate sustainability goals in relevant project delivery documents such as decision plans, progress plans, purchasing plans, etc.
    e. Communicate sustainability goals and constraints, as well as the overall step plan internally (see Definitions) during the project.

Greenhouse gas calculation for the whole building life cycle – 1 point

2. The project team must establish an overall greenhouse gas budget (see Methodology) in order to illustrate the project's greenhouse gas emissions. The greenhouse gas budget shall be presented to the developer no later than by step 3. The greenhouse gas budget shall be part of the basis for deciding sustainability goals with associated measures in the project, cf. criterion 1.
3. Post-construction, greenhouse gas accounts with as-built data shall be reviewed by the project team. Any sustainability goals that are related to greenhouse gas emissions and that have not been achieved must be accounted for and reported to the developer.

Third party stakeholder consultation – 1 credit

4. Prior to completion of step 3 the design team (see Definitions) must have consulted all relevant third party stakeholders (see Definitions). See methodology for minimum requirements for consultation content.
5. The project must demonstrate how stakeholder contributions and outcomes of the consultation exercise have influenced or changed the project
6. During step 4, consultation feedback (see Definitions) from the involved stakeholders must be sent.

BREEAM-NOR AP (step 2 and 3) – 1 credit

7. A BREEAM-NOR AP must be appointed during step 2 to facilitate the setting and achievement of the performance targets for the project.
8. The BREEAM performance targets(see Definitions) must have been formally agreed (see Methodology) between the client and the design or project team no later than the concept design work step (step 3).
9. To achieve this credit, the agreed BREEAM performance targets must be achieved. This must be demonstrated via the BREEAM Assessor reporting tool.

BREEAM-NOR AP (step 4) – 1 credit

10. Criteria 8-9 must be achieved
11. A BREEAM-NOR AP must be appointed to monitor progress against the agreed BREEAM performance targets throughout step 4 and formally report progress to the client and the design team (see Methodology).
12. The BREEAM-NOR AP must attend key project and design team meetings during step 4 (see Methodology).

Methodology

M1 Planning project delivery

M1.1 Project constraints

The overview of project constraints will form the basis and guide the project's sustainability goals. They must be at an overall level and include as a minimum:

- Regulatory requirements. For example, building regulations, heritage requirements, regulatory provisions, legal requirements, etc.
- Requirements from developer and tenant (if known).
- Operating conditions. For example, level of knowledge of users and operating personnel
- Economic conditions. For example, budget, purchasing requirements, suppliers, etc.

The aim of obtaining an overview of project constraints is to ensure that the various requirements are not contradictory and to agree on which conditions should guide the project. Several examples of areas that can also help to set project constraints can be:

- Project/construction time frame
- Purpose of the design and the design strategy
- Special requirements and restrictions in connection with installation and construction
- Risk assessment for design and construction

- The future user's budgetary framework and technical ability to perform maintenance
- Degree of maintenance friendliness and adaptability
- Requirements for project and FDV documentation (management, operation and maintenance)

The constraints must be sufficiently clear to ensure that the project's sustainability goals can be turned into concrete and preferably measurable goals.

M1.2 Overall step plan

"Neste steg" is a framework that describes construction processes over time, in eight steps from start to completion. The purpose is to develop a common norm for step division in construction projects and that this guide can be used to describe the project's implementation model. See https://bygg21.no/resultater/fasenormen-neste-steg/

An overall step plan based on this guide can be used when discussing tasks, responsibilities and roles in project implementation. The project must define those activities that define the transition from one step to the next, in order to make it easier to clarify which personnel are to be appointed at the correct step of the construction process, thereby saving both time and money.
The guide "how to succeed with your BREEAM project" is a useful tool that can help plan the environmental measures at the right time: https://byggalliansen.no/kunnskapssenter/publikasjoner/prosessveileder-breeam-gronn-byggallianse/

M1.3 Internal communication

Examples of ways to communicate project constraints, sustainability goals and the overall step plan could include brief presentations or an interactive introductory course that is communicated to all existing and new project participants. Alternatively, reference should be made to the procedure for sharing information in connection with start-up meetings, start-up of new meetings, etc.

M2 Greenhouse gas calculation for the whole building life cycle

M2.1 Greenhouse gas budget

The construction sector is an important sector for Norway to achieve its environmental goals. That recognition is not always obvious, since the sector, for example, has low direct greenhouse gas emissions. But the construction sector is a customer of both the industrial, transport and energy supply sectors and therefore has a great opportunity to influence these. Building owners, and especially professional building owners, also have a great opportunity to influence the rest of the construction sector as customers of architects, consultants, contractors and construction product manufacturers. If building owners choose to build and manage more sustainably, they will be able to influence many actors and unleash a great environmental potential. Through its ordering role, the developer and each individual project are of great importance for emissions from these sectors as well.
https://byggalliansen.no/kunnskapssenter/publikasjoner/kunnskapssenter-publikasjoner-roadmap2050/

By preparing a greenhouse gas budget in the early phase (step 3), this can be used to set climate goals and help to specify the sustainability goals and strategies in the project. The comprehensive calculation of a building's greenhouse gas emissions through the building's life cycle provides an opportunity to identify measures to reduce greenhouse gas emissions from both a short and a long-term perspective.

To ensure a holistic approach to the management of greenhouse gas emissions, a project that sets up a comprehensive greenhouse gas account that calculates emissions related to the following modules during the life of the building will be rewarded. The scope of calculations shall be:

1. Production of materials, A1–A3 (see Mat 01)
2. Transport of materials to the construction site, A4 (see Mat 01)
3. Production of materials waste in the construction process, A5 (see Mat 01)
4. Energy consumption on the construction site, A5 (see Man 03)
5. Future use, maintenance, repair, replacement and refurbishment, B1-B5 (for B2 and B4, see Mat 01)
6. Energy consumption in operations, B6 (see Ene 01)

7. Operational transportation, B8 (see Tra 01)
8. End of life cycle, C1–C4

The scope of 1-6 + 8 above shall align with the scope "Basis, not localised" (Basis, uten lokalisering) in NS3720: 2018 Method for greenhouse gas calculations for buildings. Scope B8 is included to complete the life cycle perspective.

See Methodology in the respective credits for how greenhouse gas emissions are to be calculated. In reference to Mat 01, the scope is described in M1, early-step calculations. Where no specific provisions are specified in the various courses, NS3720: 2018 Method for greenhouse gas calculations for buildings shall be used.

M2.2 Greenhouse gas calculations

Post-construction, a comprehensive greenhouse gas account with as-built data must be presented. The scope must be similar for the greenhouse gas budget, see above. The results must be registered in the BREEAM auditor tool

The project management must review the results and see how they correspond with or deviate from the sustainability goals of the project. Any discrepancies must be reported to the developer.

BREEAM-NOR recognises that greenhouse gas calculations are a developing field. The project may use FutureBuilt ZERO version 2.0, dated 14.06.2021 to document the project's total greenhouse gas emissions under this credit. In FutureBuilt ZERO method note version 2.0, 14.06.2021, the assumptions and deviations from NS3720: 2018 are explained in detail. The memorandum can be found on FutureBuilt's website: https://www.futurebuilt.no/FutureBuilt-quality criteria

M3 Third party stakeholder consultation

A process related to the involvement of external stakeholders will lead to valuable contributions and more rooted project. Feedback must be given to external stakeholders on how the contributions have been handled, even though such a consultation may result in a specification/project in which not all the desires of the involved parties have been fulfilled.

M3.1 Consultation content

Minimum consultation content will depend on the building and scope of the project, 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, visitors and users)
3. Management and operational implications
4. Maintenance resources implications
5. Impact on the local community, e.g. local traffic and transport impact
6. Opportunities for shared use of facilities and infrastructure with the local community and appropriate stakeholders
7. Compliance with statutory (national or local) consultation requirements
8. Energy use and sustainability measures
9. Inclusive and accessible design

In the case of educational types of buildings, minimum content should also include:

10. How the building and grounds could best be designed to facilitate learning
11. Where the scope of works involves changes to the internal layout and function, the consultation must consider how the design can best 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 should also include:

12. The end users' broad requirements for such facilities, including appropriate sizing, optimisation and integration of equipment and systems.

In the case of transportation hubs, minimum content should also include:

13. How to ensure a smooth, safe and secure transition between different modes of transport (air, rail, road, bike and pedestrian, recognising the diversity of user needs, including people of all ages and abilities).

M4 BREEAM-NOR AP

M4.1 BREEAM-NOR-AP

The role of BREEAM-NOR-AP is to support and promote the project group's efforts, contribute to achieving set goals and collaborate in and outside the project so that the desired classification is achieved in the formal audit. It is therefore essential that BREEAM-NOR-AP is engaged in the project as early as possible and is invited to key design team meetings.

A BREEAM-NOR-AP may not be the same person as the BREEAM Assessor. This is to avoid any conflict of interest with regard to auditing. However, a BREEAM-NOR AP may be from the same organisation/company in a project as the BREEAM Assessor. Any conflicts of interest in the project that an assessor is auditing must be assessed continuously, and it is the assessor's responsibility to assess and manage this.

A BREEAM-NOR AP must prepare a pre-assessment estimator to show how the planned goals will be achieved. Here, the AP must place special emphasis on criteria that depend on what step in the process they are implemented (step-dependent criteria) and focus on these together with the project team.

It should be expected that a BREEAM-NOR AP will work efficiently and will cooperate with the BREEAM Assessor to ensure an effective assessment process with a view to maximising the performance of the assessed project.
An additional credit will be awarded for appointing a BREEAM-NOR AP during step 5 (see BREEAM issue Man 03). The aim of the credit in Man 03 is to encourage and reward contractors and project teams that appoint a BREEAM-NOR AP and therefore ensure continuation of the sustainability objectives during step 5, and that the constructed building meets the client's target BREEAM rating.

M4.2 Formally agreed

The term 'formally agreed' relates to BREEAM performance targets. Examples of formal agreements include a contract or letter of appointment with the architect and other relevant project team members.

The project team, including the client, must adopt performance targets early enough to ensure an uncomplicated process without unnecessary obstacles and increased cost, in order to meet the criteria at a later step. This is to ensure that the performance targets affect the entire project.

M4.3 Reporting

In order for a BREEAM-NOR AP to be able to measure progress and provide feedback, the steps according to the "next step" must be clearly defined in the project, other relevant project documents must be available and the BREEAM-NOR AP must be invited to relevant project meetings throughout the project.

M4.4 Key design team meetings

Key design team meetings can be defined as those meetings in which fundamental decisions that influence or affect the building's proposed design and its construction in accordance with the design (and therefore the building's sustainability impacts and BREEAM performance), are discussed and made. These meetings would typically include representatives from at least three of the parties listed below:

1. Representatives of the client or developer
2. The principal contractor
3. The architect
4. Structural engineers
5. Building services engineers

6. Cost consultants
7. Environmental consultants
8. Project management consultants

Evidence

Criteria	Interim design stage	Final post-construction stage
1	A confirmation / obligation from the developer that targets, plans and documentation in accordance with the criteria and methodology will be made during step 3. Applies in those cases where the relevant contractor is not selected ----------------- OR Documentation showing the contractual obligations of the relevant parties to set goals, plans and documentation to comply with criteria and methodology. ----------------- OR Documentation showing: – The project's constraints – The project's goals and sustainability measures – Overall step plan - How sustainability goals are linked to the steps and implemented in the relevant project delivery tools - How constraints, goals and sustainability measures and the overall progress plan are communicated in the project	As interim design stage.
2 - 3	A confirmation / obligation from the developer that a greenhouse gas budget and account in accordance with the criteria and methodology. Applies in those cases where the relevant actor is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to prepare a greenhouse gas budget and account in accordance with the criteria and methodology. ----------------- OR Documentation showing how the greenhouse gas budget is presented to the client and how it is used for deciding sustainability goals.	Documentation showing which sustainability goals are connected to the greenhouse gas calculations, and whether these have been fulfilled. Where there are deviations from the goals, the project team must explain why and document that this has been presented to the client/developer. AND One of the following two options: 1. Greenhouse gas calculations in line with method descriptions and based on as-built data. 2. Documentation must show compliance with the criteria and method requirements in FutureBuilt ZERO version 2.0, dated 14.06.2021 and based on post-construction values.

	AND one of the following two options: 1. Greenhouse gas calculation in accordance with NS 3720: 2018 and in line with the method description under the respective issues. 2. Documentation showing compliance with the method requirements in FutureBuilt Zero version 14.06.2021	The assessor reports $kgCO_2eq/m^2$/year in the assessor tool
4 - 6	A confirmation / commitment from the developer that relevant external stakeholders will be involved in accordance with the criteria and method. Applies in those cases where the relevant actor is not selected --------- OR Documentation showing which external stakeholders are involved, and why these are relevant. Overview of completed meetings, supplemented with a selection of agendas or minutes from meetings or other correspondence showing involvement.	As interim design stage. AND Documentation showing how different input from external stakeholders has affected the design. AND Documentation showing feedback given to external stakeholders.
7	A confirmation / obligation from the developer that a BREEAM-NOR AP will be appointed in step 2. Applies in those cases where the relevant party is not selected. --------- OR Dated contract or letter of appointment for the BREEAM-NOR-AP	As interim design stage.
8	A confirmation / obligation from the developer that a requirement for a fulfilled BREEAM level will be set. Applies in those cases where the relevant party is not selected. --------- OR Relevant sections or clauses in the requirements specification or contract that specify the decided BREEAM level. BREEAM-NOR pre-assessment estimator for steps 2 and 3, with associated confirmation of the status of each credit with special focus on step-dependent credits. The BREEAM-NOR Assessor Report with completed values	As interim design stage.
9	The BREEAM-NOR Assessor Report with completed values	The BREEAM-NOR Assessor Report with completed values

10–12	A confirmation / obligation from the developer that the pre-assesment estimator will be continuously updated and BREEAM-related performance targets will regularly appear on the agenda. Applies in those cases where the relevant party is not selected. --------- OR BREEAM-NOR pre-assessment estimator for step 4, with accompanying confirmation of the status of each credit. Meeting notes or minutes, registered correspondence or the like that can show that BREEAM-related performance targets regularly appear on the agenda, and that a BREEAM-NOR AP is present.	As interim design stage

Definitions

D1 BREEAM-NOR AP Accredited Professional

An individual trained and qualified by Grønn Byggallianse as a specialist in built environment sustainability, environmental design and assessment. The role of the BREEAM AP is to facilitate the project team's efforts to successfully schedule activities, set priorities and negotiate the trade-offs required to achieve a targeted BREEAM rating when the design is formally assessed. Only qualified individuals who are approved by Grønn Byggallianse as an AP comply with the BREEAM requirements. This ensures that an adequate level of expertise is maintained through regular ongoing professional development in relevant fields of knowledge. For a list and contact details of BREEAM-NOR APs, visit: www.byggallianse.no

The AP does not have to be the same person throughout the process. However, they need to keep records of targets, reasons behind decisions, risks, etc. and ensure that these are handed over if a new AP joins the team.

D2 BREEAM-related performance targets

BREEAM performance targets refer specifically to the BREEAM rating and minimum standards required. This does not necessarily include individually targeted BREEAM issues or credits, which may be traded over the course of the project as it evolves. In agreeing to a BREEAM target, it is recommended that individual BREEAM issues, credits and criteria are targeted or prioritised. This is to ensure that the agreed target is achievable and achieved without potentially costly modifications to the design at a later stage.

D3 Project delivery stakeholders

Project delivery stakeholders include representatives of:

1. the client
2. the building occupier (where known)
3. the design team and
4. the principal contractor (where known).

With regards to contractors' involvement, this ensures their input in terms of formulating sustainable design solutions, commenting on the practicality and buildability of (one or more) design solutions and their impact on programming, costs, etc. The representative for the works may be an appointed contractor, or where the contractor is not yet appointed, a person with experience from similar projects.

D4 Project group

The composition of the project group can change during the project and typically contains several members. The members can include the client, planners and contractors.

D5 Relevant third party stakeholders

This includes, but is not limited to the following:

1. Actual or intended building users (if known) including facilities management (FM) staff or those responsible for the day-to-day operation of the building and grounds
2. A representative group/organisation from the existing local community
3. Existing partnerships and networks that have knowledge and experience of working on existing buildings of the same type
4. Potential users of any shared facilities, e.g. operators of clubs and community groups

AND the following, where relevant:

5. In educational buildings, representatives of local education authorities, school district, parent working committee (FAU)
6. Local conservation authorities (city antiquarian, cultural heritage manager, antiquarian expert, cultural heritage adviser or consultant associated with the municipality in which the building is to be built) or local/national history or heritage groups
7. Specialist service and maintenance contractors and representatives where the building function has specific technical requirements in complex environments, e.g. buildings containing laboratories
8. For stations, passenger focus groups, train and station operations groups.

D6 Consultation feedback

This is feedback that focuses on stakeholder suggestions, comments, recommendations and consultation outcomes. This includes how the suggestions and outcomes influenced or resulted in modifications to the proposed design and building operation and use.

Additional information

None.

Man 02 Life cycle cost and service life planning

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	–	–	–	–	–

Aim

To promote the business case for sustainable buildings and to deliver whole life value by encouraging the use of life cycle costing to improve design, specification, through-life maintenance and operation.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	See ref. 1.0 See Appendix D	See ref. 1.0 See Appendix D

Assessment type specific notes	
1.0	The component level LCC plan must include all component types installed by the developer.

Building type specific notes

Building type specific notes	
2.0	Law court buildings – Responsibility for complying rests with any or all of the project team and is likely to vary depending on the procurement route used. The project team includes the Ministry of Justice.

Assessment criteria

This issue is split into two parts:

- Elemental life cycle cost (LCC) and capital cost reporting (2 credits)
- Component level life options appraisal (1 credit)

Credits for each one of the two parts must be awarded independently of one another.

Elemental LCC and Capital cost reporting – Two credits

1. The project must carry out an outline and an entire asset LCC plan (see Definitions) during step 2 together with at least two design option appraisals in line with ISO 15686-5:2017 or NS3454:2013 (see Methodology).
2. Elemental LCC plan (see Methodology):
   a. Must be conducted by a person who is familiar with the chosen standard (see above) and is not professionally connected to any manufacturer.
   b. Must provide an indication of future replacement costs over the period of analysis as required by the client
   c. Must include service life, maintenance and operation cost estimates.
3. It must be demonstrated, using appropriate examples provided by the design team, how the elemental LCC plan has been used to influence design (e.g. building, systems or integrated design) to minimise life cycle costs an maximise critical value (see Definitions)
4. The capital cost of the building (see Methodology) must be reported to the assessor’s BREEAM scoring and reporting tool.

Component level LCC options appraisal – One credit

5. The project must develop a component level LCC options appraisal during stage 4 in line with ISO 15686-5:2017 or NS 3454:2013. The LCC calculations for alternatives within a component must include the following (where present) (see Methodology):
   a. External envelope, e.g. cladding, windows, roofing or insulation thickness
   b. Services, e.g. heat source, cooling source, lightning, PV system, SFP-factor reducing equipment, or controls
   c. Internal finishes, e.g. walls, floors or ceilings
   d. External spaces, e.g. alternative hard landscaping, boundary protection or green structures
6. It must be demonstrated, using appropriate examples provided by the design team, how a component level LCC options appraisal has been used to influence design (e.g. building, systems or integrated design) to minimise life cycle costs and maximise critical value (see Definitions).

Methodology

ISO 15686-5:2017 Buildings and constructed assets — Service life planning — Part 5: Life-cycle costing and NS3454:2013 Life cycle costs for construction works – Principles and classification describe the standardised method for calculation of life cycle costs for the construction industry. The objectives of these standards are to provide:

1. LCC practitioners with a standardised method of applying LCC, applicable to the Norwegian construction industry and to the key stages of the procurement process.
2. Process mapping of the LCC stages – to help structure how to plan, generate, interpret and present the results for a variety of different purposes and levels of life cycle cost planning.
3. Instructions on how to define the client's specific requirements for LCC and the required outputs and forms of reporting – and to decide on which method of economic evaluation to apply.
4. Simplification and demystification – by providing practical guidance, instructions and definitions, together with informative worked examples on how to undertake LCC (for construction).
5. An industry accepted methodology to facilitate a more accurate, consistent and robust application of LCC estimation and options appraisals, thereby creating a more effective and robust basis for LCC analysis and benchmarking.

ISO 15686-5:2017 also seeks to help eliminate confusion over scoping and terminology and to address concerns over the uncertainty and risks that are undermining confidence in the life cycle costs used for construction procurement.

When using NS 3454:2013, it is recommended, as described in ISO 15686-5, to complement calculations with an uncertainty and risk analysis.

Where the building is constructed to a pre-defined standard specification, LCC elemental plan for this specification should be used to help demonstrate compliance.

M1 Elemental LCC and Capital cost reporting

M1.1 Elemental LCC

This is commonly used for developing solutions at project level during options appraisals. Costs are normally at a building elemental level for the entire asset. Information may be a mix of typical benchmark costs for key elements, comparative cost modelling or approximate estimates.

The client should ideally agree the study period, in line with the design life expectancy of the building. However, where the life expectancy of the building has not yet been formally agreed (due to being at a very early design stage), a default design life of 60 years should be used for modelling purposes.

Based on the elemental LCC, relevant alternative studies can be carried out at concept level. Calculations must therefore be made when concepts and alternatives for the project as a whole are under appraisal. Examples of concepts that can be considered are energy supply, ventilation concept (hybrid/mechanical), facade concept, the building's compactness and shape factor, sustainability ambitions, energy level beyond regulatory requirements, central/decentralised tap water, design to reduce the SFP factor, rehabilitated vs. new build, etc. Two or more alternatives should be considered within a concept.

The options selected to minimise life cycle costs and maximise critical value shall be appropriate in terms of their relative impact on project costs, future building maintenance burden and size (volume or area) and project stage. Selected alternatives will typically affect the building design and specifications to a great extent.

At stage 2, when considering the outputs from the elemental LCC plan, examples could be in the form of elemental appraisals (where appropriate) and descriptions of evolutions in concept design, supported by calculations and explanations of how life cycle costs will be reduced and/or how critical value will be maximised with the chosen concepts.

M1.2 Capital cost reporting

At the design stage, if the final information is not available, the credit should be awarded if the client provides the predicted capital cost, including contingencies, and commits to providing this information for the final assessment stage. At the post-construction stage, if the final capital cost is not known, the client's or cost consultant's best estimate should be provided.

The capital cost for the building includes the expenses related to the initial construction of the building:

- Construction, including preparatory works, materials, equipment and labour
- Site management
- Construction financing
- Insurance and taxes during construction
- Inspection and testing

Costs related to land procurement, clearance, design, statutory approvals and post-occupancy aftercare are not included.

This data will be anonymised and used to inform future BREEAM performance benchmarking. See Additional information for details.

M2 Component level LCC options appraisal

An assessment of LCC costs in step 4 or earlier is something that is normally used as a decision basis for the choice of components, product types or specific products at building component level. An LCC assessment at the building component level can be carried out when important boundary conditions (such as the local environment and other local conditions) and project-specific requirements for performance over the life cycle of the building have been determined. The following must be decided on and taken into account in the calculation:

- What is the expected service life of the building (as opposed to the contractual service life)?
- What is the minimum expected functional performance for each building component over the life of the building?
- Are there any requirements for building components that it must be possible to repair, maintain or replace over the complete life cycle of the building?

The component level LCC option appraisal should review all of the described component types (where present). However, it is not necessary to consider every single example cited under each component, only a selection of those most likely to draw valued comparisons. This is to ensure that a wide range of options are considered and help focus the analysis on components that would benefit the most from appraisal. The options selected to minimise life cycle costs and maximise critical value shall be appropriate in terms of their relative impact on project costs, future building maintenance burden and size (volume or area) and project stage.

Only key differentiations between components and systems need to be comparatively modelled. For alternatives that influence the energy use of the building, both energy and effect costs (see Definition) should be taken into account.

At stage 4, when considering the outputs from the component level option analysis, examples are likely to be in the form of component specifications coupled with calculations and justifications for their selection (i.e. how they reduce life cycle costs or maximise critical value).

Evidence

Criteria	Interim design stage	Final post-construction stage
1–2	Documentation showing that an elemental LCC plan has been conducted in accordance with the criteria Elemental LCC plan	As per interim design stage.
3	A confirmation / obligation from the developer showing how the elemental LCC plan has affected the project. Applies in those cases where the relevant actor is not selected. -------- OR Documentation showing the contractual obligations of the relevant parties to show how the elemental LCC plan has affected the project. -------- OR Documentation showing how the elemental LCC plan has affected the project.	Documentation showing how the elemental LCC plan has affected the project.
4	The BREEAM-NOR Assessor Report with completed values.	The BREEAM-NOR Assessor Report with completed values.
5–6	A confirmation / obligation from the developer to calculate life cycle costs for the assessed alternatives during step 4 and show how the calculations have affected the design in line with the criteria. Applies in those cases where the relevant actor is not selected. -------- OR Documentation showing the contractual obligations of the relevant parties to calculate life cycle costs for the assessed alternatives during step 4 and show how the calculations have affected the design in line with the criteria -------- OR Documentation showing that the calculation of life cycle costs has been performed for the assessed alternatives and is in line with the criteria	As per interim design stage with as-built data AND Documentation showing how the calculations have affected the design during stage 4

Definitions

D1 Effect cost

In Norway, the energy price is based on an energy link, a fixed link and an effect link. Effect links are used to cover costs for grid development, since the grid must be dimensioned for the highest power output, regardless of energy consumption over time. The effect link is calculated on the basis of the customer's power output in defined periods, and these are effect costs. Pricing of effect and energy combined determines the most competitive solution in an LCC perspective.

D2 Critical value

Critical value aims to maximise the whole life value of the building based on the client's requirements and differs from minimising life cycle cost. This is a more specific analysis of how the building's ongoing maintenance and operation can impact business needs. For instance:

- Where any disruption to business is costly, a specification with extended periods between maintenance cycles and reduced maintenance time may be desirable.
- Where maintaining aesthetics is important, a maintenance cycle may be based on aesthetic upkeep rather than functional lifespan.
- Where maximum recyclability and re-usability are important, an alternative and more costly specification may be required.
- Where capital costs are constrained, the specification with the lowest LCC may not be affordable, and instead, the best available option within the budget could be chosen.

Examples of how critical value can be maximised are not limited by the list above and vary from project to project. Assessment of critical value will be an aid in assessing how the value over the life cycle of the building can be maximised.

D3 Life cycle costs

The cost of a building component/building throughout its life cycle, while fulfilling the performance requirements; a methodology for the systematic economic evaluation of life cycle costs over the period of analysis, as defined in the agreed scope.

Additional information

T1 Capital cost reporting

The lack of data related to capital and life cycle costs and benefits arising from a more sustainable building design presents a major barrier to the uptake of more sustainable solutions. This part of the issue seeks to encourage the sharing of data to break down these barriers and to ensure that BREEAM continues to encourage cost-effective and financially beneficial solutions. This information is collected to assist research into the cost and savings of developing sustainable or BREEAM-assessed buildings, to inform the business case for sustainability and the ongoing development of BREEAM. All data submitted will be treated as confidential and will only be used anonymously.

Man 03 Responsible construction practices

Number of credits available	Minimum standards				
	P	G	VG	E	O
7	Crit. 5–6	Crit. 5–6	Crit. 5–6 Crit. 7–9	Crit. 5–6 Crit. 7–9 Crit. 10–13	Crit. 5–6 Crit. 7–9 Crit. 10–13

Aim

To recognise and encourage construction sites which are managed in an environmentally and socially considerate, responsible and accountable manner, and with lowest possible emissions.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable Assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into five parts:

- Environmental management (1 credit)
- BREEAM-NOR AP and performance targets (step 5 and 6) (1 credit)
- Responsible construction practices (up to 2 credits)
- Reduction of greenhouse gas emissions from activities associated with the construction site (up to 3 credits)
- Exemplary level credit: Limitation of direct emissions from construction sites (1 credit)

Environmental management – 1 credit

1. All parties (see Definitions) who at any stage manage the construction site (see Definitions) must operate a third party certification system (see Definitions) covering their main operations.

BREEAM-NOR AP and BREEAM performance targets (step 5 and 6) – 1 credit

2. A BREEAM-NOR AP (see Methodology and Definitions) must be appointed to monitor the project to ensure ongoing compliance with BREEAM targets during step 5 and 6. The BREEAM-NOR AP must monitor site activities at sufficient intervals (see Methodology) to ensure that the risk of non-compliance is minimised. They must report on progress at relevant project team meetings, including identifying potential areas of non-compliance and any measures needed to mitigate the non-compliance.
3. The defined BREEAM performance target forms the basis of the principal contractor's contract
4. To achieve this credit at the final post-construction stage of assessment, the BREEAM-related performance target for the project must be demonstrably achieved by the project.

Responsible construction practices – Up to 2 credits

1. credit

5. Procedures must have been established for a clean and tidy building process according to recommendations given in SINTEF Building Research Design Guide 501.107. Procedures must be followed up throughout the construction period.
6. The project must achieve the items listed as required for one credit in checklist A1, which the Assessor can verify during an inspection (see Methodology).

2. credit

7. Criteria 5–6 must be met.
8. The project must create a plan handover cleaning (see Methodology). Test results and signed checklists must show that the plan has been followed and that the cleaning quality meets the quality level 4 in NS-EN-INSTA-800 as a minimum.
9. The project must achieve all items listed in checklist A1, which the Assessor can verify during an inspection (see Methodology).

Reduction of greenhouse gas emissions from activities associated with the construction site – up to 3 credits

Energy consumption from activities on the construction site – 1 credit

10. No later than step 4, greenhouse gas emissions shall be calculated and a plan set up with objectives associated with the reduction of energy consumption from activities on the construction site (see Methodology).
11. The project shall document measured energy consumption (incl. litres of fuel) and estimated greenhouse gas emissions for step 5 (see Methodology). The measured values shall be compared with the plan set up under criterion 10. Total energy consumption (total kWh) and CO_2emissions (total kg CO_2e) from the construction process must be reported via the Assessor's BREEAM reporting tool.

Energy consumption from transport of masses and waste – 2 credits

12. No later than step 4, greenhouse gas emissions shall be calculated and a plan drawn up with objectives for reducing greenhouse gas emissions associated with the transport of masses and waste (see Method).
13. The project must report greenhouse gas emissions associated with the transport of masses and waste in step 5 (see Method). The measured values shall be compared with the plan set up under criterion 12. Total energy consumption (total kWh) and CO_2 emissions (total kg CO_2e) from the construction process must be reported via the auditor's BREEAM reporting tool.

Exemplary level criteria: Limitation of direct greenhouse gas emissions from activities associated with the construction site – 1 credit

14. The project must document that a maximum of 10% of the greenhouse gas emissions reported in criterion 11 are direct emissions (see Methodology and Definitions).

Methodology

M1 BREEAM-NOR AP and performance targets (step 5 and 6)

M1.1 Purpose of BREEAM-NOR-AP

The purpose of using a BREEAM-NOR-AP (AP) in the project is to facilitate an integrated design and construction process that uses BREEAM as the basis for determining, agreeing and achieving the desired sustainability performance. Effective collaboration between an AP and the project, as well as good coordination between an AP and the BREEAM-NOR Assessor, can provide a better and more efficient BREEAM process.

This assumes that the AP has had close contact with the construction management and other subcontractors to follow up the relevant criteria in steps 5 and 6. The AP must follow up the activities on the construction site often enough to ensure that the risk of non-fulfilment of criteria is limited. The AP shall summarise status regularly, for example, in meetings documented with minutes and through status reports.

The BREEAM-NOR-AP may not be the same person as the BREEAM Assessor. This is to avoid any conflict of interest with regard to the audit. However, the BREEAM-NOR AP may be from the same organisation/company in a project as the BREEAM Assessor. Any conflicts of interest in the project that an assessor is auditing must be assessed continuously, and it is the auditor's responsibility to assess and handle this.

The AP does not have to be the same person/company throughout the process. However, the AP must ensure that the pre-assessment estimator is kept up to date, and that there is a good overview of the implemented requirements and prepared documentation. This information must be transferred if the AP role is transferred to a new person/ company.

M1.2 Site monitoring during steps 5 and 6

The AP shall be sufficiently available for the project, for example, in the form of a physical presence on the construction site, particularly in the event of the following:

- Works can be observed before they are covered up or new works or activities start; I there is a significant risk of conflict or errors
- Key evidence must be produced at specific times, including but not limited to: photographic evidence, delivery notes and other documentary evidence.
- Different activities and systems are used together and one could harm the other’s integrity or compliance against other BREEAM-NOR requirements.

M2 Considerate construction

M2.1 Scope of the considerate construction issue

This issue includes on-site demolition and construction activities, from the beginning of demolition to the completion of the construction. If the developer owns the site and initiates demolition before development, the demolition activities must also be assessed in accordance with criteria for responsible construction management. When ownership of a site is taken on by the developer or owner following completion of demolition works, such works can be excluded from the scope of the responsible construction practices issue.

M2.2 Independent assessment and verification

An assessment of the site activities against Checklist A1 must be assessed by a BREEAM-NOR Assessor along with the nominated individual on site, e.g. site manager. This individual will confirm that the procedures outlined are in place and will therefore be responsible for demonstrating compliance with Checklist A1.

M2.3 Final cleaning

The plan shall be based on the recommendations in SINTEF Byggforsk building detail sheet 501.108, including Chapter 4 – Cleaning in the final phase of the construction period and Chapter 6 – Cleaning methods. As a minimum, the plan must state who will perform the cleaning, cleaning methods, and when it is suitable to carry out cleaning and testing. Relevant sections of the plan should be implemented in the project's progress plan.

M3 Reduction of greenhouse gas emissions from activities associated with the construction site

A plan shall be prepared with objectives to reduce emissions from construction site activities. These can be requirements for energy efficiency, use of district heating, bioenergy, electricity, etc.

The plan shall contain objectives and greenhouse gas calculations where the following activities must be considered, as a minimum:

- Heating, cooling, curing, drying, lighting
- Operation of construction machinery, both mobile and stationary
- Operation of construction site offices and crew areas

The objectives of the activities shall be based on assessments related to:

- the various energy carriers, e.g. diesel, biodiesel, petrol, electricity, district heating, gas, hydrogen, oil, pellets, etc.
- direct or indirect emissions (see Definitions) from the construction site

If an off-site manufacturing site is set aside specifically for the production of components or materials related to the project, activities in this area must also be included in the assessment.

M3.1 Calculating greenhouse gas emissions for construction site activities

For each of the construction site activities, as well as possible activities for specific machinery and equipment, energy consumption in kWh and litres of fuel used for the various energy carriers shall be estimated. The estimated consumption shall be multiplied by the relevant emission factor for the relevant energy carrier. It must then be stated whether this results in direct or indirect emissions. The results shall be stated in kg CO_{2}-equivalents. See an example of the setup in Table Man03-01.

The project determines the division of activities itself to ensure the most efficient and appropriate procedures for data collection and reporting.

Table Man03-01 Proposal for set-up to calculate the volume of indirect emissions.

Activity	**Energy carrier**	**Budget energy use (kWh or litres)**	**CO_2-factor (kg/ CO_2e/kWh or kg CO_2e/l)**	**Budget for greenhouse gas emissions (indirect) (kg CO_2-e)**	**Budget for greenhouse gas emissions (direct) (kg CO_2-e)**
Activity 1, e.g. excavator	Diesel				
Activity 2, e.g. total diesel consumption of subcontractors	Biodiesel				
Activity 3	Electricity				
…					
…					
Sum					

The specific emission factor for the energy carriers used in the greenhouse gas calculation must be manufacturer-specific and documented. If the manufacturer is unable to provide a specific emission factor, the emission factors set out in Table A, 1 in NS-EN 16258: 2012 Method for calculation and declaration of energy consumption and greenhouse gas emissions for transport services shall be used. For biodiesel, the values from Table Man03-02 shall be used:

Table Man03-02 Emission factors for biodiesel

Energy carrier	Source	Indirect Greenhouse gas emissions ($kgCO_2e/l$)	Direct Greenhouse gas emissions ($kg\ CO_2e/l$)	Total Greenhouse gas emissions ($kg\ CO_2e/l$)
Conventional biofuel*, 100% biodiesel	EN 16258:2012	1.9	0	1.9
Advanced biofuel**, 100% biodiesel	70% reduction compared to fossil diesel according to the Norwegian Environment Agency M1125	1.0	0	1.0

* Conventional biofuel (first generation biofuel) is produced from raw material which may also be used to produce food or animal feed (agricultural growth)

** Advanced biofuel (second generation biofuel) is mainly produced from industrial waste, agriculture or forestry waste, and is not produced from raw materials which may be used as food or animal feed. Advanced biofuel is further defined in report M-112 «Kunnskapsgrunnlag for omsetningskrav i skipsfart», Norwegian Environment Agency, 2018.

For electricity, the CO_2 factor in scenario 2 in Chapter 7.5.3 in NS 3720: 2018 Method for greenhouse gas calculations for buildings shall be used. The average factor over the last three years shall be used.

M4 Reduction of greenhouse gas emissions associated with the transport of masses and waste

M4.1 Measures to reduce emissions associated with the transport of masses and waste

Mass transport
The plan shall contain an overview of planned mass handling and consider alternatives for reducing transport distance and volumes in and out of the construction site. This could be reduced excavation of masses, local reuse or reallocation of masses to nearby developments, requirements for driving distance, landfill, etc.

See Additional Information for Best Practices.

Transport of waste
The plan shall contain an overview for handling waste divided into different fractions (in connection with the resource management plan, Wst 01) and consider alternatives for reducing transport distance and volumes in and out of the site. This could be waste reduction, use of a compactor, sufficient storage space for waste containers, choice of waste disposal company with regards to transport distance, etc.

M4.2 Calculating greenhouse gas emissions associated with the transport of masses and waste

For each of the activities for mass and waste transport, the round trip distance to the relevant final destination must be estimated. If the final destination is not known, the most realistic possible scenario for final storage based on the available information must be calculated. Distance shall be multiplied by the relevant emission factor for the vehicle in question. The results must be stated in kg CO_2 equivalents.

For mass handling, mass withdrawals must also be specified. These must be multiplied by the relevant emission factor for the machinery in question.

The specific emission factor for the energy carriers used in the greenhouse gas calculation must be manufacturer-specific and documented. If the manufacturer is unable to provide a specific emission factor, emission factors set out in Table A, 1 in NS-EN 16258: 2012 Method for calculation and declaration of energy consumption and greenhouse gas emissions for transport services shall be used. For biodiesel, the values from Table Man03-02 shall be used.

For electricity, the CO_2 factor in scenario 2 in Chapter 7.5.3 in NS 3720: 2018 Method for greenhouse gas calculations for buildings shall be used. The average factor over the last three years shall be used.

M5 Exemplary level: Limitation of direct greenhouse gas emissions from activities associated with the construction site

The purpose of the exemplary level is to set a minimum level for the proportion of direct greenhouse gas emissions from activities associated with the construction site. The calculation methodology is the same as described under M3 Reduction of greenhouse gas emissions from activities associated with the construction site. This credit is an incentive for construction sites with low or no direct emissions, for example, fossil-free or emission-free construction sites.

Indirect and direct greenhouse gas emissions (see Definitions) per energy carrier must be documented, see Table Man03-03 for an example.

Tabell Man03-03 Proposal for set-up to calculate the volume of indirect emissions .

Energy carrier	Indirect greenhouse gas emissions [kg CO_2e]	Direct greenhouse gas emissions [kg CO_2e]
Electricity		
District heating		
Biogas		
Diesel		
Biodiesel, conventional		
Biodiesel, advanced		
Other … [enter]		
Sum		
Proportion direct greenhouse gas emissions (%)		

Evidence

Criteria	Design stage	Post-construction stage
1	A confirmation / obligation from the developer that there will be requirements for an environmental management system from the relevant parties. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to have a functioning environmental management system when carrying out the assignment. --------------	Environmental certification from the relevant parties

	OR Environmental certification from the relevant parties	
2 - 4	A confirmation / obligation from the developer that BREEAM-NOR performance targets will be set, and that a BREEAM-NOR AP, with the authority and responsibility in accordance with the criteria and methodology, will be appointed for steps 5 and 6. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to set BREEAM-NOR performance targets and appoint a BREEAM-NOR AP with the authority and responsibility in accordance with the criteria and methodology for steps 5 and 6. -------------- OR Documentation showing that the relevant parties have committed to BREEAM-NOR performance targets and that a BREEAM-NOR AP has been appointed in accordance with the criteria and method.	Documentation showing that BREEAM has been a regular topic and that an AP has followed up the project. For example. meeting minutes, status reports, etc. Documentation showing that the agreed BREEAM-NOR performance targets have been met. The BREEAM-NOR Assessor Report with completed values.
5 - 6	Confirmation / obligation from the developer that procedures will be required for a clean and dry building process and requirements for the relevant parties to meet the items in checklist A1 for one credit. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to have procedures for a clean and dry building process and to fulfil the items required for one credit in checklist A1. -------------- OR Documentation showing procedures for a clean and dry building process. AND Completed checklist A1 with relevant attachments verified by the Assessor.	Description of procedures for clean, dry buildings and reports, checklists, etc., showing compliance with the requirements for follow-up. Completed checklist A1 with relevant attachments verified by the Assessor.
8	A confirmation / obligation from the developer that a requirement will be	Documentation that confirms fulfilment of cleaning quality.

	made that the cleaning quality upon delivery must meet the requirements. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to achieve a cleaning quality that meets the requirements at handover .	
9	Confirmation / obligation from the developer that there will be a requirement to meet all the items in checklist A1. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to fulfil all the items in checklist A1. -------------- OR Completed checklist A1 with relevant attachments verified by the Assessor.	Completed checklist A1 with relevant attachments verified by the Assessor
10 - 11	A confirmation / obligation from the developer that a requirement will be made for greenhouse gas emissions to be calculated and that a plan will be drawn up for the reduction of energy consumption no later than in step 4 and in accordance with the criterion and method. The confirmation shall also contain requirements for measuring energy consumption in step 5. Applies in those cases where the relevant parties are not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to calculate greenhouse gas emissions and establish a plan for the reduction of energy consumption no later than in step 4 and in accordance with the criterion and method. The documentation shall also contain requirements for measuring energy consumption in step 5 -------------- OR Documentation showing that greenhouse gas emissions have been calculated and a plan for reducing energy consumption has been established no later than in step	As interim design stage Measured energy consumption and calculated greenhouse gas emissions in step 5 and a comparison with the original plan The BREEAM-NOR Assessor Report with completed values.

	4 and in accordance with the criterion and method.	
12 - 13	A confirmation / obligation from the developer that a requirement will be made that greenhouse gas emissions shall be calculated and a plan for reduction of greenhouse gas emissions shall be established no later than in step 4 and in accordance with the criterion and method. The confirmation shall also contain requirements for reporting consumption in step 5. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to calculate greenhouse gas emissions and establish a plan for the reduction of greenhouse gas emissions no later than in step 4 and in accordance with the criterion and method. The documentation must also show requirements for reporting consumption in step 5 -------------- OR Documentation showing that greenhouse gas emissions have been calculated and a plan for reducing greenhouse gas emissions has been established no later than in step 4 and in accordance with the criterion and method.	As interim stage Measured energy consumption and calculated greenhouse gas emissions in step 5 and a comparison with the original plan The BREEAM-NOR Assessor Report with completed values.
14	A confirmation / obligation from the developer that there will be a requirement that a maximum of 10% of the greenhouse gas emissions in criterion 11 are direct emissions. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to ensure that a maximum of 10% of the greenhouse gas emissions in criterion 11 are direct emissions. -------------- OR Documentation showing that a maximum of 10% of the greenhouse gas emissions in criterion 11 will be direct emissions.	Documentation showing that a maximum of 10% of the greenhouse gas emissions in criterion 11 are direct emissions measured for step 5 as a whole

Definitions

D1 Parties managing the work at the construction site

The company that has overall responsibility for overseeing the construction stage of the project. Relevant parties can be turnkey contractors, principal contractors, demolition contractors, etc.

D2 BREEAM-NOR Accredited Professional (AP)

An individual trained and qualified by Grønn Byggallianse as a specialist in built environment sustainability, environmental design and assessment. The role of the BREEAM AP is to facilitate the project team's efforts to successfully schedule activities, set priorities and negotiate the trade-offs required to achieve a target BREEAM rating when the design is formally assessed. Only qualified individuals who are approved by Grønn Byggallianse comply with the BREEAM requirements as an AP. This ensures an adequate level of expertise is maintained through regular ongoing professional development in relevant fields of knowledge. For a list with contact details for approved BREEAM-NOR APs, visit: www.byggallianse.no

D3 BREEAM-related performance targets

BREEAM performance targets refer specifically to the BREEAM rating and the minimum standards required. This does not necessarily include individual targeted BREEAM issues or credits, which may be traded over the course of the project as it evolves. In agreeing on a BREEAM target, it is recommended that individual BREEAM issues, credits and criteria are targeted or prioritised. This is to ensure that the agreed target is achievable and achieved without potentially costly modifications to the design at a later step.

See Man01 – project brief and design for further information on BREEAM-NOR performance targets.

D4 Indirect and direct emissions

Direct emissions of greenhouse gases are from energy carriers that have direct emissions from fossil fuels at the site, e.g. diesel, oil or gas.

Indirect emissions are related to combustion and infrastructure in the production and distribution of energy from another location. Energy carriers that do not have direct emissions from fossil fuels at the site, e.g. electricity, hydrogen, district heating, pellets, biodiesel or biogas.

D5 Environmental management system

An environmental management system is the part of a company's overall management system that designs, implements and maintains the company's environmental policy. The purpose is to incorporate environmental and climate work into a system. The environmental management system must be third party certified in accordance with ISO 14001: 2015, the EU Environmental Management System (EMAS), Eco-Lighthouse or equivalent standard.

D6 Project group

The composition of the project group may change during the project and typically contains multiple members. The members could be the client, planners, contractors and subcontractors.

D7 Construction site

Any land which is being developed (and therefore disturbed) for buildings, hardstanding, soft landscape, parking areas and site access. This includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hardstanding, site access and temporary storage will be located, it must be assumed that the construction site is the entire area affected by the construction activity.

Additional information

T1 Good practice for sustainable spoil handling

Bærum Resource Bank has developed the following principles for sustainable spoil handling:
Early involvement of all actors and authorities involved in spoil handling. These processes need to mature, and this will take time.

- Good arenas should be created for collaboration. Collaboration between projects that have a spoil surplus/spoil deficit will often provide optimal resource utilisation.
- An overview should be obtained of mass quantities, qualities and location in terms of both time and space early in the process in order to gain an idea of the scope. Mass balance should be optimised.
- It should be ensured that enough areas are set aside/regulated for recycling, storage and backfilling for useful purposes as early as possible. These are time-consuming processes. This is the responsibility of both the developers and regional and municipal planning authorities.
- In order to achieve optimal mass utilisation, significant focus is required on the quality of the masses. Masses of different quality must be handled as separate fractions, particularly surplus stones. It is also important to get as much information as possible about stone quality as early as possible. This often requires relatively extensive geological surveys to be carried out as early as the design phase of the development project.
- As transport distance often significantly impacts the climate footprint of the recycled spoil, it will be important to focus on the location of facilities in relation to where spoil is extracted and where it is to be used. The masses should be transported as short a distance as possible.
- Increased use of deviation approval forms from standards and manuals, when appropriate.
- Specific requirements should be set for optimal spoil handling from developers, municipalities and regional authorities.

T2 Examples of requirements that can be set to achieve optimal spoil handling

- Requirements must be set for optimal spoil handling in specifications when contracting both consultants and contractors.
- Evaluation of project-specific spoil handling plan when appointing a contractor.
- Specific evaluation criteria can then be (in order of priority):
- recycling rate of masses internally in the project
- recycling rate of masses that are not needed in the project (for use in other projects or for delivery to recycling facilities)
- degree of use of recycled materials as a substitute for virgin building materials (e.g. the use of crushed concrete as a substitute for crushed stone)
- The contractor should be offered a reduction in the tender amount if a recycling rate of xx% (must be project-specific) is achieved and documented through a mass handling plan.
- Functional requirements should be set as far as possible and not specific requirements for the materials used. The will give the contractor scope to be creative about the use of the masses that are available.
- There should be general guidelines/requirements for the high use of recycled materials and a possible need for justification if these are omitted.

T3 Spoil Management Plan

A spoil management plan should be based on the resource pyramid, where solutions to minimise spoil surplus or recycling should be preferred over landfill solutions. There is no template regarding what spoil handling plans should contain, but below are some points that should be considered and discussed in the plan:

1. Spoil overview by spoil types, volume, time and place (in terms of both what is generated and where it is needed)
2. Description of what the different types of spoil are used for, where and how. Here, the need for deviation approval forms should also be considered. Mass balance should be strived for and documented.
3. Description of the need to process the masses, including methods, area requirements and scope.
4. Description of the need for intermediate storage, including location, area requirements and scope. Short-distance locations are preferred.

5. Assessment of whether there are other adjacent projects that can benefit from surplus spoil that cannot be handled within the present project. The scope, spoil types and time frame for this must be described to verify whether it coincides with the spoil surplus and progress within the present project.
6. Description of spoil relocation and the logistics of same.
7. It is advantageous to conduct economic, climate and resource assessments of the proposed spoil management.

Man 04 Commissioning and handover

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	Crit. 1–4	Crit. 1–4	Crit. 1–4 Crit. 8–9	Crit. 1–4 Crit. 8–9	Crit. 1–4 Crit. 8–9

Aim

To encourage properly planned handover and commissioning processes for technical installations that reflect the needs of the building occupants.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	1-4 and 8-9
Assessment type specific notes	None	See ref. 1.0 and 1.1 See Appendix D	See ref. 1.0 and 1.1 See Appendix D

Assessment type specific notes	
1.0	Commissioning the testing schedule and responsibility for the design and preparation are applicable according to the scope of services being specified or installed.
1.1	The guides and training schedules must include, as far as possible, relevant sections regarding the services and fabrics being installed. On completion of works, the building owner, agent or user must hand over the building to the fit out contractor, who can then complete the relevant work based on the fit out strategy.

Building specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into three parts:

- Commissioning – testing schedule and responsibilities (1 credit)
- Commissioning – design,preparation and implementation (1 credit)
- Preparing for a good handover (1 credit).

Commissioning – testing schedule and responsibilities - 1 credit

1. A schedule of commissioning and testing must be prepared for technical installations and operating systems. The schedule must identify and include a suitable time frame for commissioning and re-commissioning all complex and non-complex building services and control systems. The schedule is based on NS:6450:2016 – Commissioning and testing of technical building installations, Appendix A. Minimum requirements are defined under Methodology. The schedules must be prepared no later than step 3.
2. Where a building management system (BMS) is specified, this must fulfil the requirements in Methodology.
3. The client or contractor shall appoint an appropriate project team member to monitor and programme pre-commissioning, commissioning and testing.
4. The principal contractor shall account for the commissioning and testing programme, responsibilities and criteria within the main programme of works. Necessary time must be allowed to complete all commissioning and testing activities prior to handover.

Commissioning – design, preparation and implementation – 1 credit

5. Criteria 1 to 4 must be achieved
6. During step 3, the client or the principal contractor shall appoint an ITB manager (see Definitions) with responsibility according to NS 3935:2019 Integrated technical building installations (ITB) Design, execution and commissioning, who shall carry out the following, as a minimum:
   a. Undertake design reviews and give advice on suitability for ease of commissioning.
   b. Provide commissioning management input to construction programming and during installation stages.
   c. Assess whether the project, based on its complexity, size and form of contract, needs an RITB manager (see Definitions).
7. The ITB manager must be able to document that the following areas of responsibility according to NS 3935:2019 are maintained during step 4:
   a. Further processing and detailed plan for commissioning and testing (criterion 1). The schedule must refer to a test plan including relevant tests for technical systems described in NS6450: 2016
   b. Preparation of an interface matrix (see Methodology) and ensuring that all actors in the project are informed of their responsibilities in connection with the design, installation, commissioning and testing of technical facilities, as well as ensuring cooperation between all relevant parties.
   c. Preparation of functional descriptions (see Definitions) for the technical and functional services of the various technical systems.

Preparing for a good handover – 1 credit

8. Prior to handover, two building user guides shall be developed (see Methodology) for the following users:
   a. A non-technical user guide for distribution to the building occupiers.
   b. A technical user guide for the facility managers.

A draft copy shall be developed and discussed with users first (where the building occupants are known) to ensure the guide is appropriate and useful to potential users.

9. Two training schedules should be developed prior to handover (see Methodology):
   a. A non-technical training schedule for the building occupiers.
   b. A technical training schedule for the facility managers.

Methodology

M1 Commissioning – testing schedule and responsibilities

To achieve the aim of this credit it is important to plan testing, commissioning and trial operation. NS6450: 2016 provides guidance on important matters that should be considered early in the project.

The plan for commissioning and testing must contain assessments related to the following, as a minimum:

1. Who will administer the trial operation.
2. Whether handover is to take place before or after the trial operation phase.
3. Specification of which systems are to be tested, test duration and which functions and services are to be tested. NS6450: 2016 Appendix B provides examples of this.
4. Specification of which tests are to be performed before commissioning, during the commissioning phase and in the trial operation phase.
5. Specification of what level of participation is required from individual suppliers during testing, commissioning and trial operation, as well as the distribution of work and responsibilities between client and supplier.
6. Time frames for testing, commissioning and trial operation.
7. Requirements for the preliminary FDV documentation required during commissioning and trial operation.
8. Specification of the requirements for training, both amount, duration and when the training will take place.

Any process or manufacture-related equipment specified as part of the project must be excluded from the assessment. However, such equipment should be included in cases where the equipments forms an integral part of the building HVAC services, such as certain heat recovery systems.

M1.1 Minimum requirements for a BMS at handover

Where a building management system (BMS) is specified, the following applies:

- Commissioning of all technical systems must be conducted once all control devices with corresponding physical measurements have been installed, wired and are functional
- The BMS or control installation should be running in auto mode with satisfactory internal conditions prior to handover
- All BMS schematics and graphics must be fully installed and functional to the user interface prior to handover
- The operator facilities team must be fully trained in the operation of the system.

M1.2. Interface matrix

An interface matrix must document the technical interfaces established in the project. During step 4, an interface must be established between different system types. During this stage, a generic interface must be defined that will subsequently be designed in detail. It must be determined which actor is responsible for the interface (responsible for coordinating and designing the interface) and how the interface is to be handled and documented.

Further in the design process, the solution must be detailed and implemented in specific systems and contracts. This will determine exactly how the interface is executed and who/which contract is responsible for correct performance and verification. The matrix must describe all the interfaces at system level (incl. serial number) to ensure that deliveries are clearly and specifically described and can be followed up in function tests and integrated tests.

M2 Prepare for good handover

M2.1 Building user guides

The building user guides shall be building-specific or site-specific guides. The purpose of the guides is to help building users access, understand and operate the building efficiently and in accordance with the original design intent. The content of the guides must be specific to the building type and end users. There is no requirement for the type of format of the building user guide.

The user guide should be written in a language that is easy to understand for the building's users, particularly those users with no technical background. It must be based on the building's FDV documentation (cf. requirements in the Planning and Building Act Section 21-10 (2)) and the following should be included in the guide, as a minimum:

- Overview of the building and its chosen environmental sustainability strategy, for example, information on BREEAM strategy, greenhouse gas emissions and specific sustainability measures implemented in the project
- Overview of how users should engage with the building’s sustainability strategy, e.g. energy, water or waste efficiency policy or strategy
- Relevant information about technical installations for the user – i.e. which technical systems are available and how they can be used efficiently (e.g. temperature control, heating, cooling, lighting, sun protection, ventilation. Provision of and access to shared facilities.
- Safety and emergency information or instructions.
- Building-related incident reporting and feedback arrangements.
- Provision of and access to sustainable transportation facilities, e.g. public transport, cyclist facilities, pedestrian routes, etc.
- Provision of and access to local amenities.
- Links, references and relevant contact details.

User guides for facility managers shall be based on the building's FDV documentation (cf. requirements in the Planning and Building Act Section 21-10 (2)) and the following content shall be included in the guide, as a minimum:

- Building services overview and access to building occupant controls, e.g. where they are located, what they control, how to operate them effectively and efficiently, etc.
- Building-related operational procedures specific to building type or operation, e.g. laboratories.
- Pre-arrival information for visitors, e.g. access and security procedures or provisions.
- Refit, refurbishment and maintenance arrangements or considerations
- Building-related incident reporting and feedback arrangements.
- Building related training information and relevant links to FDV documentation.

The building user guide for facility managers can use more technical language if appropriate and provide understandable information relevant to the professionals managing the building facilities. This guide should be easily accessible.

M2.2. Training schedule

A training schedule must enable the user and operating personnel to understand the user guide and be able to use the building for its intended design.

The training schedule for users shall include, as a minimum, training in the building user guides, including the sustainability strategy and how users can engage in this.

Additionally, the training schedule for facility managers shall include the following:

- The available aftercare provision and main contacts of the aftercare team, including any scheduled commissioning and post-occupancy evaluation.
- Introduction to and demonstration of installed systems and key features, particularly building management systems, controls and their interfaces.
- Introduction to the technical facilities' functional descriptions. These descriptions must be reviewed before handover and revised during the trial operation period.
- Introduction to the technical building user guide for facility managers and other relevant building documentation, e.g. design data, technical guides, maintenance strategy, operations and maintenance (O&M) manual, commissioning records, logbook, etc.
- Maintenance requirements, including any maintenance contracts and regimes in place.

Evidence

Criteria	Interim design stage	Final post-construction stage
1 - 4	A confirmation / obligation from the developer that the following will be required: - a plan for commissioning and testing - that SD facilities (if specified) as a minimum meet the scope under Method - a project team member will be contracted to monitor and programme pre-commissioning, commissioning and testing - the main contractor's progress plan, showing commissioning and testing Applies in those cases where the relevant party is not selected. ----------------- OR	Latest revision of plan for commissioning and testing. Documentation showing that commissioning and testing have been carried out in accordance with the plan, and that the test results meet the specified requirements. Documentation showing that the minimum requirements for SD facilities have been fulfilled Documentation showing that the responsible person has actively monitored and planned preparation, commissioning and testing. Documentation showing that the commissioning and test programme have been completed in accordance with the plan. Any discrepancies must be explained. The BREEAM-NOR Assessor Report with completed values.

	Documentation showing the contractual obligations of the relevant parties to establish: - a plan for commissioning and testing - that SD facilities (if specified) as a minimum meet the scope under Method - a project team member will be contracted to monitor and programme pre-commissioning, commissioning and testing - the main contractor's progress plan, showing commissioning and testing ------------- OR Documentation of - plan for commissioning and testing - SD facilities (if specified) as a minimum meet the scope under Method - a project team member will be contracted to monitor and programme pre-commissioning, commissioning and testing - - the main contractor's progress plan, showing commissioning and testing	
6	A confirmation / commitment from the developer that an ITB manager will be engaged with responsibilities as described in the criteria and method. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the main contractor to engage an ITB manager with responsibilities as described in the criteria and method. ------------- OR Documentation showing agreement between the ITB manager and RITB manager (if relevant) Documentation showing that the ITB and possibly the RITB manager have carried out assessments and provided input related to commissioning, planning and installation.	Documentation showing that the ITB and possibly the RITB manager have carried out assessments and provided input related to commissioning, planning and installation.
7	A confirmation / obligation from the developer that requirements will be set for the ITB manager's areas of responsibility in accordance with the criteria and method and that these must be addressed during step 4.	Documentation showing an agreement with the ITB manager that contains their areas of responsibility according to the criteria and method and that these should be performed during step 4.

	Applies in those cases where the relevant party has not been selected. ----------------- OR Documentation showing that the ITB manager has contractually obliged areas of responsibility according to the criteria and method and that these must be addressed during step 4 ------------- OR 1.Documentation showing an agreement with the ITB manager that contains their areas of responsibility according to the criteria and method and that these should be performed during step 4. 2. If it has been prepared: A plan for commissioning and testing, interface matrix and function descriptions.	Latest version of the plan for commissioning and testing, interface matrix and function descriptions, as well as documentation showing that the plans have been followed. Any discrepancies must be explained.
8	A confirmation / commitment from the developer that a user guide and a training schedule will be prepared for users and facility management. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing contractual obligations to prepare a user guide and a training schedule for users and facility management. ------------- OR 1. Draft user guide and documentation that this has been discussed with the users. 2. Draft training schedule for users and facility management	Final edition of the user guides. Documentation that these have been discussed with and distributed to users and operating personnel. Final edition of the training schedule. Documentation showing that these have been reviewed with users and operating personnel.

Definitions

D1 Users

The user of the building can, for example, be the owner, resident, tenant, employee or visitor.

D2 Facility Management

Personnel who take care of the daily operation and maintenance of buildings and technical facilities and who monitor technical facilities (with or without technical training) at all times.
In relation to this definition it is meant maintenance and administration of the building, its services and surroundings, including interaction with related activities in the building and the building users.

D3 Functional description

Describes which functions are to be activated in a technical system, given a previous operation or event. The functional descriptions must be prepared for all technical systems that have a function, and actual solutions and supplier-specific data/functions must be included. The functional description forms the basis of further design, execution, as well as testing and verification. Functional descriptions are the basis of the acceptance criteria to be used to decide whether or not a test is acceptable.

D4 ITB Manager

The ITB manager is a person with thorough knowledge of the integration of technical building installations (ITB) and NS 3935: 2019: Integrated technical building installations (ITB) – Design, execution and commissioning. The ITB manager must be authorised to ensure that the processes described in NS3935: 2019 are carried out and documented.

D5 Relevant member of the project group

The relevant member of the project team is responsible for verifying that technical building installations have been installed and commissioned accordance with the required standards. This individual may be from the contractor's or subcontractor's organisation, provided that they do not participate in the general installation work. The role must comply with the scope and intentions of NS 3935: 2019: Integrated technical building installations (ITB) – Design, execution and commissioning.

D6 RITB Manager

An advisory ITB (RITB) is a person responsible for ensuring that the requirements set in the project by the ITB manager are implemented. This person can be appointed by the developer or contractor. A description of how to take care of the integrity and interface between the ITB manager and the RITB manager can be found in NS3935: 2019 Integrated technical building installations (ITB) - Design, implementation and commissioning.

Additional information

None

Man 05 Aftercare

Number of available credits	Minimum standard				
	P	G	VG	E	O
3	–	–	–	Crit. 3/ Crit. 4*	Crit. 3/ Crit. 4*

*See building type specific notes

Aim

To provide post-handover aftercare to the building owner or occupants during the first year of occupation (step 7) to ensure the building operates and adapts, where relevant, in accordance with the design intent and operational demands.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	Not applicable	Not applicable
Assessment type specific notes	None	See 1.0 See Appendix D	See 1.0 See Appendix D

Assessment type specific notes	
1.0	This issue is not relevant for shell and core or shell only and has been filtered out.

Building type specific notes

Building type specific notes	
2.0	Criteria 3 do not apply to residential buildings. Criteria 4 applies only for residential buildings.

Assessment criteria

This issue is split into three parts:

- Aftercare support (1 credit)
- Seasonal commissioning (commercial buildings) OR feedback and improvements (residential) (1 credit)
- Post-occupancy evaluation (1 credit)

Aftercare support – 1 credit

1. Operational infrastructure and resources must be in place to provide aftercare support to the building occupiers, to include the following, as a minimum:
   a. Scheduled meetings must be held between the aftercare team or individual, and the building occupier or facility management (prior to initial occupation, or as soon as possible thereafter) to:
      i. Introduce users for available assistance after moving in, as well as present building guides and training plans if these exist (See Man 04).
      ii. Key information about the building, including the design intent and how to use the building to ensure it operates as efficiently and effectively as possible.
   b. On-site training is provided to familiarise the facility management with the building's technical systems, how they are operated and how they should be used.
   c. Initial aftercare support provision for at least the first month of building occupation, e.g. on-site attendance on a weekly basis to support building users and facility management (this could vary in frequency depending on the complexity of the building and building operations)
   d. The provision of long term aftercare support for building occupants for at least the first 12 months after occupation, e.g. a helpline, nominated individual or other appropriate system to support building users and facility management.

2. Necessary operational infrastructure and resources must be in place to coordinate the collection and monitoring of energy and water consumption data for at least 12 months once the building is occupied. The purpose is to analyse discrepancies between actual and calculated performance (See Methodology). Systems or user behaviour are adjusted according to the findings that are made.

Seasonal commissioning (commercial buildings) - 1 credit

3. The following seasonal commissioning activities must be completed according to NS6450:2016 – Commissioning and testing of technical building installations, over a minimum 12-month period, once the building becomes substantially occupied:
    a. Testing of all building services under full load conditions, i.e. heating equipment in midwinter, cooling and ventilation equipment in midsummer, and under part-load conditions (spring and autumn)
    b. Where applicable, testing should also be carried out during periods of extreme (high or low) occupancy
    c. Feedback should be provided from building occupants (where they are affected by complex services) about problems and concerns about the technical systems and any problems or concerns regarding their effectiveness should be addressed.
    d. Recommissioning of systems (following any work needed to serve the revised loads) and incorporating any modifications to operating procedures into operations and maintenance (O&M) manuals.

OR

Feedback and improvements (residential buildings) – 1 credit

4. For residential buildings, the following shall be carried out by the person(s) responsible for conducting a one-year inspection in collaboration with users:
    a. The home's technical facilities must be reviewed no later than in connection with a one-year inspection through feedback from users via a questionnaire, or an interview with homeowners in order to evaluate any problems or concerns about the operation and functionality of technical facilities.
    b. Improvements must be verified in accordance with criterion 4.a, as well as update any operating procedures in FDV documentation and building guides, if necessary.

Post-occupancy evaluation (POE) – 1 credit

5. The client or building occupier must commit to conducting a POE exercise one year after initial building occupation (See Methodology). The POE must be conducted by an independent third party (see Definitions) and must cover:
    a. A review of the design intent and construction process (review of design, procurement, construction and handover processes)
    b. Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building, covering:
        i. Internal environmental conditions (light, noise, temperature, air quality)
        ii. Control, operation and maintenance
        iii. Facilities and amenities
        iv. Access and layout
        v. Other relevant issues
    c. Sustainability performance (energy consumption, water consumption, performance of any sustainable features or technologies, e.g. materials, renewable energy, rainwater harvesting, etc.).
6. The client or building occupier must commit to conducting the appropriate dissemination of information (see Methodology) on the building's post-occupancy performance. This is conducted in order to share good practice and lessons learned, inform changes in user behaviour, building operational processes and procedures, as well as system controls.

Methodology

M1 Aftercare support

M1.1 Collection and monitoring of energy and water consumption data
This function can be coordinated or carried out by a dedicated aftercare team, the building owner or facilities management team.

M1.2 Actual vs. predicted performance
In most cases it is not feasible to accurately compare predicted vs. actual performance due to differences in the assumptions used in the models. When comparing predicted with actual values, an analysis should be carried out to understand why there may be performance discrepancies. These discrepancies could be attributable for a number of factors, including:

- Predicted energy consumption is normally based on building regulation compliance models, which only focus on 'regulated' energy consumptions. Additional unrelated energy consumption may not have been modelled in the design prediction model.
- Different use of the building than assumed in the calculation models due to higher presence or longer operating time.
- Inefficiencies resulting from poor control, bad commissioning or poor maintenance.
- Additional special functions such as a cafeteria, server room, etc., which are not accounted for in the predicted model.
- variations in actual user behavior that differ from what is expected, e.g. in terms of technical user equipment and lighting.

Publication: "Guidance booklet 1: Avvik mellom beregnet og reell energibruk" (NGBC) provides guidance on how to improve the accuracy of the model for the operational energy consumption of buildings at the design stage.

Publication "SINTEF Fag 6. Etterprøving av bygningers energibruk" also provides additional guidance on this issue.

M2 Post-occupancy evaluation (POE)

M2.1 POE Methodology
The most relevant POE methodology that fulfils the criteria should be used. For example, in the UK, the building use studies (BUS) methodology was developed following a series of government funded 'PROBE' building performance evaluation studies in 1995. BUS methodology is used by independent licensed partners in accordance with a four-part process. Further information is available at: www.busmethodology.org.uk/.

BRE's Design Quality Method (DQM) is a tried and tested independent POE method used by all UK auditing authorities, as well as many funding bodies. Further information is available at: www.bre.co.uk/dqm. Further guidance on POE:

- The BCO guide to Post Occupancy Evaluation (POE), British Council for Offices, 2007
- BRE Digest 478, Building performance feedback: getting started, Building Research Establishment, 2003 to Post Occupancy Evaluation Report and Toolkit, HEFCE, AUDE & University of Westminster, 2006.
- The Design Quality Indicator (DQI), www.dqi.org.uk
- BSRIA Guide to Building Performance Evaluation in Non-Domestic Buildings

M2.2 Relevant information for dissemination
This includes the following information about the building and its performance:

1. A basic description of the project and building
2. BREEAM-NOR rating and score
3. Key innovative and low-impact design features of the building
4. Project cost

5. Project size: floor area, site area
6. Facilities available for community use (where relevant)
7. Any measures taken during the construction process to reduce environmental impacts, i.e. innovative construction management techniques
8. Predicted and actual carbon dioxide emissions or energy labelling
9. Outcomes of the POE study to share lessons learned from the project including:
    a. Occupant feedback
    b. Energy and water consumption including renewable energy generation, level of rainwater or grey water provision

Appendix A (on the NGBC website) can be used as a guide for the preparation of this information.

M.2.3. Appropriate dissemination of POE information

Appropriate dissemination includes communication to immediate stakeholders such as building occupants, managers and owners. Information should also be communicated externally.

In most cases, appropriate dissemination will mean the production and publication of a building case study through one of the following means:

1. The client's or building owner's own website, publicly available literature or a press release
2. Industry, sector, government or local authority sponsored website or information portals.

Where there is a demonstrably justifiable reason why public dissemination is not possible, for example, the information is commercially sensitive or security sensitive, compliance can be demonstrated by a commitment to produce and disseminate the relevant information at an organisational level or to appropriate internal or external stakeholders. Alternatively, the sensitive parts of the relevant information for dissemination can be omitted from the publication.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–2	A confirmation / obligation from the developer that there will be requirements for follow-up of building users and measurement of energy and water consumption after moving in according to the criteria and methodology. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant actors to follow up building users and measure energy and water consumption after moving in according to the criteria and methodology.	Documentation showing the contractual obligations of the relevant parties to follow up building users and measure energy and water consumption after moving in according to the criteria and method
3	A confirmation / obligation from the developer that there will be a requirement that a seasonal trial operation will be carried out in accordance with the criteria and methodology. Applies in those cases where the relevant party is not selected. ----------------- OR	Documentation showing the contractual obligations of the relevant players to perform seasonal test operations in accordance with the criteria and method.

	Documentation showing the contractual obligations of the relevant players to perform seasonal test operations in accordance with criteria and methodology.	
4	A confirmation / obligation from the developer that there will be a requirement that evaluations and improvements will be carried out in accordance with the criteria and methodology. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant players to perform evaluations and improvements in accordance with criteria and methodology.	Documentation showing the contractual obligations of the relevant players to perform evaluations and improvements in accordance with the criteria and method.
5-6	A confirmation / obligation from the developer that requirements will be set for an evaluation and publication of the results in accordance with criteria and methodology. Applies in cases where the relevant actor has not been selected. ----------------- OR Documentation showing the contractual obligations for relevant actors to evaluate and publish the results in accordance with criteria and methodology.	Documentation showing the contractual obligations for relevant actors to evaluate and publish the results in accordance with criteria and methodology.

Definitions

D1 Facility management

Personnel who take care of the daily operation and maintenance of buildings and technical facilities and who monitor technical facilities (with or without technical knowledge) at all times.
In relation to this definition it is meant maintenance and administration of the building, its services and surroundings, including interaction with related activities in the building and the building users.

D2 Independent third party

To comply with criterion relating to the use of an independent third party, the client or design team must demonstrate either of the following options:

1. They have used a party independent of the design process to conduct the necessary POE exercise using a compliant method

OR

2. If the POE is to be carried out by an organisation involved in the design of the building, e.g. the project architect, they must present the assessor with evidence that demonstrates the independence of the POE process from the design process. BREEAM has not attempted to define what form this exercise must take; the onus is on the design team or relevant individual to clearly demonstrate to the BREEAM Assessor a credible level of independence.

Additional information

None.

Health and Wellbeing

Summary

This category encourages the increased health, wellbeing and safety of building users. Issues within this category reward building design and specification decisions that create a healthy, safe and comfortable internal and external environment.

Category summary table

Issue	Credits	Aim
Hea 01 Visual comfort	Up to 7	To ensure that daylight, artificial lighting and user control are considered in the design phase to ensure best practice in lighting quality and visual comfort for the building's users.
Hea 02 Indoor air quality	Up to 4	To recognize and encourage a healthy indoor air quality through the specification and installation of appropriate ventilation, equipment, and finishes
Hea 03 Thermal comfort	3	Ensure satisfactory thermal comfort by designing and selecting necessary controls to maintain a comfortable thermal environment for building users.
Hea 05 Acoustic performance	Up to 4	Ensure that the building provides an appropriate acoustic environment that is comfortable for the building's users.
Hea 06 Safe and healthy surroundings	Up to 3	Ensure that the building is facilitated and accessible to all potential users and enhance health and wellbeing through the use of nature-based design principles.
Hea 08 Private space	1	To provide an external space which gives occupants privacy and a sense of wellbeing

Hea 01 Visual comfort

Number of credits available	Minimum requirements				
	P	G	VG	E	O
Up to 7	Crit. 1–3	Crit. 1–3	Crit. 1–3	Crit. 1–3	Crit. 1–3

Aim

To ensure that daylight, artificial lighting and user control are considered in the design phase to ensure best practice in lighting quality and visual comfort for the building's users.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	1-4, 8-10, 14-15 and 21-22	1-4, 8-10, 14-15 and 21-22
Assessment type specific notes	None	See ref. 1.0 See Appendix D	See ref. 1.0 See Appendix D

Assessment type specific notes	
1.0	**General** If it is not possible to confirm which areas of the building will contain occupied areas, workstations, benches or desks, all areas of the building designed for or likely to be occupied areas, workstations, benches or desks must comply with the relevant criteria.

Building type specific notes

Building type specific notes	
2.0	**Prison buildings** The criteria for zoning of lighting control are excluded for assessments of prison buildings.
2.1	**Control of glare from sunlight** Filtered out for building type - Residential. The criteria apply to relevant areas in all other building types.
2.2	**Internal and external lighting levels, zoning and control** Filtered out for building type - Residential. The criteria apply to relevant areas in all other building types.

Assessment criteria

This issue is split into seven parts:

- Prerequisite: Limitation of light flicker and daylight assessments (no credits)
- Daylighting (up to three credits)
- Control of glare from sunlight (one credit)
- View out (one credit)
- Sunlight (one credit)
- Internal and external lighting levels, zoning and control (one credit).
- Exemplary level: View out, high level (one credit)

Prerequisite: Limitation of light flicker and daylight assessments – no credits

1. Lighting systems must be designed according to NS 12464-1:2021 section 5.8 to avoid the adverse effects of flicker (P_{st}^{LM}) and temporal light artefacts (see Definitions), such as stroboscopic effect (M_{VS}) (see Definitions) throughout the whole dimming range (this includes light sources and control equipment). At full

load, the requirement for the target number for the degree of fibrillation (Pst LM) and the requirement for the target number for the visibility of stroboscopic effect (MVS) are Pst LM ≤ 1.0 and Mvs ≤ 0.4, respectively.

2. For all lighting that can be regulated/dimmed, the driver must be fitted with a control device for either amplitude control or pulse width modulation (PBM), or a combination of both. If dimming of light sources/ luminaires uses PBM, the driver's output frequency must, as a minimum, be 450 Hz in order to minimise flicker.
3. Daylight assessments must be carried out no later than in step 3. The results must be presented to and reviewed together with the developer.

Daylighting – up to 3 credits

4. Daylight assessments must show that the daylight criteria have been met using one of the following alternatives:
   a. Relevant areas in the building (see Definitions) must have been designed in accordance with the level in Table Hea 01-01 for climate-based daylight targets (Lux), which is described in NS-EN 17037:2018+A1:2021 Daylight in buildings Table A.1 for openings in vertical and inclined surfaces and in Table A.2 for openings in horizontal surfaces for 50% of annual daylight hours (see Methodology).

   OR

   b. Relevant areas in the building must have been designed in accordance with the level in Table Hea 01-01 for daylight factor (D) described in NS-EN 17037:2018+A1:2021 Daylight in buildings Table A1, A2, and A3. For horizontal surface openings where translucent materials (see Definitions) are used, the minimum requirements in Table A4 in NS-EN 17037:2018+A1:2021 can be used (see Methodology).

Table Hea 01-01 Requirements for daylight and number of credits available

Level	Credits
Minimum	2
Medium	3

Control of glare from sunlight – 1 credit

5. The project must assess the probability of daylight glare (see Definitions) according to NS-EN 17037:2018+A1:2021 Daylight in buildings for relevant areas of the building (see Methodology and Definitions).
6. The assessment must have developed and implemented a strategy for glare control (see Definitions) for relevant areas of the building and where the probability of DGP (Daylight Glare Probability – see Definitions) exceeds 0.4 for more than 5% of the annual hours of operation (see Definitions).).
7. The selected glare control strategy must be optimised to ensure that daylight can enter when it is cloudy or when the sun is not shining on the façade. The strategy should contribute to a reduction in unnecessary energy usage for artificial lighting. The placement and design of the selected solutions should not be in conflict with the control systems for lighting.

View out – 1 credit

8. 75% of relevant areas of the building (see Definitions) must meet the criteria for the minimum level of visibility according to NS-EN 17037:2018+A1:2021 Daylight in buildings and as defined in Table Hea 01-02.
9. View out should be assessed from eye level for a seated person, i.e. 1.2 m from the floor surface (see Methodology).

Table Hea 01-02 Requirements for view out and number of credits available

Level	Credits
Minimum	1
High	Exemplary level (criteria 21–22)

Sunlight – 1 credit

10. The assessment should document that on a selected date between February 1 and March 21, relevant areas (see Definitions) receive at least three hours of sunlight according to NS-EN 17037:2018+A1:2021 Daylight in buildings Table A.6.

Internal and external lighting levels, zoning and control – 1 credit

Internal lighting

11. Indoor lighting intensity (lux) for relevant areas must be specified in accordance with Chapter 5.3 of NS-EN 12464-1: 2021 Lights and lighting – Lighting of workplaces Part 1: Indoor workplaces.
12. For areas where computer screens are regularly used, a confirmation is required that the lighting is designed to limit the possibility of glare in accordance with the glare number limit specified in the national guidelines for best lighting practice (see Methodology).
13. The uniformity of the lighting (from artificial light) must comply with the recommendations in the national guidelines for best lighting practice.

External lighting

14. Outdoor lighting intensity (lux) must be specified in accordance with NS-EN 12464-2: 2014 Lighting and Lighting of workplaces Part 2: Outdoor workplaces.
15. Where no external light fittings are specified (either separate from or mounted on the external building façade or roof), the criteria relating to external lighting do not apply and the credit can be awarded on the basis of compliance with criteria 11–13 above. If no internal lighting is specified, the credit cannot be awarded.

Zoning and occupant control

16. Internal lighting must be zoned to allow for occupant control (see Definitions). Zoning must be in accordance with the criteria below for relevant areas present within the building:
    a. In office areas, each zone must have no more than four workplaces (see Methodology). For workplaces, the requirement for user control includes workplace lighting, not general lighting.
    b. Workstations adjacent to windows or atria and other building areas must be separately zoned and controlled. For workplaces, the requirement for user control includes workplace lighting, not general lighting.
    c. Seminar and lecture rooms: zoned for presentation and audience areas
    d. Library spaces: separate zoning of stacks, reading and counter areas
    e. Teaching space or demonstration area
    f. Whiteboard or display screen. This criterion only applies if there is a need for lighting in the presentation zone. If there is no such need, this criterion can be considered to be fulfilled.
    g. Auditoria: zoning of seating areas, circulation space and lectern area
    h. Dining, restaurant and café areas: separate zoning of servery and seating/dining areas
    i. Retail: separate zoning of display and counter areas
    j. Bar areas: separate zoning of bar and seating areas
    k. Wards or bedded areas: zoned lighting control for individual bed spaces and control for staff over groups of bed spaces
    l. Treatment areas, day rooms, waiting areas: zoning of seating and activity areas and circulation space with controls that are accessible to staff.
17. For educational buildings only: Areas used for teaching, seminar or lecture purposes must have lighting controls specified by the size and use of the space. In a typical auditorium or lecture theatre with stepped seating and a formal lectern, demonstration or performance areas would typically be expected to have lighting controls as follows:
    a. Full normal lighting (to allow for entry, exit, cleaning, etc.)
    b. Demonstration area lighting off and audience area lighting reduced to a low level (for the purpose of line slide projection, but allowing enough light for the audience to take notes).

c. All lighting off (for the projection of tone slides, colour slides and for the purposes of visual demonstrations or performances).
d. Separate localised lectern lighting.
e. Manual lighting controls must be easily accessible for teachers while teaching and on entering or leaving the teaching space. Manual lighting controls need only be provided for staff, not pupils.

18. For hotels only: For hotel rooms or rooms in a hotel suite that are used as work areas, similar to a small office, the lighting levels must be in accordance with national best practice levels for this type of room.
19. Prison buildings only: In addition to criteria 11–13, there must be the facility for the occupant of the cell to select a lower level of general lighting if required. This through using for example, dimming, step switching or separate task and general lighting.
20. Court buildings only: Separate zoning must also be provided for the following areas (as a minimum):
    a. Judge's or magistrate's bench
    b. Defence and prosecutor's bench
    c. Jury area (if relevant)
    d. Public seating area.

    Lighting control of zones in the above spaces, and the court as a whole, must cater for the following settings:
    e. Full lighting (to allow cleaning, etc.)
    f. Normal lighting (for court sessions)
    g. Dimmed (for the purpose of showing audio-visual evidence, but allowing sufficient light to allow for notes to be taken

Exemplary level criteria – highest requirements for view out – 1 credit

21. 75% of relevant areas in the building must meet the criteria for the highest requirements for view out defined in Table A.5 in NS-EN 17037:2018+A1:2021 Daylight in buildings (see Methodology).
22. Visibility shall be assessed from eye level for a seated person, i.e. 1.2 m from the floor surface.

Methodology

M1 Limitation of light flicker and daylight assessments

M1.1 Methodology according to NS-EN 17037:2018+A1:2021

Daylight assessment shall be in accordance with NS-EN 1703:2018-A1:2021. The assessment can be completed with either climate based lighting values (lux) or the daylight factor (D). Daylight assessment for residential buildings, see M1.2.

M1.2 Daylight assessment for residential buildings

The assessment can be carried out in accordance with M1.1 or in accordance with pre-accepted performance 1.b in TEK17 § 13-7, second paragraph for daylight in residential units. Please note, however, that all conditions described under pre-accepted performances must be met. This requires, among other things, that the project must document that there is nothing that blocks the view of the horizon at an angle of more than 45 degrees measured from the horizontal plane.

M2 Daylighting

M2.1 Methodology according to NS-EN 17037:2018+A1:2021

The assessment should document that the requirements for access to daylight in NS-EN 17037:2018+A1:2021 Daylight in buildings are fulfilled for relevant areas (see Definitions) in the building by showing compliance with either average daylight illuminance (lux) or the daylight factor (D).

Calculations shall not include areas within a distance of 0.5 m from walls.

The assessment should use the B.2 Calculation grid in NS-EN 17037:2018+A1:2021 Daylight in buildings to make a specification that will ensure standardised and accurate results.

The following reflection factors should be used in each room:
- floors: 0.3
- walls: 0.5
- windowsills: 0.8
- ceilings: 0.8

The reflection factor for the external surfaces (ground) to be used is 0.2.
The project can choose other reflection factors, but this must be justified.

Standard evenly cloudy skies shall be used in simulations (CIE – sky type 1 or 16 in ISO 15469: 2004).
Calculations must be performed on a reference plane that is 0.85 m above the floor.

Table Hea 01-03 Requirements for daylight

	Openings in vertical surfaces	**Openings in horizontal surfaces**	**Openings with translucent materials in horizontal surfaces**
Minimum level	EITHER D=0.8% in 95% of the room AND D=2.4% in 50% of the room OR E_T=100 lux in 95% of the room AND E_T=300 lux in 50% of the room AND Lux values must show compliance for at least 50% of the annual daylight hours (see the Methodology below).	EITHER D=2.4% in 95% of the room OR E_T=300 lux in 95% of the room AND Lux values must show compliance for at least 50% of the annual daylight hours (see the Methodology below).	EITHER D=0.7% in 95% of the room AND D=2.1% in 50% of the room OR E_T=100 lux in 95% of the room AND E_T=300 lux in 50% of the room AND Lux values must show compliance for at least 50% of the annual daylight hours (see the Methodology below).
Medium level	EITHER D=2.4% in 95% of the room AND D=4.0% in 50% of the room OR E_T=300 lux in 95% of the room AND E_T=500 lux in 50% of the room AND Lux values must show compliance for at least 50% of the annual daylight hours (see the methodology below).	EITHER D=4.0% in 95 % of the room OR E_T=500 lux in 95% of the room AND Lux values must show compliance for at least 50% of the annual daylight hours (see the methodology below).	EITHER D=2.1% in 95% of the room AND D=3.4% in 50% of the room OR E_T=300 lux in 95% of the room AND E_T=500 lux in 50% of the room AND Lux values must show compliance for at least 50% of the annual daylight hours (see the methodology below).

M2.2 Annual daylight hours

Annual daylight hours is the time from sunrise to sunset throughout the year. Reference is made to climate data for 275 climate sites in Norway and 14 climate sites on Svalbard and Jan Mayen: http://climate.onebuilding.org/WMO_Region_6_Europe/default.html

The assessment must justify which climate site best corresponds to the location of the building in question.

M2.3 Daylight, indirect or reflected light

For areas where indirect or reflected light is used to demonstrate compliance with daylighting criteria, calculations or results from appropriate lighting design software must be provided, see Annex B in NS-EN

17037:2018+A1:2021, to demonstrate that such areas meet the BREEAM-NOR criteria (if the light from these sources is required in order for the room to comply). Examples of such light include light shelves, clerestory glazing, sun pipes or internal translucent or transparent partitions (such as those using frosted glass).

M2.4 Documentation of daylight

Documentation must show daylight assessments for all relevant rooms (see Definitions).
NS-EN 17037:2018+A1:2021 can be used to show compliance with technical regulations TEK17 § 13-7.
For commercial buildings, public buildings or other buildings with workplaces, in the case of daylight levels that are lower than those required in Table Hea01-01 and TEK17 § 13-7, there must be approval/dispensation from the Norwegian Labour Inspection Authority showing that this has been explicitly approved.

M3 Control of glare from daylight

M3.1 Relevance of control of daylight glare

The methodology described in NS-EN 17037:2018 - A1:2021 Daylight in buildings only applies to rooms that are side-lit. For rooms with skylights or glass ceilings, the assessor must seek technical clarification for approval of an alternative method.

M4 View out

M4.1 Method according to NS-EN 17037:2018+A1:2021

The project must show that all three assessment requirements for view out are met to demonstrate that the minimum level has been achieved, as described in NS-EN 17037:2018+A1:2021 Daylight in buildings Table A.5. Table A5 defines the view in three layers: sky, landscape (urban or nature) and ground (water) (top, middle, bottom).

The standard describes the method for assessing views through multiple windows on the same façade and on different façades in section C.3. There are tables for guidance on window sizes for different room types and horizontal viewing angles.

A view into an internal courtyard or atrium will comply provided the distance from the opening to the back wall of the courtyard or atrium is at least 10m (therefore allowing enough distance for the eyes to refocus). The view cannot be an internal view across a room, as this is likely to become obstructed by partitions, filing cabinets, etc. In addition, an external view out can offer positive effects for health and well-being that cannot be offered by an internal view.

Table Hea 01-04. Requirements for view out to achieve the credit

	Horizontal point of view	Distance from the opening/ window to the building/object outside	Number of landscape layers that can be seen from at least 75% of the room area
Minimum level	≥ 14°	≥ 6.0 m	At least one landscape layer (middle) must be included in the view
High level	≥ 54°	≥ 50.0 m	All layers (top, middle and bottom) must be included in the view

M5 Sunlight

M5.1 Methodology according to NS-EN 17037:2018+A1:2021

The assessment must document that the medium level in Table A.6 in NS-EN 17037:2018+A1:2021 has been achieved. In buildings for people with limited mobility, the orientation of openings should take into account the hours of occupancy and any preferences for sunlight at particular times of day. The assessment should be conducted for each opening in the space, from a reference point (P) located on the inner surface of the opening and 1.2 m above the floor, for openings without a sill, and 0.3 m above the sill of the opening, if a sill is present. See Annex D in NS-EN 17037:2018+A1:2021 for further information on the calculation methodology.

If the room has multiple openings in the façade that provide sunlight, the project can count sunlight from both openings, provided that they do not provide sunlight for the same period of time. For example, a room that receives one hour of sunlight from a window to the south and two hours of sunlight from a window to the west later in the day can count a total of three hours of sunlight for this room.

Sunlight credit can be validated either by using software, see section D.3 in Annex D in NS-EN 17037:2018+A1:2021, or by using the geometric construction method described in section D.4 in Annex D in NS-EN 17037:2018+A1:2021.

M6 Internal and external lighting levels, zoning and control

M6.1 National guidelines for best lighting practice

Lighting culture 1B Luxury table and planning criteria for indoor lighting systems, which is a guide to NS-EN 12464-1:2021 Light and lighting – Lighting of workplaces – Part 1: Indoor workplaces.
Lighting culture 1C Luxury table and planning criteria for lighting of outdoor workplaces, which is a guide to NS-EN 12464-2:2014 Light and lighting – Lighting of workplaces – Part 2: Outdoor workplaces.

M6.2 Zones with four workspaces

The limit of four workspaces is indicative of the required standard but is not a fixed requirement. Where there is justification for this to be increased to fit the adopted lighting strategy, this may be accepted provided that the assessor is satisfied that the aim of this criterion is upheld, i.e. that there is suitable zoning or control of lighting to enable a reasonable degree of occupant control over lighting in their personal work area. The relevant design team member, e.g. lighting consultant, should set out how this is to be achieved in such an instance.
Where the occupancy or workstation layout is not known, lighting control can be zoned on the basis of 40m² grids, i.e. an assumption of one person or workspace per 10m².

M6.3 Other zones or rooms

If rooms or zones are not mentioned in criteria 16–20, the assessor may assess whether the specifications in the criteria are appropriate for the assessed room/zone.

M6.4 Small spaces

Buildings consisting entirely of small rooms or spaces (less than 40m²) that do not require any subdivision of lighting zones or control will meet the zoning criteria by default.

M6.5 The following internal areas are excluded from the lighting zone requirements

a. Media and arts production spaces
b. Sports facilities (exercise spaces only, including hydrotherapy and physiotherapy areas).

Evidence

Criteria	Design stage	Post-construction stage
1-3	A confirmation / obligation from the developer that requirements will be set for limiting flicker	Updated documentation of the degree of flicker and the visibility of stroboscopic effect

Criteria	Design stage	Post-construction stage
	in lighting systems and daylight assessments. Applies in those cases where the relevant party is not selected. ---------------- OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for limiting flicker in lighting systems and daylight assessments. ----------------- OR Documentation of the degree of flicker and the visibility of stroboscopic effect for all lighting systems. AND Documentation of control devices for all lighting. AND Daylight assessment for all relevant rooms in the building.	for all lighting systems with as-built information. Updated documentation of control device for all lighting with as-built information. Updated daylight assessment for all relevant rooms in the building with as-built information.
4	A confirmation / obligation from the developer that requirements will be set for daylight levels. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to meet all requirements for the design of the selected daylight level. -------------------- OR Daylight assessment for all relevant rooms in the building.	Updated daylight assessment for all relevant rooms in the building with as-built information.
5–7	A confirmation / obligation from the developer that requirements will be set for the control of glare from daylight for relevant areas of the building. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for the control of glare from daylight for relevant areas of the building. -------------- OR	Glare control strategy for relevant areas of the building with as-built information. Assessor's inspection report with photographic evidence showing that the results of the glare control strategy have been implemented.

Criteria	Design stage	Post-construction stage
	Glare control strategy for relevant areas of the building.	
8–9 and 21–22	A confirmation / obligation from the developer that a requirement will be made to meet all requirements for view out. Applies in those cases where the relevant party is not selected. ---------------- OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for view out. --------------- OR Documentation of view out for relevant areas of the building.	Documentation of view out for relevant areas of the building. Assessor's inspection report with photographic evidence showing that the criteria for distance have been implemented.
10	A confirmation / obligation from the developer that a requirement will be made to meet all requirements for sunlight. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for sunlight. ---------- OR Documentation of sunlight for relevant areas of the building.	Updated documentation of sunlight for relevant areas of the building with as-built information.
11–20	A confirmation/commitment from the developer to meet all requirements for indoor and outdoor lighting levels and zoning. Applies in those cases where the relevant party is not selected. ------------------ OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for indoor and outdoor lighting levels and zoning. ------------------ OR Documentation of indoor and outdoor lighting levels and zoning.	Updated documentation for indoor and outdoor lighting levels and zoning with as-built information. Assessor's inspection report with photographic evidence showing that indoor and outdoor lighting levels and zoning requirements have been implemented.

Definitions

D1 Workspace

Rooms where employees are to perform work that is part of the company's regular activities. See the following: https://www.arbeidstilsynet.no/regelverk/forskrifter/arbeidsplassforskriften/1/1-4/

D2 Illuminance

The amount of light falling on a surface per unit area, measured in lux.

D3 Glare from daylight

If there are particularly bright surfaces or dots in the field of view, or there are large contrasts, the possibility of glare arises. It is common to distinguish between two types of glare: visually impaired glare and glare that causes discomfort. Both forms of glare are affected by the light intensity in the surroundings. The darker the environment, the greater the likelihood of glare problems.

D4 Computer simulation

Software tools that can be used to model more complex room geometries for daylighting.
The simulation tool must be validated according to CIE 171: 2006 and prerequisites are given in NS-EN 12464-1: 2011 chapter 4.4.

D5 Daylight Glare Probability (DGP)

“Probable glare from daylight” (DGP) is an approach that assesses illuminance (see Definitions) at eye level and individual glare sources, to estimate the number of dissatisfied persons, based on an empirical formula. (NS-EN 17037: 2018, Appendix E.2)

D6 Clinical areas

Areas of the building in which medical functions are carried out that require specific restricted environmental conditions such as humidity, daylighting, temperature, etc. (e.g. x-ray, operating department, delivery room, etc.).

D7 Flicker

An observer's perception (in a specified environment) of visual instability caused by a light stimulus if luminance or spectral energy distribution fluctuates with time (0.1 Hz−80 Hz). The size symbol for the degree of flicker is P_{st}^{LM}, where 'st' in lower case stands for "short term" and 'LM' in upper case stands for "Luminance Modulation". $P_{st}^{LM} = 1$ defines the probability threshold, where the probability that the fluctuations are perceived as flicker is 50%.

D8 Public areas

Areas of the building designed for public use. For example: for a healthcare building, this includes areas of the building designed for public use where no medical functions are carried out (e.g. reception, retail unit, waiting areas).

D9 Relevant areas of the building – glare from daylight

For glare control, areas of the building in which lighting and resultant glare could be problematic for users must be included, e.g. those areas that have been designed to contain or use workstations (with or without computers), projector screens, laboratories, study areas, libraries, control rooms, reception desks, sports halls or spaces in which people have to spend time in fixed locations such as classrooms, hospital wards, court rooms and factory production lines.

Spaces in the categories described above, for which daylight and view out are excluded, should not be assessed using the glare control criteria. This includes reception and atrium spaces where these spaces meet this definition.

Where an atrium space does not meet the definition of 'Relevant areas of the building – glare from daylight", it does not need to comply with the criteria. However, the risk of glare must be considered for any relevant building areas that connect to the atrium space. This is because sunlight could pass through the atrium causing discomfort to users of other relevant building areas that connect to the atrium space. Where this is the case, building design measures or the provision of shading will be required to enable the glare to be controlled or eliminated.

Curtains (where used without other forms of shading) do not meet the criteria for the glare control credit. This is because they do not provide sufficient control to optimise daylight into the space. As such, the use of curtains to control glare is likely to cause occupants to rely more on artificial lighting.

D10 Relevant building areas – daylight

For homes and other types of accommodation, relevant building areas are living rooms and similar rooms, kitchens and bedrooms. This does not include storage rooms, corridors, hallways, cloakrooms, toilets, shower rooms, etc.

For all other buildings, relevant building areas are all types of workspace areas (see Definitions) and public areas (see Definitions). This includes the following (where the areas are occupied continuously for 30 minutes or more):

1. Sports hall exercise spaces
2. Laboratory areas, unless the type of research that will be carried out requires strictly controlled environmental conditions, such as the exclusion of natural light at all times.
3. Self-contained flats
4. Kitchen and catering areas
5. General communal areas
6. Small offices (including those within multi-residential buildings)
7. Meeting rooms (including those within multi-residential buildings)
8. Leisure areas
9. Any area that may involve close up work.

The areas in the list are specifically described because they are often omitted.

However, this excludes the following (where present):

1. Media, arts production, SEN sensory spaces in special schools, x-ray rooms and other areas requiring strictly controlled acoustic or lighting conditions
2. Clinical areas (see Definition), with controlled environmental conditions, e.g. operating theatres, delivery rooms or pathology departments. However, BREEAM-NOR strongly advises that the benefits of daylighting and view out are seriously considered when designing areas of critical and intensive care in healthcare buildings.
3. Holding areas and custody cells where security issues conflict with the BREEAM-NOR daylighting requirements
4. Custody cells in courts, where privacy is a functional or operational requirement.

D11 Relevant areas of the building – sunlight

Patient areas: all areas in the building that are mainly used by patients, and is used for more than 30 minutes (e.g. wards, day rooms, etc.),
Teaching: all areas in the building that are mainly used by staff and students to be used for more than 30 minutes (e.g. classrooms, offices, etc).
Dwellings: at least one of the relevant rooms/areas in the dwelling defined under daylight.
Other buildings: all workstations or permanent workplaces.

D12 Relevant building areas – view out

BREEAM-NOR defines relevant building areas requiring a view out to include areas of the building where:

1. There are or will be workstations or benches or desks for building users.
2. Close work will be undertaken or visual aids will be used.

Excluded areas for each of these might include:

1. where they are located centrally in a ward or patient area in order to enable patient observation.
2. Courts and interview rooms where compliance is not possible due to security or privacy criteria.
3. Prison staff areas containing workstations which, for security or observational reasons, must be located centrally within the building.
4. Any clinical areas where the control of environmental or operational conditions prevents such spaces from providing a view out.
5. Conference rooms, lecture theatres, sports halls, acute SEN and also any spaces where the exclusion or limitation of natural light is a functional requirement, e.g. laboratories, media spaces, etc.
6. Isolated workstations for intermittent, short-term work, e.g. workstations within a server room.

D13 Separate occupant control

Light switches or controls for a particular area or zone of the building that can be accessed (see Definitions) and operated by the individuals occupying that area or zone. Such controls must be located within, or within the vicinity of, the zone or area they control.

D14 Strategy for glare control – glare from daylight

Glare control must provide shading from both high-level summer sun and low-level winter sun.

When using fixed (non-moving) systems, analyses/studies must be used to demonstrate that the users are shielded during the period in which the building is in use.

Traditional curtains that are drawn from each side of a window and meet in the middle, or that are drawn over the entire window from one side to the other, do not meet the requirements for glare control, as the control/design could prevent daylight from entering. Thus, the use of curtains to control glare is likely to make users more dependent on artificial lighting.

D15 Stroboscopic effect

Changes in a static observer's perception of movement in a non-static environment caused by a light stimulus if luminance or spectral energy distribution fluctuates (oscillates) with time (80 Hz−2.5 kHz)
The size symbol for the visibility of the stroboscopic effect is M_{VS} where V and S in lowercase stand for "Visibility" and "Stroboscopic". Mvs = 1 defines the visibility threshold, where the probability that the fluctuations will give a visible stroboscopic effect is 50%.

D16 Temporal light artefacts

Changes in the observer's visual perception (in a specified environment), caused by a light stimulus whose luminance or spectral energy distribution fluctuates with time.

D17 Accessible locations

An accessible location for dimming switches is a location that can be easily accessed by all building users in that zone. Alternatively, all building users could be given access to remote controls or computer software that controls the lighting.

D18 Translucent materials

A translucent light effect (refraction of light) can be achieved in different ways and with different products. In essence, the various translucent products can be divided into four main categories:

1. Products containing translucent and insulating fillers between transparent materials such as airgel.
2. Products where the surface itself is translucent. An example of this is frosted glass.
3. Transparent products, where a translucent effect is created with a foil. An example of this is ordinary three-layer glass with translucent foil.
4. Products where the material itself can change. (phase-change materials). For example, Glass X.

D19 View out

BREEAM-NOR uses the definition in NS-EN 17037:2018 - A1:2021, described in section 3.22. See also the description in section 5.2.

D20 Annual hours of operation

It is up to the assessment to define the relevant hours of operation. The definition in Tra 01 can be used as guidance. The selected hours of operation must be made visible in the documented calculations.

Additional information

None

Hea 02 Indoor air quality

Number of available credits	Minimum standards				
	P	G	VG	E	O
Up to 4	Crit. 1–2	Crit. 1–2	Crit. 1–2 Crit. 4	Crit. 1–2 Crit. 5	Crit. 1–2 Crit. 5

Aim

To recognise and encourage healthy indoor air quality through the specification and installation of appropriate ventilation, equipment, and finishes.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	1–2, 3.a–c 4, 5 and 12	1–2, 3.a–c and 4
Assessment type specific notes	see ref 1.0	see ref. 1.0, 1.1 and 1.2 see Appendix D	see ref. 1.0, 1.1 and 1.2 See Appendix D

Assessment type specific notes	
1.0	Criteria 1-2: The indoor air quality plan must be completed for the scope of works being assessed. This applies to shell and core assessments, as well as fully fitted. Assessors should use their judgement to determine the applicability of each aspect of the requirements for IAQs and ensure that the report addresses relevant aspects as fully as possible within the scope of the development.
1.1	Criteria 3a–c: If ventilation systems are not within the remit of the shell and core developer, compliance can be demonstrated through the building servicing strategy where this is predetermined by the built form or core services provision.
1.2	Criteria 4, 5 and 12: In cases where the number of product types installed in the building is less than the criterion specifies, interior surface treatments or integrated interior work in the building, not specified and installed by the developer (and will be provided as part of the fit-out works) is taken into account. A green fit-out agreement (see Attachment D) can be used to document these and fulfilment of criteria 4, 5 or 12. This rule applies only to those areas of the building that the scope of the green fit-out agreement covers.

Building type specific notes

Building type specific notes	
2.0	**Industrial** If the industrial building does not contain an office or other occupied space, this issue is not applicable.

Assessment criteria

This issue is split into five parts:

- Prerequisite: indoor air quality plan (no credits)
- Ventilation (1 credit)
- Emissions from construction products (up to two credits)
- Post-construction indoor air quality measurement – one credit
- Exemplary level criteria – Emissions from construction products (one credit)

Prerequisite: Indoor air quality (IAQ) plan – no credits

1. A site-specific indoor air quality plan has been produced (see Methodology). The objective of the plan is to facilitate a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building.
2. The project is in compliance with Mat 05 criteria 6–8 Control plan and moisture measurements (see Methodology).

Ventilation – 1 credit

3. The building must have been designed to minimise the indoor concentration and recirculation of pollutants in the building as follows:
   a. Fresh air into the building must be provided in accordance with the criteria of NS-EN 16798-1-2019 Annex B.3 category II, or better.
   b. Ventilation pathways must be designed to minimise the ingress and build-up of air pollutants inside the building (see Methodology)
   c. Where present, HVAC systems must incorporate suitable filtration to minimise external air pollution, as defined in NS-EN 16798-3:2017. The specified filters should achieve supply air classification of at least SUP 2 for supply air to occupied spaces (see Definitions).
   d. Areas of the building subject to large and unpredictable or variable occupancy patterns (see Definitions) must have carbon dioxide (CO_2) or air quality sensors specified and:
      i. In mechanically ventilated buildings or spaces: sensors must be linked to the mechanical ventilation system and provide demand-controlled ventilation to the space.
      ii. In naturally ventilated buildings or spaces: sensors must either have the ability to alert the building owner or manager when CO_2 levels exceed the recommended set point, or must be linked to controls that can adjust the quantity of fresh air, i.e. automatic opening of windows or roof vents.

Emissions from construction products – up to 2 credits

One credit

4. Three out of the five product types must meet the emission limits, testing requirements and any additional requirements listed in Table Hea02-1. Where wood-based products are not one of the three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class, as a minimum.

OR

Two credits

5. All of the product types listed in Table Hea 02-01 must meet the emission limits, testing requirements and any additional requirements.

Table Hea 02-01: Emission criteria by product type

Emission limit*			Testing requirement**
Formaldehyde	Total volatile organic compounds*** (TVOC) (see Definitions)	Category 1A and 1B Carcinogens (see Definitions)	
Interior paints and coatings			
≤0.06 mg/m³	≤0,3 mg/m³	≤0.001 mg/m³	EN 16402:2019 or NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 or NS-EN EN 16516:2017+A1:2020 or CDPH Standard Method v1.2
Additional requirements: Meet TVOC content limits (See Table Hea 02-04) Wet room paint must be used in wet zones (see Definitions).			
Wood-based products (including wood flooring)			
≤0.06 mg/m³	≤0.3 mg/ m³	≤0.001 mg/m³	NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 Or EN 16516:2017+A1:2020 Or CDPH Standard Method v1.2 Or EN 717-1 (formaldehyde emissions only)
Flooring materials (including floor levelling compounds)			
≤0.06 mg/m³	≤0.3 mg/m³	≤0.001 mg/m³	ISO 10580 Or NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 Or NS-EN EN16516:2017+A1:2020 Or CDPH Standard Method v1.2
Ceiling, wall, and acoustic and thermal insulation materials			
≤0.06 mg/m³	≤0.3 mg/m³	≤0.001 mg/m³	NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 Or NS-EN 16516:2017+A1:2020 Or CDPH Standard Method v1.2
Interior adhesives and sealants (including flooring adhesives)			
≤0.06 mg/m³	≤0.3 mg/m³	≤0.001 mg/m³	NS-EN 13999 (Parts 1-4) Or NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 Or NS-EN 16516:2017+A1:2020 Or CDPH Standard Method v1.21
* The emission limits in this table apply to the finished product, i.e. after any coating or other treatment process have been applied.			

<table>
<tr><th colspan="3">Emission limit*</th><th>Testing requirement**</th></tr>
<tr><th>Formaldehyde</th><th>Total volatile organic compounds*** (TVOC) (see Definitions)</th><th>Category 1A and 1B Carcinogens (see Definitions)</th><th></th></tr>
<tr><td colspan="4">** Compliance with emission limits shall be demonstrated after 28 days in an emission test chamber or earlier as stipulated by the relevant testing requirements standard. The emission rate obtained from the chamber test method must be extrapolated to predict what the concentration would be in the air of the theoretical model or reference room (as detailed in the respective testing standard) and this extrapolated concentration must be compared with the emission limit in this table.

***Where test results for a product exceed the TVOC emission limit, compliance with the above requirements can still be achieved where the test results demonstrate an R-value ≤ 1 after 28 days.</td></tr>
</table>

Post-construction indoor air quality measurement – 1 credit

6. The formaldehyde concentration (see Methodology) in indoor air must be measured post-construction (but pre-occupancy) and must not exceed 100µg/m^3 averaged over 30 minutes (World Health Organization guidelines for indoor air quality: Selected pollutants, 2010).
7. The formaldehyde sampling and analysis must be performed in accordance with:
   a. Active sampling method: NS-EN ISO 16000-2: 2006 Indoor air – Part 2: Sampling strategy for formaldehyde (ISO 16000-2:2004) and ISO 16000-3 Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air – Active sampling method

   OR

   b. Passive sampling method: ISO 16000-4:2011 Determination of formaldehyde – Diffusive sampling method
8. The total volatile organic compound (TVOC) concentration in indoor air must be measured post-construction (but pre-occupancy) and must not exceed 500µg/m^3 over 8 hours.
9. The TVOC sampling and analysis must be performed in accordance with:
   a. Active sampling method: NS-EN ISO 16000-5:2007 Indoor air – Part 5: Sampling strategy for volatile organic compounds (VOCs) (ISO 16000-5:2007) and ISO 16000-6:2021 Indoor air – Part 6: Determination of organic compounds (VVOC, VOC, SVOC) in indoor and test chamber air by active sampling of sorbent tubes, thermal desorption and gas chromatography using MS or MS FID.

   OR

   b. Active sampling method: NS-EN ISO 16017-1:2000 Indoor, ambient and workplace air – Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography – Part 1: Pumped sampling (ISO 16017-1:2000)

   OR

   c. Passive sampling method: NS-EN ISO 16017-2:2003 Indoor, ambient and workplace air – Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography – Part 2: Diffusive sampling (ISO 16017-2:2003)
10. Where levels are found to exceed these limits, the project team must confirm that measures have, or will be, undertaken in accordance with the IAQ plan to reduce the TVOC and formaldehyde levels to within the above limits.
11. The measured concentration levels of formaldehyde (µg/m^3) and TVOC (µg/m^3) must be reported via the BREEAM NOR Assessor Report. The IAQ plan should be updated with measured values and indicate whether remedial actions have been taken.

Exemplary level criteria: Minimising emissions from construction products – 1 credit

12. Three of the product types listed must meet the emission limits, testing requirements and any additional requirements listed in Table Hea 02-02 below. Where wood-based products are not one of the three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class, as a minimum.

Table Hea02-02: Exemplary level emission criteria by product type

Emission limit*				
Formaldehyde	**Total volatile organic compounds (TVOC)*** **	**Total semi-volatile organic compounds (TSVOC)**	**Category 1A and 1B carcinogens (see Definitions)**	**Testing requirement*** *
Interior paints and coatings				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	NS-EN 16402:2019 OR NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 OR NS-EN 16516:2017+A1:2020 OR CDPH Standard Method v.1.2
Additional requirements: Must meet VOC content limits (see Table Hea02-04). Wet room paint must be used in wet zones (see Definitions).				
Wood-based products including wood flooring				
≤ 0.02 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 OR NS-EN 16516:2017+A1:2020 OR CDPH Method v1.2 OR EN 717-1 (formaldehyde emissions only)
Flooring materials (including floor levelling compounds)				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 10580 OR NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 OR NS- EN 16516:2017 + A1:2020 OR CDPH Standard method v1.2

Emission limit*				
Formaldehyde	**Total volatile organic compounds (TVOC)*** **	**Total semi-volatile organic compounds (TSVOC)**	**Category 1A and 1B carcinogens (see Definitions)**	**Testing requirement****
Ceiling, wall and acoustic and thermal insulation materials				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 10580 OR NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 OR NS-EN 16516:2017+A1:2020 OR CDPH Standard method v1.2
Interior adhesives and sealants (including flooring adhesives)				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	NS-EN 13999 (Parts 1-4) OR NS-EN ISO 16000-9:2006 and NS-EN ISO 16000-9:2016/AC:2007 OR NS-EN 16516:2017+A1:2020 OR CDPH Standard method v1.2

* The emission limits in this table apply to the finished product, i.e. after any coating or other treatment process have been applied.

** Compliance with emission limits shall be demonstrated after 28 days in an emission test chamber or earlier as stipulated by the relevant testing requirements standard. The emission rate obtained from the chamber test method must be extrapolated to predict what the concentration would be in the air of the theoretical model or reference room (as detailed in the respective testing standard) and this extrapolated concentration must be compared with the emission limit in this table.

***Where test results for a product exceed the TVOC emission limit, compliance with the above requirements can still be achieved where the test results demonstrate an R-value ≤ 1 after 28 days.

Methodology

M1 Prerequisite

M1.1 Indoor air quality (IAQ) plan

It has been documented that poor indoor air quality can be linked to poor health and performance for the building's users. Thus, BREEAM-NOR projects will develop and implement an Indoor Air Quality Plan (IAQP) that seeks to minimise sources of pollution (see Definitions) and optimise indoor air quality. The methodology below is intended as a guide to the project. The project must consider whether there are other factors for achieving good ventilation in the building that must be considered. For example if any factors relating to the construction process might increase the risk of moisture in the building, ref criterion 2. The use of other methods must be assessed by the assessor.

M1.1.1 The content of the indoor air quality plan

The content of the plan must follow the instructions in checklist A2. Upon completion, the plan must be supplemented with a completed test report in accordance with Annex A.3 in NS 12599: 2012 Ventilation for buildings. Test procedures and measurement methods for handover of air conditioning and ventilation systems.

M1.1.2 Determining pollution location

The following web page is used: https://www.miljodirektoratet.no/tjenester/fagbrukertjeneste-for luftkvalitet/?kommune=4601&underside=aarsmiddel to identify whether the site is in an area of low or high pollution. The following options must be specified:

- Enter the municipality in which the building is located
- Select “Calculated”
- Select “Annual average”
- Select “NO_2”
- Select time period “2019” (this is the reference year used by all assessments)
- Click on the map where the building/project is located
- Take a screenshot for audit purposes
- Select “PM_{10}” and “$PM_{2.5}$”
- Select time period “2019” (this is the reference year used by all assessments)
- Click on the map where the building/project is located
- Take a screenshot for audit purposes

M1.1.3 High pollution location

Reference is made to Regulations on the limitation of pollution §7-6 https://lovdata.no/dokument/SF/forskrift/2004-06-01-931/KAPITTEL_3-1-1#%C2%A77-8v

If the area exceeds the annual limit values in the list below, it shall be deemed a high pollution location:

- PM_{10}: 20 µg/m²
- $PM_{2.5}$: 10 µg/m²
- NOx: 40 µg/m²

Which corresponds to ODA 2 in EN-NS 16798-3.
See M1.1.2 to determine the level of pollution.

If the area is a high pollution location, the assessment should consider, for example, placing the building air intake and adapting the ventilation filter type to minimise the pollution of indoor air by polluted outdoor air.

M1.1.4 Low pollution location

Any location with a pollution level that does not exceed the levels defined in M1.1.3.

M1.2 Compliance to Mat 05 criteria 6–8.

Compliance to criterion 2 is achieved by showing compliance with criteria 6 - 8 in issue Mat 05 Designing for durability and climate adaption. To show compliance with the prerequisite criteria in Mat 05 or achieve credits for Mat 05 is not needed to show compliance to Hea 02.

As a result of this, criteria 6 - 8 in Mat 05 is a minimum requirement from certification level Pass.

M2 Ventilation

M2.1 Location of ventilation intakes and exhaust pathways

The design of air-conditioned and mixed mode buildings should minimise the build-up of air pollutants. The location of ventilation intakes and exhaust pathways should be designed in accordance with any or a combination of the following methods:

M2.1.1 Positioning at a 10m distance

The building's air intakes and exhausts must be separated by a horizontal distance of 10m. Intakes must be positioned at a horizontal distance of at least 10m from sources of external pollution (including the location of air exhausts from other buildings). Air intakes and exhausts must be placed and designed in accordance with the recommendations of the Building Research Guide Series 552.360 “Location of fresh air intake and return to reduce pollution” to reduce the risk of moisture penetration and other pollution. Solutions defined as “poor” and “quite poor” should not be used. Exhausts and other pollutant sources should not be discharged into enclosed spaces, such as courtyards, in which intakes are also located.

M2.1.2 Jet cowl

A high velocity exhaust stack (jet cowl) with an exhaust opening that meets the following criteria is pre-accepted:
1. Direct exhaust flow upwards directed.
2. The average exhaust velocity must be 5 m/s or more over the stack opening (minimum velocity for VAV systems).
3. There must be a minimum of 0.4 metres vertical distance between the exhaust opening and upper part of the air intake.

M2.1.3 Building Research Guide Series 552.360

Methodology for calculating any short circuit between exhaust and fresh air intake in smaller buildings with air volumes up to 1000 l/s. The location and design of air intake and exhaust must be according to Building Research Guide Series 552.360 Chapter 6 for places with low pollution (see Methodology). Solutions defined as “poor” and “quite poor” should not be used.

M2.1.4 SN-CEN/TR 16798-4

The building’s air intakes and exhaust should be located in relation to each other and sources of external pollution, in accordance with the following best practice in SN-CEN/TR 16798-4 sections 8.8.1 to 8.8.4 (guidance to NS-EN 16798-3:2019)

M2.1.5 CFD or wind tunnel modelling

a. CFD or wind tunnel modelling (see Definitions) of pollutant dispersion can be used to inform the location of the building's air intakes and exhausts in relation to each other and sources of external pollution. This can be achieved using either wind tunnel modelling (see Definitions) or numerical modelling (see Definitions).
b. Pollutant dispersion modelling in urban areas is complex so it is important that the person carrying out the modelling is a competent individual (See Definitions).
c. The recommended maximum recirculation factor for air renewal is 0.01. Wind statistics and data for local pollution must be used.
d. This is particularly relevant for buildings with exhaust air with pollution level EHA 3-4 according to SN-CEN/TR 16798-4 Chapters 8.8.1 to 8.8.4 and for buildings in high pollution locations (see Methodology).

Where significant levels of gaseous pollutants such as nitrogen dioxide are identified in the outdoor air, the use of appropriate gas phase filtration in the building ventilation system should be considered, see also Methodology M1.3.

The design teams must ensure that the filter performance is appropriate for the on-site pollutant conditions.

The design of naturally ventilated buildings should minimise the build-up of air pollutants. Ventilation intakes and airflow pathways should be designed so that TEK17 as a minimum is fulfilled.

Table Hea 02-03 Options for approved location of air intake and exhaust pathways.

Options listed above the table:	M2.1.1	M2.1.2	M2.1.3	M2.1.4	M2.1.5
Building type:	All	All	Residential buildings Residential institutions (long- and short-term) Offices	Commercial buildings and residential buildings, if relevant.	All
Exhaust air pollution level: *	EHA1-4	EHA 1-4	EHA 1-2	EHA 1-4	EHA 3-4
Pollution level on site **	High/Low	High/Low	Low	High/Low	High/Low

* The EHA definition can be found in the guide to EN-NS 16798-3: 2019, SN-CEN / TR 16798-4 Chapters 8.8.1 to 8.8.4
** see methodology in M1.3

M2.2 Calculation method and category

For residential buildings, the calculation method is specified in NS-EN 16798-1: 2019 Chapter 6.3 and Annex B § B.3.2. For other types of buildings, see Chapter 6.3 and Annex B § B 3.1. Here, the project can choose either method 1 or method 2 depending on how much information is available in the project.

M3 Emissions from construction products

M3.1 Accreditation of organisations performing sampling or laboratory analysis

All organisations used for analysis of indoor air or for analysis of emissions from construction products must be accredited according to ISO/IEC 17025 with specific accreditation covering:

- Sampling: Pumped sampling for formaldehyde in air; pumped sampling for VOCs in air
- Chemical analysis: Determination of formaldehyde; determination of VOCs.

Sampling and chemical analysis of indoor air can be performed by separate organisations, but they must all be accredited.

M3.2 Scope of assessment of emissions from construction products

The scope of the VOC credit issues does not extend to furnishings, for example, desks or shelving. It focuses on key internal finishes and fittings integral to the building.
Only products that are installed or applied in parts of the building where their emissions are likely to affect indoor air quality need to be assessed. For the purposes of this issue, this means any product installed or applied:

- Inside the inner surface of the building's infiltration
- Inside the vapour or waterproof membrane or
- Inside the inner surface of the building envelope's interior facing thermal insulation layer, where present.

Inherently non-VOC emitting products do not need to be assessed and can be deemed fully compliant with the criteria. Examples of non-VOC emitting products include:

- Bricks
- Natural stone that does not contain radon (the highest annual average value should be lower than 100 Bq/m³)
- Concrete
- Ceramic tiles
- Glass
- Untreated metal surfaces, etc.

This is unless organic-based coatings, binders or sealants are used in their production or finishes.

Products specified for specialist applications or providing a specific function may be exempted from meeting the emission limits in Table Hea 02-01 and Table Hea 02-02 where it can be demonstrated that there are no alternative products available that can perform the function and meet the emission limits.

VOC emissions are also relevant for the interior surfaces of prefabricated products or rooms such as elevators, bathrooms, etc.

Table Hea 02-04 Maximum TVOC content for paints and coatings

Product category	Free TVOC content of ready-to-use product (g/l)
Interior matt walls and ceilings: Paint with gloss value ≤ 25 60 ° intended for use on interior walls and ceilings.	10
Interior glossy walls and ceilings paint with gloss value> 25 60 ° intended for use on walls and ceilings indoors	40
Interior trim and cladding paints for wood and metal: paint intended for decoration and cladding, and which forms an opaque film. This subcategory also includes primers without special properties and intermediate coats.	90
Interior trim varnishes and wood stains, including opaque wood stains: transparent or semi-transparent paints intended for decoration and protection of wood, metal and plastic. This subcategory also includes cover stains, meaning stains that provide an opaque film for coverage and protection of wood against degradation.	65
Interior minimal build wood stains: products for wood with an average film thickness.	50
Primers: Primers with sealing and/or insulating properties intended for use as a base on wood, walls and ceilings.	15
Binding primers: Products intended to stabilise loose substrates or to provide water-repellent properties and/ or protect wood against bluewood (fungal attack).	15
One-pack performance coatings: Surface treatment products based on film-forming material. They are intended for applications that require special properties, such as primer and top layer for plastic, primer for iron substrates, primer for reactive metals such as zinc and aluminium, anti-corrosion topcoats, treatment products for floors, including wood and cement floors, products with graffiti-repellent and fire-retardant properties, and products that must comply with health requirements in the food industry or the health sector.	100
Two-pack reactive performance coatings for specific end use such as floors: surface treatment products with the same application as one-component special paint, but where another component (for example tertiary amines) is added before application.	80
Multi-coloured coatings: paints intended to give a two-colour or multi-colour effect directly on first application.	80
Decorative effect coatings: paints intended to give special aesthetic effects on specially prepared and already painted or primed substrates, which are then treated with various tools during drying.	80
Testing requirements: NS-EN ISO 11890-2: 2020 or NS-EN ISO 17895:2005 or Calculation based on ingredients and raw materials.	

Reference is also made to the Regulations on restrictions on the use of chemicals that are hazardous to health and the environment and other products (the Product Regulations) for a better explanation of the categories in the table above.

M3.3 Number of products

For compliance with the first credit and exemplary level credit for emissions from constructions products, where four product types are specified within the building, the requirements remain the same and three out of the four products must comply with the criteria for emissions from construction products.

Where three or fewer product types are specified within the building, the number of product types that need to be assessed for the emissions criteria reduces proportionally as follows:

- Where three product types are present, two of them must comply.
- Where two or fewer product types are present, one of them must comply.

For the second credit, all of the products that are specified must comply. For example, if only four product types were specified, then all of these products would need to comply to achieve the second credit.

M3.4 Documentation and self-declaration of emission levels from construction products

The emission requirements from the various product groups are functional requirements and can be documented in several ways. The following is approved as documentation, if relevant:

Table Hea 02-05 List of approved documentation for criteria 4, 5 and 12

	Danish Indoor Climate Labelling Class 1	Danish Indoor Climate Labelling Class 2	EMICODE EC1PLUS	EMICODE EC1	EMICODE EC2	Indoor Air Comfort Gold®	German Blue Angel DE-UZ 176	GUT	M1	ECOproduct * green	ECOproduct * category 1
Interior paints and coatings	4, 5, 12	4, 5	4, 5 (parquet)	-	-	4, 5, 12	-	-	-	4, 5	4, 5, 12
Wood-based products including wood flooring	4, 5, 12	4, 5	-	-	-	4, 5, 12	4, 5 (DE-UZ 176 Panels and doors)	-	-	4, 5	4, 5, 12
Flooring materials (including floor levelling compounds)	4, 5, 12	4, 5	4, 5	4, 5	4, 5	4, 5, 12	(DE-UZ 120, 128, 176) 4, 5	4, 5, 12 (carpet)	4, 5	4, 5	4, 5, 12
Ceiling, wall and acoustic and thermal insulation materials	4, 5, 12	4, 5	-	-	-	4, 5, 12	(DE-UZ 132) 4, 5	-	-	4, 5	4, 5, 12
Interior adhesives and sealants (including flooring adhesives)	4, 5, 12	4, 5	4, 5	4, 5	4, 5	4, 5, 12	(DE-UZ 113, 123) 4, 5	-	4, 5	4, 5	4, 5, 12

* ECOproduct v5.3.

The following documentation is also accepted if it contains information on emissions to indoor air that meet the criteria of Hea 02:

- Verified EPD
- EU Ecolabel/Nordic Ecolabel (Swan)
- SINTEF technical approval
- SINTEF environmental certificate
- Self-declaration of product emission levels:

- Manufacturers' self-declaration of emission levels from construction products is acceptable in the form of technical specification sheets or manufacturers' literature provided the testing has been performed by an accredited laboratory (see Methodology above) in accordance with the above. OR, where the manufacturer declares that the product contains no formaldehyde, carcinogens of category 1A and 1B or VOCs.

If assessors, clients, or scheme operators wish to seek recognition of other schemes not currently listed, please contact NGBC (tech@byggalliansen.no) for details of the application process.

M3.5 Reused products

Preliminary research shows that emission values for formaldehyde fall significantly in the first years after construction products are put into use, to achieve a stable emission level. Measured values may still be above what is permitted in current practice. If construction products are reused, the buildings must meet the same quality requirements as new buildings that have been built with new materials. It is therefore important that formaldehyde is also measured in reused building materials.

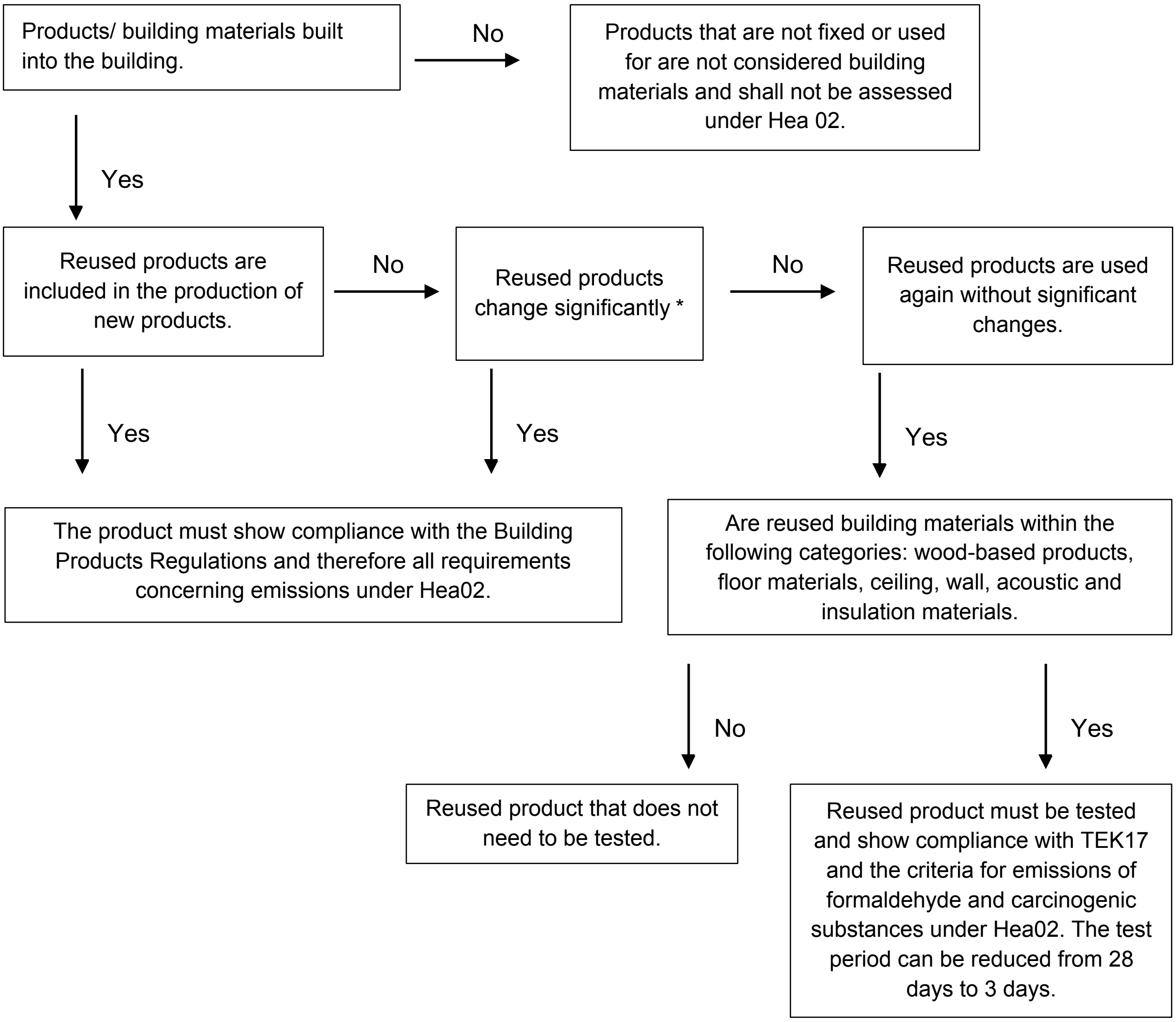
It is not the same for TVOCs. TVOCs are continuously emitted and the values for these will be falling. Building materials will therefore be said to be "completely issued" eventually.

Carcinogenic substances are a new parameter on which there is currently little research. There is therefore little basis for assessing whether re-used products will be "completely emitted". Because of this, carcinogenic substances must be measured in reused building materials until there is sufficient data on this.

It is necessary to verify that the construction products meet the requirements of the regulations. Verification can take place through e.g. third-party testing or other form of control of the performance levels in the regulations. Reference is made to the Construction Product Regulations and Building Technical Regulations (TEK17) with guidance for more information on this.
Manufacturers and importers are responsible for documenting construction products. They are also obliged to keep the building product's documentation for 10 years after the building product has been introduced on the market.

The figure below shows which reused building materials must be documented and which type of documentation is needed to show compliance with the criteria in Hea 02:

Table Hea 02-06 Overview of the documentation requirements for re-used products.



* The change is significant if the process goes beyond repair, washing or regular maintenance. Reference is also made to the Regulations on documentation of construction products (DOK), Chapter 3.

M4 Post-construction indoor air quality measurement

M4.1 Accreditation of organisations performing sampling or laboratory analysis

All organisations used for sampling and analysis of indoor air or for analysis of emissions from construction products must be accredited according to ISO/IEC 17025, with specific accreditation covering:

- Sampling: Pumped sampling for formaldehyde in air; pumped sampling for VOCs in air
- Chemical analysis: Determination of formaldehyde; determination of VOCs.

Sampling and chemical analysis of indoor air can be performed by separate organisations, but all organisations must be accredited.

M4.2 The measurement of formaldehyde and TVOC

The measurement of formaldehyde and TVOC must be conducted in accordance with the relevant standards (as listed in the criteria). ISO 16000-2 and NS-EN ISO 16000-5 provide guidance on sampling strategies for formaldehyde and VOCs, respectively. Sampling should be performed in rooms that will be occupied for extended periods of time i.e. occupied spaces such as bedrooms, living rooms, classrooms, offices, etc. A representative number of rooms should be sampled, rather than every room in the building. For example, in an office building, sampling of one cellular or single occupancy office should suffice to assess the indoor air quality for that type of habitable space in the building (assuming the other cellular offices have the same materials specification and ventilation strategy). In larger rooms, such as open-plan office areas, additional sampling locations may be required in order to understand the homogeneity of the indoor environment.

Uncertainties in sampling and analysis are inevitable and unavoidable. It is therefore recommended that replicate samples are taken at each sampling location (ideally a minimum of three samples for each measurement parameter). Before sampling, naturally ventilated rooms should be intensively ventilated for 15 minutes, and then outer doors and windows closed for at least 8 hours (e.g. overnight) before sampling begins with the room still closed off. For mechanically ventilated rooms, the ventilation system should be running under standard operating conditions for at least 3 hours before sampling begins. Sampling locations should be at least 1m to 2m from a wall and at a height of between 1m to 1.5m.

This information is provided to assist project teams and BREEAM-NOR Assessors on the appropriate scope of post-construction indoor air quality measurement, and, as such, is intended as guidance only and is not a compliance requirement. The sampling strategy should be determined based on the advice of the appropriate person appointed to conduct the testing.

Evidence

Criteria	Design stage	Post-construction stage
1-2	A confirmation / obligation from the developer that there will be a requirement to meet all the criteria for the IAQ plan, control plan for moisture measurement and checklist A2. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to fulfil all requirements for the IAQ plan, control plan for moisture measurement and checklist A2. OR Plan for indoor air quality and completed checklist A2 with relevant attachments.	IAQ plan and completed checklist A2 with relevant attachments. AND Completed test report according to Annex A.3 in NS 12599: 2012 Ventilation for buildings – Test procedures and measurement methods for handover of air conditioning systems and ventilation.
3	A confirmation / obligation from the developer that there will be requirements for ventilation category II or better, location of air intake/exhaust and CO2 sensors and choice of filter. Applies in those cases where the relevant party is not selected. OR Documentation showing the contractual obligations for the relevant parties to meet all the requirements for design of ventilation category II or better, location of air intake/ exhaust and CO2 sensors and choice of filter. OR Documentation showing projected ventilation category II or better, location of air intake and exhaust, selected filter and location of	Documentation showing that ventilation category II or better, location of air intake and exhaust, selected filter and location of the CO2 sensors is installed. AND Assessor's inspection report with photographic evidence showing that ventilation, air intake and exhaust, filters and sensors are installed, (where it is possible to inspect). AND Documentation of skills and experience of the qualified person

Criteria	Design stage	Post-construction stage
	CO_2 sensors.	
4, 5 and 12	A confirmation / obligation from the developer that a requirement for emissions from the required number of building materials will be made. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to meet all emission requirements from the required number of building materials. ----------------- OR Documentation showing that the required number of specified product types fulfils the emission requirements.	Documentation showing that the required number of product types in the finished building fulfils the emission requirements.
6-11	A confirmation / obligation from the developer that a requirement will be made to meet all requirements for measuring indoor air quality after construction. Applies in those cases where the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to meet all requirements for measuring indoor air quality after construction. ----------------- OR Documentation showing the selected method and results of measuring indoor air quality after construction.	Documentation showing the selected method and results of measuring indoor air quality after construction. Documentation of skills and experience of the qualified person The BREEAM-NOR Assessor Report with completed values.

Definitions

D1 Construction products

Construction products in this issue include construction products, in accordance with Chapter 2 of the Veiledningen til byggevareforordningen and surface treatment products, adhesives, fasteners, kitchen and bathroom fittings and other fixtures and fittings that are an integral part of the building.

D2 Sources of external pollution

This includes but is not limited to the following:

1. Highways and main access roads on the assessed site
2. Car parks, delivery and vehicle waiting bays
3. Other building exhausts, including from building services, plants, industrial or agricultural processes.

Common pollutants discharged from these sources are covered by the Regulations relating to pollution control https://lovdata.no/dokument/SF/forskrift/2004-06-01-931/KAPITTEL_3-1-1#%C2%A77-8v and include: benzene, 1,3-Butadiene, carbon monoxide, lead, nitrogen dioxide, ozone, particles (PM10, PM2.5), polycyclic aromatic hydrocarbons and sulfur dioxide and pollutants from all types of industrial processes.

Service and access roads with restricted and infrequent access (for example, roads used only for waste collection) are unlikely to represent a significant source of external pollution. These roads can therefore be excluded from the criteria of this issue. This does not include vehicle pick-up, drop-off or waiting bays (see also Methodology M1.2).

D3 Sources of internal pollution

The actual pollutants and pollutant sources within a building will depend on its location, the type and use of the building and its ventilation strategy. Pollutants that are commonly found in indoor air within buildings that an IAQP would be expected to address (where applicable) include:

- Particulate matter including vehicle emissions, pollen and dust.
- Very volatile organic compounds (VVOCs) including formaldehyde.
- Volatile organic compounds (VOCs).
- Inorganic gases including carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3) and radon.
- Biological contaminants such as bacteria, mould spores, pollen and dust mites.
- Unpleasant odours

D4 Category 1A and 1B carcinogens

Carcinogenic compounds detectable by VOC emission testing requirements in Table Hea 02-01 and Table Hea02-02-02 and that are classified as category 1A or 1B carcinogens in Annex VI to Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, which are listed as carcinogenic VOCs in Annex H of EN 16516.

D5 Competent individual – Wind tunnel modelling

An individual with one or more of the following qualifications and experience can be considered to be a 'competent individual' for the purpose of carrying out wind tunnel modelling:

- Holds a degree or equivalent qualification in a relevant engineering field (mechanical, chemical), physics, mathematics or meteorology.
- Has a minimum of three years' relevant experience.

Such experience must clearly demonstrate a practical understanding and experience of wind tunnel modelling and factors affecting outdoor pollutant dispersion in relation to ventilation and the built environment.

D6 Competent individual – Numerical modelling

An individual with one or more of the following qualifications and experience can be considered to be a 'competent individual' for the purpose of carrying out numerical modelling:

- Holds a degree or equivalent qualification in a relevant engineering field (mechanical, chemical), physics, mathematics, meteorology, environmental sciences, environmental engineering or a related environmental discipline.
- Demonstrated ability to interpret environmental guidelines, policies, plans and legislative requirements.

D7 Numerical modelling

Numerical modelling is a computer-based simulation method for modelling pollutant dispersion and air quality in the outdoor environment. Various numerical models are commercially available and may be used to investigate the location of ventilation intakes and exhausts. Such as those based on empirical methods and computational fluid dynamics (CFD).

D8 Areas with a large and unpredictable occupancy

The following are examples of these types of space:

- Auditoria
- Gyms
- Retail stores or malls
- Cinemas
- Waiting rooms
- Canteens
- Meeting rooms

Where the assessed building does not have any areas deemed to be large with an unpredictable pattern of occupancy, the criterion does not apply.

D9 Occupied space

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user. Work and public buildings contain all types of work rooms and public rooms. This does not include storage rooms, corridors, hallways, cloakrooms, toilets, shower rooms and the like. For homes and other accommodation living rooms and similar rooms, kitchen and bedroom are included. However, the definition excludes the following for the purpose of this issue:

1. atria or concourses
2. entrance halls or reception areas
3. ancillary space, e.g. circulation areas, storerooms and plant rooms.

D10 R-value

Sum of all Ri values. Ri is the ratio Ci or LCIi, where Ci is the mass concentration of the individual VOCi. in the air of the reference room, and LCIi is the LCI value of VOCi. The LCI value is the 'Lowest Concentration of Interest', which is the substance-specific value for health-related evaluation of the emission from construction products as agreed by the EU-LCI Working Group (https://ec.europa.eu/growth/sectors/construction/eu-lci_en).

D11 A third party

A third party can be defined as:

– A party independent of the design process that conducts the necessary consultation exercise.

OR

– If the consultation is to be carried out by an organisation involved with the design of the building, e.g. the project architect, then they must present the assessor with evidence that robustly demonstrates the independence of the consultation process. BREEAM-NOR has not attempted to define what form this evidence must take; the onus is on the design team or relevant individual to clearly demonstrate to the BREEAM Assessor a credible level of independence.

D12 TSVOC – Total semi-volatile organic compound

Sum of the concentrations of identified and unidentified volatile organic compounds eluting between n-hexadecane (excluded) and n-docosane (included) on a gas chromatographic column specified as a 5% phenyl/ 95% methyl polysiloxane capillary column.

D13 TVOC – Total volatile organic compound

Sum of the concentrations of identified and unidentified volatile organic compounds eluting between and including n-hexane and n-hexadecane on a gas chromatographic column specified as a 5% phenyl/95% methyl polysiloxane capillary column.

D14 Wind tunnel modelling

Wind tunnel modelling is a versatile physical technique that allows a large number of variables (for example, building design, intake and exhaust positions, local pollutant sources, wind speed and direction) to be investigated in complex urban areas. In particular, wind tunnel modelling provides reliable and detailed data, both visual and quantitative, on outdoor pollution distribution. This enables effective siting of intakes and exhausts for both mechanically and naturally ventilated buildings.

D15 Wet zones

Reference is made to TEK17 §13–15 Wet rooms and rooms with water installations and Byggebransjens våtromsnorm.

Additional information

None.

Hea 03 Thermal comfort

Number of available credits	Minimum standard				
	P	G	VG	E	O
3	–	–	–	–	–

Aim

Ensure satisfactory thermal comfort by designing and selecting necessary controls to maintain a comfortable thermal environment for building users.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	1–8	Not applicable
Assessment type specific notes	None	See ref 1.0 See Appendix D	None See Appendix D

Assessment type specific notes	
1.0	**Thermal modelling** Thermal modelling assumptions must be reasonable and represent typical usage patterns and loads given the parameters and function of the building. Thermal modelling may need to be completed on the basis of a typical notional layout.

Building specific notes

Building type specific notes	
2.0	**Industrial** This issue is not applicable to industrial units that only contain an operational or storage area and are without office space or other occupied spaces (see Definitions).

Assessment criteria

This issue is split into three parts:

- Thermal modelling (one credit)
- Design for future thermal comfort (one credit)
- Thermal zoning and controls (one credit).

Thermal modelling – 1 credit

1. Thermal modelling or an analytical measurement/evaluation of the levels of thermal comfort must be performed (see Definitions) in accordance with the standard NS-EN 16798-1:2019 Energy performance of buildings – Ventilation for buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6) (see Definitions), in which seasonal variations must be taken into account (see Methodology).
2. The criteria for local thermal comfort (see Definitions) must be used to determine the thermal comfort index of the building. In particular, the temperature intervals in summer and winter must be adapted to the recommended comfort criteria in standard NS-EN 16798-1: 2019. In addition, there should be no areas with levels that could create local dissatisfaction (see Definitions).
3. The levels of thermal comfort in the building's occupied spaces (see Definitions) must meet the requirements of Category II in Appendix B of standard NS-EN 16798-1: 2019.

4. The PMV and PPD indices (see Definitions) based on the above modelling must be reported via the BREEAM NOR assessor report.

Design for future thermal comfort – 1 credit

5. Criteria 1 to 4 must be achieved.
6. The thermal modelling must show that the relevant requirements set out in criterion 3 are met for future climate change (see Methodology) in Norway.
7. The PMV and PPD indices must be reported based on the BREEAM-NOR assessor report based on the above modelling.
8. Where criterion 6 is not met, the project team must demonstrate how the building has been adapted or designed so that it can easily be adapted in the future using passive design solutions, as defined in Ene 01, in order to subsequently meet the requirements of criterion 6.

Thermal zoning and controls – 1 credit

9. Criteria 1 to 4 must be achieved.
10. The thermal modelling analysis must have informed the temperature control strategy for the building and its users.
11. The strategy for proposed heating or cooling systems (see Methodology) must demonstrate that it has addressed the following:
    a. Zones within the building, and how the building services could efficiently and appropriately heat or cool these areas. For example, the different requirements for the central core of the building compared to the façade areas must be considered.
    b. The degree of occupant control (see Definitions) that is required for these zones. This must be based on discussions with the end user (or alternatively use building type or specific design guidance, case studies, feedback) and must consider:
        i. User knowledge of building services.
        ii. Occupancy type, patterns and room functions (and therefore appropriate level of control required).
        iii. How the user is likely to operate or interact with the systems, for example, are they likely to open windows, access thermostatic radiator valves (TRV) on radiators, change air-conditioning settings, etc
        iv. User expectations (this may differ in the summer and winter) and degree of individual control (i.e. obtaining the balance between occupant preferences, for example, some occupants like fresh air while other occupants dislike draughts).
    c. How the proposed systems will interact with each other (where there is more than one system) and how this may affect the thermal comfort of the building occupants.
    d. The need or otherwise for an accessible building user actuated manual override for any automatic systems.

Methodology

M1 Thermal modelling

M1.1 Occupancy patterns

User density and operating times/usage patterns should correspond to energy calculations.

Where the number of building users is unknown, the standard user density in Table Tra 02-05 “Standard user density by building type” can be used.

Where typical usage patterns are also unknown, the project can use Table A.8 in NSPEK 3031: 2020 Building’s energy performance. Calculation of energy needs and energy supply.

Alternatively, the design team can use its own assessments but must justify or confirm the number of users and usage patterns used in the thermal model.

M2 Design for future thermal comfort

M2.1 Future climate changes

Dynamic thermal simulation software packages provide the facility for building designs to be assessed under external climatic conditions specific to the geographic location.

Climate data for 275 climate sites in Norway + 14 climate sites on Svalbard and Jan Mayen can be found here: http://climate.onebuilding.org/WMO_Region_6_Europe/default.html

The assessment must make a reasoned assessment of which climate site best corresponds to the location of the building in question.

Methods for preparing climate data that take into account future climate change can be found here: https://www.weathershift.com/heat

Meteonorm, https://meteonorm.com/en/, can also be used for evaluating future climate change.

The following probabilistic weather data files should be used to establish the projected climate change environment against which the design is evaluated:

Naturally ventilated buildings

- Time period: 2050s
- Emissions scenario: Medium (RCP 4.5)
- 50th percentile/average

Mechanically ventilated or mixed mode buildings

- Time period: 2030s
- Emissions scenario: High (RCP 8.5)
- 50th percentile/average

The above weather data represent the minimum requirements to perform thermal modelling under a climate change scenario and subsequently demonstrate compliance. Where design teams feel that added consideration of building occupant risk or sensitivity to overheating is necessary, weather files can be used that exceed the minimum requirements outlined above. The time periods indicated above have been selected to represent the building services life cycle likely to be present in each building services strategy type. A shorter time period must be chosen for mechanically ventilated or mixed mode building types due to the consideration of the life span of mechanical servicing equipment (before major upgrade or replacement is required), and to avoid over-specification of plant which could lead to inefficient operation.

M3 Thermal zoning and controls

M3.1 Thermal comfort strategy for less complex heating or cooling systems

For buildings with less complex heating or cooling systems, the thermal comfort strategy need only comply with criterion 11.a and 11.b above.

Compliance can be demonstrated where zoning allows separate occupant control (within the occupied space) of each perimeter area (i.e. within 7 m of each external wall) and the central zone (i.e. over 7 m from the external walls). For example, adequate TRVs placed in zones around the building perimeter and the provision of local occupant controls to internal areas.

Evidence

Criteria	Design stage	Post-construction stage
1–8	A confirmation/obligation from the developer that a requirement will be made to carry out thermal modelling, to achieve category II thermal comfort and to report the PMV and PPD indices. Applies in cases where the relevant party has not been selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to meet all thermal modelling requirements, to achieve category II thermal comfort and report the PMV and PPD indices. ----------------- OR Thermal modelling that has achieved category II AND Reporting of PMV and PPD indices	Updated thermal modelling that has achieved category II with as-built information. AND Updated PMV and PPD indices with as-built information. AND The BREEAM-NOR Assessor Report with completed values.
9-11	A confirmation/obligation from the developer that there will be a requirement to meet all requirements for the temperature control strategy. Applies in cases where the relevant party has not been selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for the temperature control strategy. ----------------- OR Temperature control strategy AND Thermal modelling that has achieved category II AND reporting of the PMV and PPD indices	Updated temperature control strategy with as-built information. AND Updated thermal modelling has achieved category II with as-built information. AND The PMV and PPD indices have been updated with as-built information.

Definitions

D1 Occupant control
Responsive heating or cooling controls for a particular area or zone of the building that can be accessed and operated by the individuals occupying that area or zone. Such controls will be located within or within the vicinity of the zone or area they control.

D2 Predicted mean vote (PMV)
The PMV is an index that predicts the mean votes of a large group of persons on the seven-point thermal sensation scale based on the heat balance of the human body divided into hot, warm, slightly warm, neutral, slightly cool, cool and cold according to NS EN ISO 7730: 2005 Ergonomics in thermal environment – Analytical determination and interpretation of thermal well-being when calculating PMV and PPD index and local thermal comfort (ISO 7730: 2005). Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment.

D3 Predicted percentage dissatisfied (PPD)
A measure of the percentage of a large group of people who are expected to be dissatisfied with the thermal environment, i.e. who experience it too cold or too hot as described in NS-EN ISO 7730:2005. In connection with assessments according to NS-EN16798-1: 2019, anyone who feels it is very hot, hot, cold or very cold should be considered as being dissatisfied with the thermal environment.

D4 Relevant standards
NS-EN 16798-1:2019: Energy performance of buildings – Ventilation for buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6)

D5 Local dissatisfaction
Dissatisfaction can be caused by unwanted cooling or heating of a particular body part. This is known as *local discomfort*. The most common causes of local discomfort are draughts, abnormally high vertical temperature difference between the head and ankles, too hot or too cold floor, or too high radiation asymmetry caused by a temperature difference between cold and hot surfaces in an area.

D6 Occupied space
See Definitions in Hea02.

D7 Thermal dynamic analysis
Thermal comfort analysis tools can be subdivided into a number of methods of increasing complexity. The most complex of these and the one that provide the greatest confidence in the results is the full dynamic model. This type of model enables annual heating or cooling loads, overheating risks and control strategies to be assessed.

D8 Thermal comfort
In NS-EN16798-1: 2019: Energy performance of buildings – Ventilation in buildings – Part 1: Indoor climate parameters for dimensioning and assessment of buildings' energy performance including indoor air quality, thermal environment, lighting and acoustics (Module M1-6). Thermal comfort is defined when calculating PMV and PPD indices and local criteria for thermal comfort.

Thermal comfort describes the state in which people feel satisfied with the thermal environment.

The term *thermal environment* is described by air temperature, radiation temperature due to radiation exchange with surrounding surfaces, air velocity in the living zone, and relative humidity. Both high and low air temperatures can cause discomfort and health problems.

The purpose of this issue is to encourage appropriate and robust consideration of thermal comfort issues, and the specification of appropriate occupant controls to ensure both maximum flexibility of the space and thermal comfort for the majority of building occupants.

Additional information

None

Hea 05 Acoustic performance

Number of available credits	Minimum standard				
Up to 4	P	G	VG	E	O
	–	–	–	–	–

Aim

Ensure that the building provides an appropriate acoustic environment that is comfortable for the building's users.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	Not applicable
Assessment type specific notes	None	See Appendix D	See Appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into two parts:

- Prerequisite: suitably qualified acoustician (no credits)
- Sound class requirements (up to four credits)

Prerequisite: suitably qualified acoustician – no credits

1. A suitably qualified acoustician (see Definitions) shall be appointed by the client at the appropriate stage in the procurement process (but no later than step 3) to provide early design advice on:
    a. External sources of noise impacting the chosen site
    b. Site layout and zoning of the building for good acoustics
    c. Acoustic requirements for users with special hearing and communication needs
    d. Acoustic treatment of different zones and façades.

Sound class requirements – up to 4 credits

2. Relevant spaces within the building (see Definitions) must comply with the requirements for satisfactory sound conditions (see Definitions) as detailed in Table Hea 05-01 (see Methodology):

Table Hea 05-01 Sound class requirements according to NS8175:2019

	Credits		
Noise class in NS 8175:2019	**C**	**C and B ***	**B**
Category 1: Commercial and education	1	2	3
Category 2: Residential buildings including sheltered accommodations, accommodation and similar	2	3	4

* C and B Category 1: Additional credit can be awarded if a building that is sound class C achieves class B for airborne sound.

* C and B Category 2: Additional credit can be awarded if a building that is sound class C achieves class B for airborne sound and impact sound insulation.

3. A suitably qualified acoustician must carry out ambient noise testing to ensure that the relevant spaces achieve the required levels. Where the testing identifies that the spaces do not meet the standards, remedial work must be carried out and the testing repeated to confirm that the required levels have been achieved prior to handover and occupation.

Methodology

M1 Sound class requirements

M1.1 Relevant standard

NS 8175: 2019 Acoustic conditions in buildings. Sound classification of various types of buildings.

M1.2 Sound testing

A programme of pre-completion acoustic testing must be carried out by a suitably qualified acoustician in accordance with the acoustic testing and measurement procedures outlined in NS 8175:2019 and the final report must be submitted according to Appendix B in NS 8175:2019.

M1.3 Privacy index

To increase the ambient noise level, where privacy is required or the ambient targets include both a minimum and a maximum limit, an artificial sound source or sound masking system may be required. Any artificial sound source or sound masking system should be installed and operational at the time of the acoustic testing to demonstrate compliance.

M1.4 Testing programme

Acoustic measurements must be performed according to NS 8175:2019. These measurements shall be carried out in at least 5% of the units, flats, detached houses, offices or parts of a building being classified in a sound class, or at least in one unit if 5% is less than one.

M1.5 Remedial works

Where a programme of pre-completion testing identifies that spaces do not meet the standards, remedial works must be carried out prior to handover and occupation. The spaces must be retested to ensure compliance. Remedial works must be carried out on all affected and potentially affected areas, including rooms or spaces previously untested with a similar construction and performance requirement.

The test report, or covering correspondence, should include a clear statement that the testing is in accordance with NS 8175:2019.

Evidence

Criteria	Design stage	Post-construction stage
All	A confirmation / obligation from the developer that there will be a requirement to use a qualified acoustician, sound class and noise testing before completion. Applies in those cases where the relevant party is not selected. OR Documentation showing the contractual obligations of the relevant parties to use a qualified acoustician, achieve the relevant sound class and perform noise testing before completion. OR Acoustician's CV. AND The acoustician's report with relevant appendices.	Documentation of skills and experience of the qualified acoustician. An acoustician's report with relevant appendices. Noise testing before completion with relevant attachments.

Definitions

D1 Suitably qualified acoustician (SQA)

An individual achieving all the following items can be considered to be 'suitably qualified' for the purposes of a BREEAM-NOR assessment.

1. Has a college or university education with competence in acoustics (or equivalent qualifications).
2. Has a minimum of three years' relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of the factors affecting acoustics in relation to construction and the built environment; including acting in an advisory capacity to provide recommendations for suitable acoustic performance levels and mitigation measures.

Where an SQA is verifying the acoustic measurements or calculations carried out by another acoustician who does not meet the SQA requirements, they must first verify that they comply with the definition of an SQA and as a minimum, has read and reviewed the report and confirmed in writing that they have found it to:

1. represent sound industry practice
2. be appropriate given the building being assessed and scope of works proposed

D2 Relevant areas

Relevant areas are defined in NS 8175: 2019.

D3 Satisfactory sound conditions

This include requirements for:

- airborne sound
- impact sound insulation
- room acoustic conditions, including speech comprehension
- noise from building technical installations
- noise from outdoor sound sources.

Additional information

None

Hea 06 Safe and healthy surroundings

Number of available credits	Minimum standard				
	P	G	VG	E	O
Up to 3	–	–	–	–	–

Aim

Ensure that the building is facilitated and accessible to all potential users, and enhance health and wellbeing through the use of nature-based design principles.

Fully fitted/Shell and Core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	Criteria 1–5	Not applicable
Assessment type specific notes	None	Ref 1.0 See Appendix D	None See Appendix D

Assessment type specific notes	
1.0	Only two credits for inclusive design are available for shell and core assessments

Building type specific notes

Building type specific notes	
2.0	**Prisons** In the case of an assessment of a prison building or development, the criteria only apply to publicly accessible areas outside of the secure perimeter zone (but still on the wider prison site). This could include visitor reception or waiting buildings, facilities or estates offices, storage buildings and visitor or staff parking.
2.1	Homes and sheltered accommodation can achieve two credits for Inclusive design. All other types of buildings can achieve one credit for Inclusive design.

Assessment criteria

This issue is split into two parts:

- Inclusive design (up to two credits)
- Biophilic design (one credit).

Inclusive design – up to 2 credits

1. The assessment must have carried out a feasibility study of inclusive design (see Methodology) no later than by the end of step 3.
2. The feasibility study must be designed on the basis of a consultation with representatives of all intended users (see Definitions).
3. The feasibility study must conclude with an Inclusive Design Strategy.
4. The feasibility study must document that all functional requirements (see Methodology) were assessed for relevance before establishing the final strategy.
5. A responsible person must be appointed to the project to follow up the strategy until completion of the building.

Biophilic design – 1 credit

6. The assessments must have carried out a feasibility study of biophilic design see Definitions) no later than by the end of step 3. A minimum of five different elements of biophilic design elements must be included in the final design of the building (see Methodology).
7. Biophilic design elements must be incorporated throughout the building and contribute to a positive impact on users' health and well-being. The criteria in Table Hea 06-01 must be met. See Methodology and Definitions for details.

Table Hea 06-01 Criteria for number and type of biophilic design elements

Criteria for biophilic design elements	1 credit	Exemplary level
Number of elements integrated in the building	5	10
Number of elements per category in the building	Minimum 1	Minimum 2
Number of elements that can be experienced directly in 80% of the occupied space	Minimum 2	Minimum 4
Number of elements that can be experienced on the same floor	Minimum 3	Minimum 6
Number of elements that are not usually present in similar buildings.	1	5

Exemplary Performance: Extensive biophilic design – 1 credit

8. Criterion 6 must be achieved.
9. The criteria for "Exemplary level" in table Hea 06-01 must be met. See Methodology and Definitions for details.

Methodology

M1 Inclusive design

M1.1 Relevant standards

NS- EN 17210:2021 Accessibility and usability of the built environment. Functional requirements

M1.2 Methodology for developing inclusive design strategy

Step 1: Design considerations that safeguard the diversity of users:

1. The intended target groups (see Definitions) for the assessment must have been identified.
2. The assessment has taken into account the needs of the intended target groups as described in section 5.2.2– section 5.2.5 in NS-EN 17210: 2021 regarding:
   - sensory abilities and properties.
   - immunological system functions: Allergies and hypersensitivity.
   - physical abilities and characteristics.
   - cognitive skills.

Step 2: Overall requirements for the assessment of relevant elements of the assessment:

The assessment must assess the overall requirements for the accessibility and user friendliness of:

- roads
- outdoor areas
- access areas
- horizontal circulation in the building
- vertical circulation in the building
- occupied areas in the building
- location and design of fixed equipment
- sanitary areas

- evacuation routes and emergency exit information

Further details can be found in section 5.3 in NS-EN 17210: 2021.

Step 3: Detailed requirements for the assessment of relevant elements in the project:
The assessment must assess the need for detailed requirements for accessible and user-friendly elements. See details in section 6–15 in NS-EN 17210: 2021.

Step 4: Building-specific requirements
The assessment must assess the need for building-specific requirements. See details in NS-EN 17210: 2021:
- hotels (section16.2)
- student housing (section 16.3)
- housing (section 16.4)
- sports, retail, catering and cultural buildings (section 17)
- offices, educational, industrial and health buildings (section 18)
- outdoor areas (section 19)
- transport areas (section 20)

M2 Biophilic design

M2.1 Feasibility study

The steps below represent the recommended approach to planning and incorporating biophilic design:

1. The site, ecology and stakeholders in the project must be investigated and explored.
   Biophilic design works best if it is the starting point for the project concept. A deep understanding of the context/place, including history, culture, ecology and local climate is crucial for the biophilic design of buildings or outdoor areas and can provide inspiration to the project participants. The questions below are relevant:
   - why is this place unique or typical of the area?
   - what is a regional material palette?
   - what other senses can come into play: colour palette, tactile palette, auditory palette, etc.?
   - how do current residents react to both climate and weather? Time of day?
   - How does this ecosystem work? What is unique about it?
   - How can people be connected to the climate and ecosystem in this place?
   - What ecosystem services are available, and what other values do they provide (aesthetic, physical and auditory, etc.)?

   The assessment should identify external resources that may be of relevance to the project, such as user considerations, programme requirements from authorities and/or clients, or other factors that are relevant.

2. People and local identity
   The goal of this step is to understand how to create unity within the finished building and between the building and the larger community of the assessment. It is necessary to consider who is likely to use the building and their relationship to the place, history and community of which they are part. Cultural diversity should be explored in the context of biophilic reactions to space, light, colours or other sensory impressions. Any differences will be useful when designing the room and will help to evoke the emotional aspects of the project.

3. Identify participants and roles
   Analysis participants should include a wide range of stakeholders and perspectives. Expertise outside the typical project team can enrich conversation and the gathering of perspectives in the room. Short presentations from external experts on history, culture or ecology can be useful for sharing knowledge and inspire participation and new ideas. The assessment should ensure there is a manageable number of participants in this process.

4. Workshop and targets for biophilic design
   The project team should arrange a workshop or meeting to agree on which elements of biophilic design are relevant and to ensure that these are consolidated with the client.

Guiding questions for determining targets:

- How familiar are the project participants with the principles and research on biophilic design?
- How does biophilic design support the client's amibition for the project?
- How can biophilic design support the wishes or requirements of residents or local sommunity?
- How will biophilic design affect the overall design process?
- What are the intentions and goals of the biophilic design for this assessment?

5. Incorporation of biophilic design
The project team must assess which elements of biophilic design (see Methodology) correspond to the set targets in section 4 above. The project team must also identify which of the selected elements are not usually found in similar buildings. The responsibilities and activities needed to incorporate biophilic elements are included in the project plan documents.

For a more detailed process for designing biophilic designs, refer to the biophilic design guide:
https://www2.living-future.org/l/464132/2019-03-25/ghpnlf?RD_Scheduler=BD

M2.2 Elements of Biophilic Design

Category 1: Direct integration of nature	**Category 2: Indirect integration of nature**
a. Visual connection with nature	a. Dynamic and diffused light
b. Physical access to nature	b. Natural materials
c. Presence of water (and/or fire)	c. Tactile surfaces
d. Sunlight or daylight	d. Shapes and pattern

Category 1: Direct incorporation of nature

a. Visual connection with nature:
Rooms/spaces with a visual connection to nature, vegetation, ecosystems and natural processes. It has been well documented that views or the presence of natural elements can contribute to stress reduction and increased productivity. The aim is to offer users the opportunity to change focus, rest their eyes and avoid cognitive exhaustion.
b. Physical access to nature:
The building users should have access to nature experiences in the building's outdoor areas or on neighbouring sites, in order to take short breaks. To be considered a nature experience, the outdoor space must be dominated by lush vegetation in several layers, preferably combined with other natural elements such as wildlife, water or natural stones.
c. Presence of water (and/or fire):
Incorporation of water elements that can be experienced as stimulating or calming because they can be seen, heard or touched, both indoors and outdoors. Water elements can be designed as a garden pond or in other ways integrated into the architecture, for example, such as water mirrors, waterfalls, fountains, aquariums, water playing area, etc. This could also be an existing natural element within or in visible proximity to the development area.
d. Sun input/daylight:
In addition to general light input that covers statutory daylight requirements, the creative treatment of daylight is encouraged to create a dynamic play of light and shadow in the building. Sunlight can be filtered through vegetation, patterns or materials (partially or completely transparent), reflection on different colours/textures or other inspiring design.

Category 2: Indirect integration of nature

a. Dynamic and diffused light
The use of artificial lighting that mimics the dynamics, variation, temperature, colour and intensity of natural light, or light effects that occur in nature (for example, indirect lighting through foliage, sparkling glare on water, light via transparent surfaces, starry sky, etc.). It can also be direct simulations of daylight as it would appear in its encounter with architecture, or by using a human centric lighting system (HCL), where artificial light can be used to imitate the changes in light intensity and colour temperature that occur in natural light throughout the day.

Layer upon layer of light can be perceived as being natural and easy on the eye and usually consists of a combination of hard and soft light with different focus points (can also be graded in intensity). Deliberate sculpting of light and shadow helps to emphasise tactility and texture in materials, shape and volume and gives the environment a measure of intimacy and/or increased sense of space. The strategic use of light can help to highlight different functions, easily create variation in the surroundings and help navigation in buildings or areas. The use of completely or partially transparent surface materials also helps to create depth in spaces and provide illusion.

b. Natural materials:
This includes the use of visible – treated or untreated – natural materials or elements from nature for example wood, leather, wool, earth or stone. If the material is untreated or has a controlled chemical surface treatment, it will eventually develop a distinctive patina. The materials may also reflect local ecology or geology to promote site identity.

c. Tactile surfaces
This includes the use of surfaces and materials with a clear structure and/or overlapping shapes/elements that give the surface tactile properties. The texture of the surfaces can have different levels of tactility such as smooth, hard, soft, coarse, hot or cold. Tactility is usually perceived through the sense of touch but also through sight and hearing. The kinetic sense is also enhanced and stimulated by tactile surfaces. Tactility also helps to emphasise shapes, contrasts and depth and, when using the right materials, has sound-dispersing or sound-absorbing qualities. The format and scale of the texture(s) can be both large and small, but the smaller the texture, the closer to the surface you need to be in order to enjoy its tactile quality.

Efforts should be made to create variation between different structures. The amount of stimuli must be adapted to the given project (ref. paragraph “variation/ contrast”). The texture can be an illusion (photo, painting and visualisation or similar), but this will give very little to the perception of space beyond a purely immediate visual impression.

d. Shapes and patterns
This includes the use of symbolic representations or imitation of biological forms (often organic), lines, patterns, textures or numerical schemes or geometries found in nature. The representations can be both two- and three-dimensional, but the latter will give the greatest sensory benefit/effect. For example, artistic representations of natural motifs, perforated plates with foliage patterns, column structures with trunk-like branching or complex structures/techniques that mimic solutions found in nature (biomimicry).

M2.3 Integrating Biophilic Design in the building

To comply with the purpose of biophilic design, the selected elements should be integrated into the building in a way that is perceived as holistic, natural and intuitive. One isolated biophilic element does not make it a biophilic designed building and each user of or visitor to the building should experience the elements in each occupied area. See Methodology M2.5 for details.

Furniture or objects that are not part of the construction project will generally not meet the criteria. The biophilic design elements should, as far as possible, be an integrated quality in the building and not easily changed by new tenants or new owners.

It will always be a challenge to categorise design elements into clear, separate groups. In some cases, it could be argued that one element could cover several types and categories of biophilic design elements, as described in Methodology M2.2 above. It will normally only be considered as one element. This is because this issue rewards projects that consistently integrate biophilic elements into the building. There should be a significant difference in quantity and quality of biophilic elements to buildings without such qualities. Here, the project and the assessor must use their judgment and consider the aim of the issue and health improvement for the building users, when elements are counted and categorised.

M2.4 Biophilic elements that are not usually present
There should be biophilic elements that are not usually found in similar building types. The purpose of this is to stimulate projects to try other measures than those that are usually used or imposed by the authorities.
For example, it is relatively common for residential buildings to have access to and a view of nature or to have outdoor space with visual focus point, water elements or natural materials. BREEAM-NOR encourages extra effort to be made in the exploring of different elements of biophilic design in order to create more variety and increase the general level of knowledge about biophilic design.

TEK17 Chapter 8: Developed outdoor area and Chapter 13 Indoor climate and health as well as regulatory provisions and associated thematic guidelines can be used to identify elements that commonly feature in similar buildings.

Determining the biophilic elements that are not usually present should be made in dialogue with competent project team members, such as architects, interior architects or other professionals and should be justified by a competent person.

M2.5 Directly experienced biophilic elements
Direct experience means that the user has a direct visual or sensory experience of the biophilic element in 80% of the occupied space (see Definitions).
- For a home, care building with independent housing units, accommodation, etc. this means 80% of the occupied space in each dwelling or apartment and 80% of any common areas in the building.
- For commercial buildings, this means 80% of the occupied space in the building.

For example, a view of a tree can be an element, but it must then be visible from a window in a living room or office. Elements in the form of materials must be visually visible in the room.

Non-direct experience means that the element can be experienced in common areas, but on each floor. For example, light fixtures or patterns can be integrated into a common hallway outside apartments.

Evidence

Criteria	Design stage	Post-construction stage
1-5	A confirmation/commitment from the developer that a requirement will be made to meet all requirements for a feasibility study and inclusive design strategy. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for the feasibility study and inclusive design strategy. --------------------- OR Documentation showing the inclusive design strategy and person responsible for following up the strategy.	Documentation showing that an inclusive design strategy has been incorporated in the building. Assessor's inspection report with photo documentation showing that the inclusive strategy has been incorporated.
6-9	A confirmation/commitment from the developer that a requirement will be made to perform a feasibility study and incorporate biophilic design elements in the building. Applies in those cases where the relevant party is not selected. ------------------- OR Documentation showing the contractual	Documentation of the feasibility study. Documentation showing how biophilic design have been incorporated in the building Assessor’s inspection report with photo documentation showing that biophilic design has been incorporated.

Criteria	Design stage	Post-construction stage
	obligations of the relevant parties to meet all requirements for feasibility study and to incorporate biophilic design elements in the building. ------------------ OR Documentation of the feasibility study. AND Documentation showing how biophilic design elements have been incorporated in the design of the building.	

Definitions

D1 Biophilia

The term originates from the Biophilia hypothesis (Edward O. Wilson 1984) and suggests that humans have a strong inherent biological urge to interact with nature and other life forms. The human body and mind evolved in close interaction with nature. Many of our emotional, solution-oriented and critical abilities reflect skills learned in close synergy with nature's stimuli.

Thus, based on the biophilia hypothesis, it is assumed that too great a division between man and nature is undesirable and could lead to reduced quality of life if contact is not maintained – if only through narratives. Firstly, an abundance of intrusive artificial elements with no references to nature will reduce the aesthetic quality of an area and, secondly, increase the level of dissatisfaction.

Given that modern people spend almost 90% of their time indoors and that over half of the world's population lives in urban areas, recognising these deep-seated needs will be essential to achieving a sustainable society.

D2 Biophilic design

Biophilic design seeks to increase people's access to nature experiences in the built environment – in both directly and indirectly – by weaving the nature's beneficial properties into the urban context.

The goal is to create a more multisensory, experiential and intuitive architecture that satisfies the need for natural stimuli/sensory variation and recognises the importance of the environment's aesthetic influence on human health and well-being.

This is a broad concept. Ideally, biophilic design should be integrated into the building's architectural concept. BREEAM-NOR rewards assessments that have worked systematically with the subject and that have integrated biophilic elements in a consistent manner. Optimal and functional solutions are easier to achieve if they are part of the overall concept of the building.

See Identifying the 14 Patterns of Biophilic Design | Human Spaces (interface.com) for further information.

D3 User's health and well-being performance

Key health and well-being performance comprises visual comfort, indoor air quality, thermal comfort and acoustic performance, as described in Hea 01, Hea 02and Hea 05 and any allergies or adverse reactions because of plants or materials.

D4 Target group

- Users with disabilities; addressing and proposing design solutions that remove the barriers that define disability.
- People in different age groups, gender, ethnicity and physical condition.
- Parents with children (where appropriate for the use or type of building).

D5 Occupied Space

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user. In work and public buildings, this includes all types of workrooms and public rooms. For residential buildings, this includes living rooms and similar rooms, kitchens and bedrooms. Storage rooms, corridors, hallways, cloakrooms, toilets, shower rooms, etc. are not included.

Additional information

None

Hea 08 Private space (residential buildings only)

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	–	–	–	–	–

Aim

To provide an external space that gives occupants privacy and a sense of well-being.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/ shell & core
None

Building type specific notes

Building type specific notes	
2.0	This issue is only applicable to residential buildings, single and multiple dwellings
2.1	**Extensions** There are no additional or different requirements to those outlined above that are specific to extension projects.

Assessment criteria

This issue consists of one part:

- Private outdoor spaces (1 credit)

Private outdoor spaces – 1 credit

1. During step 3, the project team must demonstrate that outdoor spaces (see Methodology), private or semi-private, must comply with the following requirements:
   a. Are of a size that allows all occupants to sit outside (see Methodology)
   b. Are accessible and available for all occupantsand designed according to NS-EN 17210:2021 Accessibility and usability of the built environment. Functional requirements Section 7-8.
   c. Is accessible only to the occupants of designated dwellings.
   d. Is adjacent to or in close proximity to the dwellings and meet the minimum size requirements (see Methodology).

Methodology

M1. Private outdoor spaces

M1.1 Examples of outdoor spaces

The following are representative examples of outdoor spaces:

1. Private gardens

2. Communal gardens or courtyards, that provide a pleasant and secluded environment large enough for all occupants of the designated dwellings to share and designed in a way that makes it clear that the space is only to be used by the occupants of designated dwellings.
3. Balconies
4. Terraces (roof or other)
5. Patios

Juliet balconies generally do not comply with the criteria as they are too small to provide an external space. Enclosed areas, such as conservatories, do not comply with the criteria.

The design of the space, its boundaries and its relationship with the designated dwelling should make it clear that the space is only for the use of occupants.

M1.2 Size requirements

The minimum size of outdoor spaces is:
1. For private spaces: 1.5m² per bedroom
2. For semi-private spaces, i.e. shared access by all dwelling occupants: 1.0m² per bedroom.

If there are requirements arising from national regulations or established national best practice, stricter than the requirements above, these must be fulfilled instead.

Evidence

Criteria	Design stage	Post-construction stage
1	A confirmation/ obligation from the developer that a requirement for private space with the required qualities will be made. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to design and install private space with the required qualities. -------------- OR Documentation of projected location and/or specifications for private space with the required qualities. AND (if relevant for the chosen solution) Manufacturers' product information and/or documentation showing that the relevant criteria have been met.	Documentation of as-built location and specifications for private space with the required qualities. AND (if relevant for the chosen solution) Manufacturers' product information and/or documentation showing that the relevant criteria have been met. Assessor's inspection report with photographic evidence showing that a private space has been installed.

Definitions

None.

Additional information

None.

Energy

Summary

This category encourages the specification and design of energy efficient building solutions, systems and equipment that support the sustainable use and management of energy during the building's operation. Issues in this section assess measures to improve the inherent energy efficiency of the building, encourage the reduction of carbon emissions and support efficient management throughout the operational phase of the building's life.

Category summary table

Issue	Credits	Aim
Ene 01 The energy performance of the building	Up to 12	Recognize and encourage buildings with minimal energy consumption in the operational phase through good design.
Ene 02 Energy monitoring	2	To recognize and encourage energy sub-metering to facilitate the monitoring of operational energy consumption. To enable managers, tenants, and consultant's post-handover to compare actual performance with targets in order to reduce the performance gap.
Ene 03 External lighting	1	To reduce energy consumption through the specification of energy efficient light fittings for external areas of the development.
Ene 05 Energy efficient cold storage	2	To encourage the installation of energy efficient refrigeration systems, in order to reduce operational greenhouse gas emissions resulting from the system's energy use.
Ene 06 Energy efficient transportation systems	3	To encourage the specification of energy efficient transportation systems within buildings.
Ene 07 Energy efficient laboratory systems	Up to 5	To encourage laboratory areas that are designed to minimize their operational energy consumption and associated CO_2 emissions.
Ene 08 Energy efficient equipment	2	To encourage installation of energy efficient equipment to ensure optimum performance and energy savings in operation.

Ene 01 The energy performance of buildings

Number of credits available	Minimum standards				
	P	G	VG	E	O
Up to 12	-	-	-	Crit. 9–12 (2 credits)*	Crit. 9–12 (2 credits)*

* As a minimum 1 credit is achieved for criterion 9 – 10 PLUSS 1 credit for criterion 11 – 12.

Aim

Recognise and encourage buildings with minimal energy consumption in the operational phase through good design.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	1-12
Assessment type specific notes	None	See ref. 1.1 and 1.2 See Appendix D	Se ref 1.1, 1.2 and 1.3 See Appendix D

Assessment type specific notes	
1.1	For energy modelling, if the building services' efficiency and performance specifications are not known (i.e. they are not within the remit of the shell and core/shell only developer and will be provided as part of the fit-out works), services complying with the minimum energy efficiency standards or backstop levels required by TEK should be used. A reduction in the net energy demand can be demonstrated by assuming a typical layout for the relevant building type using building servicing equipment that just meets minimum standards.
1.2	For energy modelling, the design team can use the performance specifications confirmed by a green fit-out agreement that is contractually required from the tenants in their fit-out works. This rule only applies to those areas of the building covered by the scope of the green fit-out agreement. Speculative areas of the assessed building not fitted out or covered by the scope of such an agreement must comply with note 1.1.
1.3	Low and zero carbon feasibility study Criteria 5–7: The LZC feasibility study must be completed as part of the shell only design, based on the expected building use and loads specified in the design brief, or where these are not specified, for likely scenarios. The built form should allow for the future installation of the most cost-effective LZC options. It must be demonstrated that there is sufficient space in the building for the installation of future systems and that the building's design and orientation are optimised for future systems.

Building type specific notes

Building type specific notes	
2.0	**Industrial** Criterion 1 is not applicable to industrial units that only contain an operational or storage area and have no office space or other occupied spaces.

Assessment criteria

This issue is split into seven parts:

- Passive design (two credits)
- Low and zero carbon technologies (one credit)
- Energy performance (up to four credits)
- Adaptation to EU Taxonomy (one credit)
- Prediction of operational energy consumption (four credits)
- Exemplary level criteria: Post-occupancy stage (two credits)
- Exemplary level criteria: Plus House (one credit)

Passive design – 2 credits

1. The assessment will achieve the first credit in Hea 03 Thermal comfort: Thermal modelling to demonstrate that the building design analysed in the feasibility study of passive design delivers appropriate levels of thermal comfortin the occupied spaces.
2. No later than step 3, the project must have carried out a feasibility study of passive design (see Methodology) to reduce energy demands for heating, cooling, ventilation and lighting.
3. Relevant measures from the feasibility study must have been implemented in the assessment and used as a basis for the energy label calculations in the energy performance criteria.
4. The results of a feasibility study must be quantified by calculating the building's net energy demand (see Definitions) and comparing them with the energy requirements in the current building regulations (TEK).

Low and zero carbon technologies – 1 credit

5. No later than step 3, an energy specialist (see Definitions) must have completed a feasibility study of low carbon energy sources (see Methodology).
6. The feasibility study must be used as a basis for determining the most appropriate local climate-friendly energy supply solution (see Methodology) for the building/development on or near the site.
7. Local LZC technologies for the building or development must be installed in line with the recommendations of the feasibility study.
8. The reduction in carbon dioxide (CO_2-eq) emissions resulting from the feasibility study must be quantified.

Energy performance – up to 4 credits

9. An energy specialist (see Definitions) must have performed calculations using approved software (see Definitions) and the building must have achieved an energy label according to the figure below in a combination of heating grade (colour) and energy grade (letter). This combination will give up to 3 credits. The achieved energy mark is used to award the number of credits as indicated in the table below.

   OR

   FutureBuilt definition of nZEB. Obtained nZEB is used to allocate 4 credits. (see Methodology)

Figure Ene01-01 Credit acheivents for energy performance

Buildings categories with a low proportion of heat:

						FutureBuilt nZEB
A	2	2	2	2	3	4
B			1	1	2	
C						

Current building categories (< 50% share of heat):

Office buildings, school buildings, universities, hospitals, nursing homes, commercial buildings.

Buildings categories with a high proportion of heat:

						FutureBuilt nZEB
A	1	2	2	2	3	4
B			1	2	3	
C						

Current building categories (> 50% share of heat):

Apartment blocks, detached houses, kindergartens, hotels, sports buildings, cultural buildings, light industrial buildings.

10. The assessment must include a thermographic survey of the building construction that confirms the following:
    a. Insulation continuity is in accordance with construction drawings documented in NS-EN ISO 6946: 2007 Building components and elements – Heat resistance and heat transfer coefficient – Calculation methods
    b. Unnecessary cold bridges have been avoided
    c. There are no paths for air leakage through the structure (except through openings made intentionally)

Adaptation to EU taxonomy – 1 credit

11. The project shall document the results of the calculated delivered energy, distributed by fuel, to the building, exported energy from the building and greenhouse gas emissions, according to NS 3031: 2014 and NS 3720:2014 (see Methodology).
12. The assessment must demonstrate the following energy reduction:
    a. For new constructions the building primary energy demand is reduced by at least 10% measured against nationally defined nZEB (See Methodology).
    b. For major refurbishments (see appendix C) delivered energy demand meets the requirements in TEK17
    OR
    The building achieves a reduction of primary energy demand of at least 30% against the energy performance before refurbishment.

Prediction of operational energy consumption – 4 credits

13. The relevant members of the project team must participate in an energy design workshop focusing on operational energy performance, no later than step 3 (see Methodology).
14. Additional energy modelling must be undertaken during the design stage, including scenario evaluation, in order to generate predicted operational energy consumption figures and establish guidelines for procedures for annual energy monitoring (see Methodology)
15. An obligation to report predicted energy consumption targets must be established in the operational phase, as well as design assumptions and input data (with justifications). The obligation must also specify that energy models will be updated continuously during the building's operation to take into account any changes in the building specification, and to correspondingly revise energy consumption.
16. A risk assessment must be carried out to highlight any significant design, technical and process risks that should be monitored and managed throughout the construction and commissioning process.

Exemplary level criteria: Energy management in post-occupancy stage – 2 credits

17. Criteria 13–16 must be met.
18. Maximum available credits must be achieved in Ene 02 Energy monitoring . In addition, preschools, primary schools, law courts, prisons, long-term stay institutions and multi-residential buildings must meet the requirements of the second credit for sub-metering of high energy load and tenancy areas.
19. The client or building occupier must commit to funding energy monitoring in the operational stage (see Methodology). This requires a responsible person to be appointed to report on the actual energy consumption compared with the targets set in criterion 15 above.
20. The energy model, described in criterion 15, must be sent to:
    a. The Norwegian Green Building Council and
    b. The building owner.

Exemplary level criteria: Plus house – 1 credit

21. The assessment must comply with FutureBuilt criteria for Plus House (see Methodology).

Methodology

M1 Passive design

M1.1 Feasibility study of passive design

A feasibility study and simple energy calculations should be carried out with regard to the following recommended list:

1. The location of the site and the location of the building on the site.
   For example, the site's solar, shadow and topography conditions. Local pollution (sound, light and air quality) should also be considered here.
2. Local on-site climate analysis
   Temperature, wind direction and speed, amount of sun, amount and type of precipitation per year. Where data for the site is unavailable, the nearest and most suitable climate site can be selected. Weather conditions must be assessed in relation to climate change (see Definitions).
3. Building orientation
   For example, the site should be located to utilise daylight without creating a need for local cooling in the building, as well as with regard to wind speed, direction and local pollution in order to draw clean air into the building without the need for increased energy consumption when operating the ventilation system. There should be an option to use thermal buoyancy in the building.
4. Building design
   For example, design to draw daylight far into the building and provide good visibility and sunlight without glare or danger of overheating. The building design should be able to produce local energy. An assessment should be conducted regarding the number and placement of windows on facades in all directions. The form factor (area of all exterior surfaces (facade, roof and floor/building volume) should optimise the building shape. The smaller the form factor, the less heat loss during construction and the greater the opportunity to utilise internal heat gain and reduce specific energy requirements.
5. Building construction
   For example, an assessment of the building's heat loss values, density and thermal mass.
6. Category of building and expected use
   For example, the location of building functions should be adapted to the operating strategy in order to avoid situations in which all building systems are running at full power when users are only using a small part of the building.
7. Floor plans
   For example, locating building functions in terms of internal heat supply and the influence of external factors. This is to avoid functions with high heat gain from the sun, for example, being placed on facades, or that functions with high heat gains are placed on the top of the building where the utilisation of waste heat further

down in the building will be demanding. Computer rooms should be placed against an outer wall, if possible, in order to utilise direct free cooling.

8. Daylight and lighting strategy
   For example, measures should be assessed to achieve daylight further into the building and to increase the amount of daylight into the building. An assessment should be conducted of daylight in relation to the lighting strategy.
9. Ventilation strategy
   For example, using thermal buoyancy in the building and assessing geometries to avoid stagnant areas.
10. Passive heating and cooling strategy
    For example, heating or cooling from the building's processes such as computer room, refrigerated counters or parking garage. Assessment of free cooling (see Definitions and Additional information).

The number of energy calculations will vary and it is up to the energy specialist to assess what is appropriate. There are no requirements to show compliance to any other issues in this manual for the feasibility study.

M1.2 Calculated reduction of the building's net energy demand

All savings resulting from the implementation of the above measures must be documented and compared with the energy requirements of TEK 17.

In addition, a calculation of real energy demands should be carried out with actual input data and for the local climate. Finally, the results should be compared before and after the measures are implemented.

The feasibility study must contain an objective for the net energy demands of the building.

The calculation standard used to determine a "standard building" shall also calculate the savings, i.e. the assessment may use NS 3031: 2014 or SN-NSPEK 3031: 2020, but must use the chosen standard for both calculations.

The results for the total energy requirement must be documented according to Table 4: The total energy budget for net energy demands at calculation point A in SN-NSPEK 3031: 2020 Building energy performance – Calculation of energy demands and energy performance or Table 5 in NS 3031: 2014.

M2 Low and zero carbon feasibility study

M2.1 Feasibility study of energy supply with low greenhouse gas emissions

The feasibility study of the building's total energy requirements carried out by an energy specialist (see definitions) must include the following as a minimum:

1. Energy generated from LZC energy sources (see Definitions) per year.
2. Carbon dioxide savings over a 60-year period from LZC energy sources per year. For the calculation of carbon dioxide reduction, the European (EU28+NO) energy consumption mix (see definitions) must be used as a basis for the assessment.
3. An LCC analysis according to method M1 under Man 02, for the available climate-friendly energy source, accounting for payback (see Definitions). For this issue, the LCC analysis shall be completed no later than step 3.
4. Local planning criteria such as regulatory provision, including land use and noise which will influence the choice of energy supply solutions.
5. Feasibility of exporting heat or electricity from the system.
6. Available grants.
7. All technologies appropriate to the site and energy demand of the development.
8. Reasons for excluding other technologies.
9. If appropriate:
   a. The building must be connected to an existing local community CHP system OR
   b. The building must be connected to an existing source of waste heat or power OR
   c. a building or site CHP system must be specified with the potential to export excess heat or power via a local community energy scheme OR

   d. a source of waste heat or power must be specified with the potential to export excess heat or power via a local community energy scheme
10. Energy storage.

The reduction of CO_2-eq can be demonstrated by comparing it with a “standard building”, i.e. energy requirements in the building regulations (TEK17). A "Standard building" must be supplied with electricity from the grid.

M2.2 Scope of LZC systems and how they are assessed

M2.2.1 Recognised local LZC technologies

Technologies capable of achieving the criteria must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC from 23 April 2009 on the promotion of the use of energy from renewable energy sources implemented in Norwegian law:

- FOR 2011-12-21 no. 1469: https://lovdata.no/dokument/LTI/forskrift/2011-12-21-1469
- FOR 2011-12-21 no. 1470: https://lovdata.no/dokument/LTI/forskrift/2011-12-21-1470
- FOR 2011-12-21 no. 1481: https://lovdata.no/dokument/LTI/forskrift/2011-12-21-1481
- FOR 2013-09-11 no. 1122: https://lovdata.no/dokument/LTI/forskrift/2013-09-11-1122

The following requirements must also be considered:

1. There must be a private pipeline system for the supply of energy produced to the building under consideration.
2. Air source heat pumps, both air-to-air and air-to-water, are now a standard technology and heat from air sourced heat pumps is not considered to be an LZC technology. Further information on the calculation of energy from heat pumps can be found in Annex VII to Directive 2009/28 /EF.

The project must document that they have examined the installer's competence of the LZC energy supply, and that they are confident that the installer has the necessary knowledge to install the technology correctly.

M2.2.2 Novel LZC technology not listed

Other systems may be acceptable as part of an LZC strategy under this issue but are not inherently considered to be LZC technologies. Acceptability will depend on the nature of the proposed system and the carbon benefits achieved. The BREEAM-NOR assessor must confirm acceptability with NGBC, if in doubt.

M2.2.3 Building assessed as part of a larger development

Where the building under assessment forms part of a larger development and either a new or existing LZC installation is provided for the whole site, then the amount of LZC energy generation counted for in this issue, and subsequent emissions saved, should be proportional to the building’s energy demand compared to the total energy demand for the site (see also note below on existing LZC technology).

M2.2.4 LZC technology already available on site

For developments for which there is an existing LZC energy source that can supply a compliant percentage of energy to the assessed building, a feasibility study will still have to be conducted in order to demonstrate that the existing technology is the most appropriate for the assessed building or development. The study should seek to identify any other options for supplying a higher proportion of the building's energy demand in addition to energy supplied by an existing source. In order to be compliant, the LZC energy source must continue to provide low carbon energy to existing buildings and provide additional low carbon energy to the new building.

M2.2.5 Shared community power stations

This BREEAM-NOR issue seeks to encourage the installation of on-site and near-site LZC technologies. ‘Local’ does not have to mean on site; community schemes (near site) can be used as a means of demonstrating compliance.

M2.2.6 Waste heat from incineration
Waste heat from an incineration plant can only be considered as low carbon for the purpose of this BREEAM-NOR issue if all other LZC technologies have been considered and discounted in the feasibility study and under the following circumstances:

EITHER
1. The local authority or region in which the incineration plant is located is demonstrably meeting its annual waste reuse and recycling targets and waste management policies

OR

2. There is a near-site or on-site facility connected to the building, via a private wire arrangement, which is demonstrably removing reusable and recyclable waste material prior to incineration.

M2.3 Biofuels

M2.3.1 First generation biofuels
BREEAM-NOR does not recognise or reward building systems fuelled by first generation biofuels manufactured from feedstocks, e.g. biofuels made from sugars, seeds, grain, animal fats, etc. where these are grown or farmed for the purpose of biofuel production. This is due to the current uncertainty over their impact on biodiversity, global food production and greenhouse gas savings, plus the ease of interchangeability between fossil fuels.

BREEAM-NOR may recognise systems using second generation biofuels (see Methodology M2.3.2) or biofuels manufactured from biodegradable waste materials, e.g. biogas, waste vegetable oil, or locally and sustainably sourced solid biofuels, e.g. woodchips and wood pellets, where these are not interchangeable with fossil fuels or first-generation biofuels.

M2.3.2 Second generation biofuels and biofuels from waste streams
BREEAM-NOR recognises that biofuels produced from biomass that is a by-product of other processes may provide a more sustainable alternative to fossil fuels. Typically, these use waste feedstocks consisting of residual non-food parts of current food crops, industrial waste such as woodchips, other waste vegetable matter and waste fish oil from sustainable fish stocks to produce biofuel.

Such biofuels will, in principle, be recognised by BREEAM-NOR for the purpose of defining low and zero carbon technologies. However, due to the emerging nature of such technologies, full details would be required for review by NGBC prior to confirmation of acceptability, including the following:
1. Type, provenance and sustainability of the biomass feedstock
2. Avoidance or minimisation of fossil fuel use in extracting the biofuel
3. Minimising fossil fuel use in transporting the biomass or biofuel
4. Presence of a supply agreement and a robust supply chain
5. Compatibility of the biofuel with the specified boiler or plant and manufacturer's warranty issues.

The use of other recycled or waste-derived biofuels such as waste oil from catering may also be recognised by BREEAM-NOR subject to the above criteria. For smaller scale applications, the assessor will also need to demonstrate that the biofuel is locally sourced. BREEAM-NOR does not qualify the term 'locally sourced' or specify a minimum supply contract. However, the assessor must determine and demonstrate that these are reasonable for the particular application.

M2.4 Waste heat from a building-related operational process

Waste heat from an operational process that takes place within the assessed building (or on the assessed site) can be considered as 'low carbon' for the purpose of this BREEAM-NOR issue. This is conditional on the generation of the heat from the process being integral to the assessed building. Examples of operational processes and functions include manufacturing processes, high temperature ovens or kilns, compressors serving process plants, micro-breweries, crematoriums, testing and commissioning boilers for the purpose of training or manufacture, and data centres. It does not include waste heat from IT or server rooms, which could be used as part of conventional heat recovery measures.

M2.5 Relevant standards

NS3720: 2018 Methodology for greenhouse gas calculations for buildings. The European (EU28+NO) energy consumption mix (see Definitions) is used as the basis for the assessment.
SN-NSPEK3031: 2020 Buildings' energy performance – Calculation of energy demands and energy performance.
NS 3031: 2014 Calculation of buildings' energy performance – Methodology and data

M3 Energy performance

M3.1 Thermographic examination

The thermographic survey (see Definitions) must examine the building envelope and all walls against heated areas and walls between heated and unheated areas.

The thermal examination must be carried out according to NS-EN 13187: 1998 Thermal properties of buildings – Qualitative method for detecting thermal irregularities in building envelopes – Infrared method.

M3.2 FutureBuilt nZEB

For more detailed definition, see FutureBuilt “Criteria for nZEB” rev. 12.05.2021.

M3.3 Building assessed as part of a larger development

If the assessed building is part of a larger development and there are existing or new LZC sources which serve other buildings, then the amount of LZC energy generation should be allocated to buildings based on their energy consumption. However, LZC energy generation from existing LZC sources that has already been allocated to comply with building regulations must be excluded from consideration to avoid double counting.

M3.4 EPC

Regulations on energy labelling of buildings and energy assessment of technical facilities were adopted on 18 December 2009 and entered into force on 1 January 2010. The Energy Act authorises the Energy Labelling Regulations.
Commercial buildings over 1000 m² must always have a valid energy certificate. An energy certificate is also mandatory for all new buildings and shall be part of the marketing of all sales and rentals of homes and commercial buildings.
For further information, see: https://www.energimerking.no/

M3.5 Relevant standards

NS 3031: 2014 Calculation of buildings' energy performance – Methodology and data
NS-EN ISO 6946:2017 Building components and building elements – Thermal resistance and thermal transmittance – Calculation methods (ISO 6946:2017)
NS-EN 13187:1998 Thermal performance of buildings – Qualitative detection of thermal irregularities in building envelopes – Infrared method (ISO 6781:1983 modified)

M4 Adaptation to the EU Taxonomy

M4.1 Nationally defined nZEB

Nearly Zero Energy Buildings were defined by the Ministry of Local Government and Regional Development in “[Guidance on the calculation of primary energy demand in buildings and energy frameworks for nearly zero energy buildings]” published on behalf of the Norwegian Government on 31.01.2023. The guidance is based on the Energy performance of buildings directive (Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings) and the EU Taxonomy for sustainable finance.

To show compliance the methodology given in the guidance for determining nearly zero energy buildings must be followed.

M4.2 Reduction of primary energy demand for renovation of existing buildings

The calculations for the 30% reduction of primary energy demand is primarily aimed at reducing the building energy demand through passive activities such as insulating and lower U-value for windows, reducing lighting energy demand or installing/improving heat recovery in ventilation systems.

In these calculations, a reduction in primary energy demand as a result of a change in the energy source must not be included.

M4.3 Relevant standards

NS 3031: 2014 Calculation of energy performance of buildings - Method and data
NS 3720:2018 Methodology for greenhouse gas calculations for buildings. The European (EU28+NO) energy consumption mix (see definitions) is used as the basis for the assessment.

M4.4 Calculated reduction of the building's primary energy demand

The reduction of the building's primary energy demand must be documented and compared against energy requirements for nationally defined nZEB and the projects must submit the following information:

Table Ene01-01 Reduction of primary energy

Energy by fuel	Nationally defined nZEB			Project information		
	Total net energy demand kWh/(m²y)	**Specific delivered energy kWh/(m²y)**	**Greenhouse gas emissions CO_2-eq/m²**	**Total net energy demand kWh/(m²y)**	**Specific energy delivered kWh/(m²y)**	**Greenhouse gas emissions CO_2-eq/m²**
1. electricity	Please refer to the TEK17 §14-2 energy frame.	Base your assumption on how much of the specific delivered energy is covered by this fuel.	Calculate greenhouse emissions for this fuel.	Calculate amount of the total net energy demand.	Calculate how much of the specific delivered energy is covered by this fuel.	Calculate greenhouse gas emissions for this fuel.
2. central heating		Base your assumption on how much of the specific delivered energy is covered by this fuel.	Calculate greenhouse emissions for this fuel.		Calculate how much of the specific delivered energy is covered by this fuel.	Calculate greenhouse gas emissions for this fuel.
3. biofuels		Base your assumption on how much of the specific delivered energy is	Calculate greenhouse emissions for this fuel.		Calculate how much of the specific delivered energy is covered by this fuel.	Calculate greenhouse gas emissions for this fuel.

		covered by this fuel.				
4. other energy fuel (please specify)		Base your assumption on how much of the specific delivered energy is covered by this fuel.	Calculate greenhouse emissions for this fuel.		Calculate how much of the specific delivered energy is covered by this fuel.	Calculate greenhouse gas emissions for this fuel.
Calculated reduction of the building’s net energy requirement:				Calculated percentage reduction	%	

M5 Prediction of operational energy consumption

M5.1 Relevant standards

SN-NSPEK 3031:2020 Energy performance of buildings – Calculation of energy demands and energy supply
NS 3031: 2014 Calculation of buildings' energy performance – Methodology and data
NS 3720:2018 Methodology for greenhouse gas calculations for buildings. The European (EU28+NO) energy consumption mix (see definitions) is used as the basis for the assessment.

M5.2 Methodology for prediction of operational energy consumption for different scenarios

The aim of the methodology is to create better understanding of energy modelling techniques and reward more accurate predictions of energy consumption at early stages to support better design and construction of new buildings.

An energy specialist (see Definitions) must model several scenarios creating a range of predicted consumptions, informed by a risk assessment of the building’s energy consumptions.
These scenarios will consider:

- Weather and climate and future climate change (see Methodology)
- Operating hours for systems
- Occupancy hours
- Management factors (see Definitions)

The intention is to provide consistency with current industry guidelines where possible. Where appropriate, BREEAM-NOR methodology refers to existing documents for compatibility with current industry standard methodologies.

It may be necessary to use complex energy calculation software. It is not necessarily possible to use the same software as the software used to check compliance with building regulations and energy labelling (see Definitions).

Step 1: Mapping the parameters that will affect the building's demand for delivered energy

The relevant members of the project team must participate in a meeting/workshop to map which parameters affect the building's energy demands and which factors can enrich the building's energy model.

A risk analysis will be performed during the meeting regarding how the building’s energy performance will be affected by:

- Weather and climate and future climate change (see Methodology),
- Changes in the use of the building and variations in the expected use of the building in terms of days and years.
- An assessment of the robustness of the building and the building's technical facilities

The results of the meeting/workshop shall be used as a basis for assessing relevant energy measures (structural and technical)

The risk analysis must provide recommendations regarding which scenarios should be modelled in the next step.

Step 2: Energy model: basis
An energy specialist (see Definitions) must perform the modelling of the various scenarios using an approved simulation programme (see Definitions). It is up to the energy specialist to choose the simulation programme that is best suited for the assessment, as long as it complies with the criteria specified in the definitions (see Definitions).

The energy specialist must log all assumptions made and all information provided by the design team and use these to create the most accurate realistic energy model possible.

The results of the energy calculation must show the following information, as a minimum:

- Divided between regulated and unregulated energy needs (see Definitions)
- Distributed by fuel
- Distributed by functional area and/or distributed between rental areas and common areas (if applicable)
- Distributed per month
- Presence profiles that will be used as a basis for the calculations, such as the definition and number of standard working days, weekends/holidays, etc.

This is so that the measured dates in the operation can be easily comparedwith the calculated dates at the most detailed level possible.

Step 3: Energy scenarios
The energy specialist shall use the energy calculation model to prepare a range of operating scenarios. It is recommended that the following operating scenarios be used as a basis for assessment:

- Reference: in this scenario, climate data for the current climate location, expected presence and expected internal loads are used as a basis, as well as the management factor (see Definitions) that is considered relevant after interviewing the users. The HVAC system must be modelled with a high degree of detail
- Good energy management: like the reference, but with a management factor of 1.0 for all systems
- Poor energy management: like the reference, but with a management factor of 1.15 for all systems
- Extreme weather: like the reference, but with climate data projected to 2080 according to weather and climate and future climate change (see Definitions)
- Worst case: like the reference, but with climate data projected to 2080 according to weather and climate and future climate change (see Methodology) and a management factor of 1.15

Step 4: Reporting template
A template for reporting must be prepared that states both the modelling assumptions and the results. The template must describe:

- The source of information for the assumptions and inputs
- Important assumptions that have been made and the risk that these assumptions are incorrect
- Accuracy level that can be attributed to the most critical assumptions and inputs
- Probable variations in the results
- Clarification of which variables the design team has control over, and which variables are controlled by the building users
- Changes in the results from “design stage” to “as-built stage”
- The sensitivity of the variables

The template must be customised so that future reporting shows the results for:

- Energy requirements for heating and cooling (kWh/m² and kg CO_2-eq/m²)
- Electricity-specific energy demand (kWh/m² kg CO_2-eq/m²)

M5.3 Weather and climate and future climate change

Climate data for 275 climate sites in Norway and 14 climate sites on Svalbard and Jan Mayen can be found here: http://climate.onebuilding.org/WMO_Region_6_Europe/default.html

The energy specialist must make a reasoned assessment of which climate site best corresponds to the location of the building in question. Note that it will not always be the geographically closest climate site that should be chosen, if the energy specialist considers that the climatic conditions between the building in question and the closest climate site are not a good match (this may be relevant if the closest climate site is a lighthouse, as these are often located in locations characterised by harsh weather conditions).

Methods that can be used to convert climate data so that these take into account future climate changes are listed here: https://www.weathershift.com/heat

M6 Exemplary level criteria: Post-occupancy stage

M6.1 Methodology for following up operational energy consumption in the post-occupancy stage

The building owner must obligate to:

- Report energy consumption for the first 12 months of normal occupancy for all relevant end uses
- Report energy consumption for the first 12 months, broken down into monthly intervals, for all relevant end uses
- Compare reported energy consumption figures with targets set in criterion 13–16.
- Identify causes of discrepancies and the remedial measures required.

To demonstrate the obligation, the building owner must set aside sufficient funds to pay for the assessment and reporting of the actual energy consumption of the building compared with the goals set out in criteria 13–16.

M7 Exemplary level criteria: Plus House

M7.1 Plus House

For a more detailed definition, see FutureBuilt “Criteria for Plus House” rev. 12.05.2021.

Evidence

Criteria	Design stage	Post-construction stage
1–4	A confirmation/commitment from the developer that there will be a requirement to obtain credits for thermal modelling, carry out a feasibility study of passive design and implement the measures from the feasibility study. Applies to those cases in which the relevant party has not been selected. OR Documentation showing the contractual obligations of the relevant parties to obtain credits for thermal modelling, conduct a feasibility study of passive design and implement the measures from the feasibility study. OR	Updated documentation of thermal modelling under Hea03 with as-built information. AND Updated feasibility study of passive design and associated calculations for reducing energy demand in the building with as-built information.

	Documentation of thermal modelling under Hea03 AND Feasibility study of passive design and associated calculations for reducing energy demand in the building.	
5-8	A confirmation/commitment from the developer that there will be requirements for the feasibility study of energy supply with low greenhouse gas emissions. Applies to cases in which the relevant party has not been selected. OR Documentation showing the contractual obligations of the relevant parties to fulfil all requirements for a feasibility study of energy supply with low greenhouse gas emissions. OR Feasibility study of energy supply with low greenhouse gas emissions and associated calculations of greenhouse gas reduction.	Updated feasibility study of energy supply with low greenhouse gas emissions and associated calculations of greenhouse gas reduction with as-built information. AND Documentation of installed energy supply. Documentation of skills and experience of the energy specialist The BREEAM-NOR Assessor Report with completed values.
9–10 and 20	A confirmation/commitment from the developer that energy levels and thermographic examinations will be required. Applies to cases in which the relevant party has not been selected. OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for the selected energy level and thermographic examination. OR Calculation of energy label and (if relevant) FutureBuilt nZEB. AND Documentation showing the contractual obligations of the relevant parties to meet all thermographic examination requirements.	Energy certificate AND (if applicable) Confirmation from FutureBuilt that energy levels have been achieved AND Thermographic report. Documentation of skills and experience of the energy specialist. The BREEAM-NOR Assessor Report with completed values.
11–12	A confirmation/commitment from the developer that greenhouse gas calculation and calculation of the building's net energy demands will be required. Applies to cases in which the relevant party has not been selected. OR	Updated greenhouse gas calculations with as-built information AND Updated calculation of a reduction in the building's net energy demands with as-built information. AND

	Documentation showing the contractual obligations of the relevant parties to meet all greenhouse gas calculation requirements and calculation of reductions in the building's net energy demands. OR Greenhouse gas calculations. AND Calculation of a reduction in the building's net energy demands.	The BREEAM-NOR Assessor Report with completed values.
13–16	A confirmation/commitment from the developer that there will be requirements for a working meeting/workshop, energy modelling, reporting of targets and risk assessment. Applies to cases in which the relevant party has not been selected. OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for a work meeting/workshop, energy modelling, reporting of targets and risk assessment. OR Documentation of the meeting. AND Energy model AND Commitment to reporting goals. AND Documentation of risk assessment.	Documentation of the meeting. AND Updated energy model with as-built information. AND Commitment to reporting goals. AND Updated documentation of risk assessment with as-built information.
17–19	A confirmation/commitment from the developer that there will be a requirement to achieve credits for criteria 13–16 and Ene02 and the obligation to cover the costs of energy follow-up in operation. Applies to cases in which the relevant party has not been selected. OR Documentation showing the contractual obligations of the relevant parties to achieve credits for criteria 13–16 and Ene02 and obligation to cover the costs of energy follow-up in operation. OR	Documentation of criteria 13-16. AND Documentation of Ene02. AND Obligation to cover the costs of energy follow-up in operation.

	Documentation of criteria 13–16. AND Documentation of Ene02. AND Obligation to cover the costs of energy follow-up in operation.	

Definitions

D1 Energy Specialist

A person with at least three years' relevant experience of energy modelling over the last five years and recognised qualifications as an engineer in energy and environment, building physics, or HVAC technology. The expertise must be broad enough to cover all relevant technical aspects, guarantee that the data entered into the energy model are correct and that the results reflect the actual performance of the building.

D2 European (EU28+NO) energy consumption mix

For electricity, the CO2 factor in scenario 2, European (EU28+NO) energy consumption, in chapter 7.5.3 in NS 3720: 2018 Method for greenhouse gas calculations for buildings shall be used. The average factor for the last 3 years of available data must be used.

D3 Free cooling

The ability of the building to provide cooling to the internal occupied areas without the need to rely on energy-consuming mechanical cooling. Free cooling is an enhanced passive design method that requires engineering design and modelling to demonstrate its effectiveness. Other similar methods include enhanced passive ventilation and enhanced daylighting.

D4 Approved building energy calculation software

Approved energy software validated according to the requirements of NS 3031: 2014 Calculation of buildings' energy performance – Methodology and data and NS-EN ISO 6946: 2007 Building components and elements – Heat resistance and heat transfer coefficient – Calculation methods.

D5 Approved software for validation of the prediction of operational energy consumption

Dynamic simulation programme with advanced functions for HVAC systems and controls, which, as a minimum, can:

- simulate annual energy consumption based on energy calculations at least every hour (8760 hours)
- model power variations per hour for technical equipment, lighting, setpoints for heating and operation of ventilation systems
- model the effect of thermal mass, performance curves for partial loads for technical systems, correction curves for capacity and the efficiency of heating and cooling systems
- the simulation tool must be able to take into account that daylight is utilized when the need for electric lighting is assessed.

D6 Payback period

The period of time needed for a financial return on an investment must equal the sum of the original investment.

D7 Near-site LZC

A LZC source of energy generation located near to the site of the assessed building. The source is most likely to be providing energy for all or part of a local community of buildings, including the assessed building, e.g. decentralised energy generation linked to a community heat network or renewable electricity sources connected via a private wire arrangement (see definitions).

D8 On-site LZC

An LZC source of energy generation that is located on the same site as the assessed building.

D9 Weather and climate and future climate change

An assessment of future climate change can be found at the Norwegian Climate Service Centre under "climate projections" www.klimaservicesenter.no. Emission scenario RCP 8.5 shall be chosen as the basis for the assessment.

Climate data for 275 climate sites in Norway + 14 climate sites on Svalbard and Jan Mayen can be found here: http://climate.onebuilding.org/WMO_Region_6_Europe/default.html

The assessment must make a reasoned decision regarding which climate site best corresponds to the location of the building in question.

Methods that can be used to convert climate data so that these take into account future climate changes are listed under: https://www.weathershift.com/heat

D10 Short-term institutions

"Short-term stay institutions" are defined as: hotels, hostels, boarding houses and the like.

D11 Long-term institutions

"Long-term stay institutions" are defined as: sheltered accommodations and other types of housing for the elderly and/or the disabled, colleges, student apartments or other types of housing for students, as well as military barracks.

D12 Net energy demand

Net energy demand is the building's energy demand without regard to the energy system's efficiency or losses in the energy chain, cf. NS 3031: 2014

D13 nZEB (FutureBuilt)

Near-zero energy buildings are based on the TEK17 requirements for net energy demands as a reference for weighted delivered energy with adjustments in relation to typical building volumes and internal loads for the various building categories.

For a more detailed definition, see FutureBuilt "NZEB Criteria for FutureBuilt projects. Revised May 2021" https://www.futurebuilt.no/content/download/28111/157863

D14 Plus House

Energy consumption related to the operation of the building shall, as a minimum, be compensated during the year by the production of renewable energy. In order to be regarded as a Plus House, surplus energy of 2 kWh/m2 BRA per year must be produced. For more detailed definition, see "Criteria for FutureBuilt Plus House – Revised May 2021".

https://www.futurebuilt.no/content/download/28113/157869

D15 Private wire arrangement

In the context of BREEAM-NOR for low or zero carbon technology installations, a private wire arrangement whereby any electricity generated on or in the vicinity of the site is fed directly to the building being assessed, using dedicated power supplies. If electricity is generated that is surplus to the immediate demand of the building, this electricity may be returned to the national grid. The carbon benefit associated with any electricity fed into the grid in this manner can only be allocated to an individual installation or building. In cases in which a building is supplied by a communal installation, no carbon benefit can be allocated to buildings which are not connected to the communal installation.

D16 Regulated energy

The building's energy consumption from the specification of controlled, fixed building technical installations and luminaires, including space heating and cooling, hot water, ventilation and lighting. Regulated energy items are defined in SN-NSPEK3031: 2020 Buildings' energy performance – Calculation of energy demands and energy performance and in NS 3031: 2014 Calculation of buildings' energy performance – Methodology and data.

D17 Management factor

The estimated difference between the ideal and actual operation of the building. This requires the design team to determine how well the building is expected to be managed during its operational phase by conducting a structured interview with potential users and asking a number of questions (see Additional information).

These questions is then used to determine the control factors (see Definitions) for the specific use of the building and/or functional areas, for which a management factor of 1.1 means that poor control of the building will result in a 10% increase in energy consumption compared to the modelled values.

It is expected that there will be a positive response to most of the questions in the interview. Consequently, any use of a management factor in the main scenario must be justified based on the responses from the interviewees and must be no greater than 1.15.

D18 Thermographic examination

A method for creating images of a building using heat radiation. The images help to identify areas in the building that have higher (or lower, in the case of the internal structure) surface temperatures than expected, which indicates heat loss from, or air infiltration into, the building which, in turn, highlights faults in the building.

D19 Unregulated energy

Building energy consumption resulting from a system or process that is not 'controlled', i.e. energy consumption from systems in the building for which the building regulations do not impose requirements. For example, this may include energy consumption from systems integral to the building and its operation, e.g. lifts, escalators, refrigeration systems and ducted fume cupboards, or energy consumption from operational-related equipment, e.g. computers, servers, printers, photocopiers, laptops, mobile fume cupboards, cooking, audio-visual equipment and other appliances.

At present there is no standard or national calculation methodology for modelling unregulated energy demands in a building. To demonstrate compliance with the 'exemplary level criteria', the building's modelled operational 'regulated' energy consumption may be used as a proxy for its unregulated energy demand, i.e. unregulated energy equals 100% of regulated energy. While not accurate, this approach enables BREEAM-NOR to assess and award credits for buildings that meet a proportion of their unregulated energy demand via on-site or near-site renewable energy sources. Where unregulated energy demand for the building can be accurately predicted, this data can be used to determine the percentage of unregulated energy demand that is met by renewable energy sources. Unregulated energy demand can be estimated on the basis of metered data from a similar or same building type with the same unregulated system or process loads.

Additional information

T1 List of questions to determine management factors

- Will the operator be motivated to reduce energy consumption?
- Will anyone be responsible for utilising energy saving measures (e.g. switching off lights during the day or using pool covers at night)?
- Will a full-time engineer or energy manager be based on site?
- Will the building be regularly maintained using a planned preventive maintenance programme?
- Will commissioned sub-meters be used to help identify where energy is being used?
- Will automatic metering reading (AMR) be installed?
- Will building energy management software be provided as part of the BMS to enable the building manager to monitor energy consumption and target energy savings measures?
- Will energy targets be set?
- Will there be consequences if energy consumption reduction targets are not achieved (e.g. management-level scrutiny)?
- Will there be a budget to assist with energy efficiency?
- If a budget is assigned, would it be sufficient for the measures that need to be implemented?
- Will the occupants be made aware of their role in energy efficiency through regular awareness campaigns, etc?
- Will there be a formal arrangement between landlords and tenants on sharing responsibility for energy efficiency savings and investments (e.g. a Green Lease Agreement)?

T2 Aim of free cooling

The aim of the free cooling credit is to remove the need for active cooling throughout the building. The implementation of free cooling technologies will result in a reduction in energy consumption associated with the building's cooling. It can also make the building much simpler to operate and maintain than a building with active cooling.

T3 Aim of passive design

The passive design analysis credit is intended to encourage project teams to proactively consider the ways in which the building could benefit from and adopt passive design measures.

T4 Energy models submitted to NGBC

Energy models must be submitted to NGBC in order to assist with the quality assurance of credits for the post-occupancy stage and the ongoing development of BREEAM-NOR. NGBC will keep the models secure in our systems.

T5 RCP 8.5

'Representative Concentration Pathways' (RCPs) describe different scenarios for the future development of global greenhouse gas emissions. The emissions are converted into climate drives in the form of concentrations in the atmosphere. The number associated with the RCPs refers to the estimated climate drive in 2100 compared to the middle of the 18th century.

RCP8.5: Continuous growth in greenhouse gas emissions

RCP8.5 is a scenario with high greenhouse gas emissions. The scenario involves current CO_2 emissions tripling by 2100 in addition to a rapid increase in methane emissions. The global population is expected to increase to 12 billion by 2100.

During RCP8.5, it is very likely that the increase in global temperature by the end of the century will be more than 4 oC relative to the period from 1850–1900. In this scenario, the greenhouse gas concentration in the atmosphere – and the global mean temperature – will continue to rise after 2100.

Ene 02 Energy monitoring

Number of credits available	Minimum standards				
Up to 2	P	G	VG	E	O
	-	-	-	-	-

Aim

To recognise and encourage energy sub-metering to facilitate the monitoring of operational energy consumption. To enable managers, tenants and consultants post-handover to compare actual performance with targets in order to reduce the performance gap.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	Not applicable
Assessment type specific notes	None	Note 1.0 See Appendix D	None See Appendix D

Notes for fully fitted/shell & core	
1.0	Sub-metering of high energy load and tenancy areas criteria 5 and 6. Sub-meters must be installed on the energy supply to each separate tenanted unit or floor plate within the assessed development.

Building type specific notes

Building type specific notes	
2.0	Criteria 1-4 do not apply to residential buildings and will be filtered out.
2.1	Criteria 5-6 applies to large energy metering systems and tenanted areas. These are not applicable to pre-schools, primary schools, law courts, prisons and residential institutions for long term stay (see Definitions), unless the post-occupancy stage Ene 01 credits are targeted. The criteria do not apply to residential buildings and will be filtered out.
2.2	Criteria 7 applies to residential buildings

Assessment criteria

This issue is split into three parts:

- Sub-metering of end-use categories (1 credit)
- Sub-metering of high energy load and tenancy areas (1 credit)
- Sub-metering of energy consumption in residential buildings (2 credits)

Sub-metering of end-use categories – 1 credit

1. Energy metering systems (see Definitions) must be installed so that at least 90% of the estimated annual energy consumption of each fuel is assigned to the end-use categories (see Methodology), if relevant:
   a. Space heating
   b. Ventilation heating
   c. Hot water
   d. Room cooling
   e. Ventilation cooling
   f. Ventilation, i.e. fans (major) (See Definitions)
   g. Major pumps (See Definition)

h. Lighting, permanently installed (see Methodology)
i. Small power
j. Snow melting plant (foot scrapers can be exempted), see also Ene 08 on snow melting plants
k. Local renewable or low carbon systems such as photovoltaics, solar thermal collectors, wind turbines, etc.
l. Charging stations for electric vehicles
m. Other major energy consuming systems or plants, if relevant.
Depending on the building type, this might include: plant used for swimming or hydrotherapy pools; other sports and leisure facilities; kitchen plant or catering equipment; office equipment; cold storage plant; laboratory plant; sterile services equipment; transportation systems (e.g. lifts and escalators); drama studios and theatres with large lighting rigs; telecommunications; dedicated computer rooms or suites; server rooms (see also Ene08); covered car parks; and floodlighting (the list is not exhaustive). The consultant/project can assess/calculate what may not be necessary to sub-meter, and which other energy-consuming components/systems should be sub-metered.

2. Where heat pumps and/or cooling units are used in hydronic heating/cooling systems, both electrical energy input and thermal heat/cooling output must be metered. This will enable the calculation and presentation of the effectiveness of the heat pump and cooling machine in the energy monitoring system.
3. The energy consumption in buildings must be metered according to the total gross internal area (see Methodology):
   a. If the area is bigger than 1,000m²
   Sub-meters must be installed for each end-use category relevant to an appropriate energy monitoring and management system (EOS, see Definitions).
   b. If the area is smaller than 1,000m², use either:
      i. an energy monitoring and management system is installed or
      ii. separate accessible energy sub-meters are installed with pulsed outputs or other open protocol communication outputs for future connection to an energy monitoring and management system.
4. Building users (see Definitions) can identify energy consuming end uses by clearly marking the energy meters themselves and/or by marking each of the energy meters in the energy monitoring system with the relevant energy category.

Sub-metering of high energy loads and tenancy areas – 1 credit

5. A significant proportion (see Definitions) of the energy supply must be monitored with an accessible energy monitoring and management system for:
   a. each tenanted area
   OR
   b. relevant function areas or departments (see Methodology) in single occupancy buildings.
6. Sub-metering must be installed per floor plate in large single occupancy or single-tenancy buildings with one homogeneous function, for example, hotel bedrooms, offices.

Sub-metering of energy consumption in residential buildings – 2 credits

7. Electric AND thermal energy consumption must be measured per dwelling and for common areas, as well as for total consumption for the entire building. Furthermore, arrangements must be put in place to ensure that residents can easily follow up their energy consumption via the internet, or the likes, with the shortest possible delay in the transfer of data, i.e. data transfer at least once a day.

Methodology

M1 Sub-metering of end-use categories

M1.1 Estimating the annual energy consumption of each end use

Where the total consumption of any single end-use category (or combination of end-use categories added together) is estimated to account for less than 10% of the annual energy consumption for a given fuel type, it is not necessary for this end use to be sub-metered. In this instance, the design team should demonstrate that the respective end use is expected to account for less than 10% of the annual energy consumption for the fuel type. Where a given end use will clearly account for less than 10% of the total annual energy consumption for the fuel type in question, a simple hand calculation or use of benchmark data to demonstrate this is acceptable.

M1.2 Lighting and small power
Due to traditional distribution methods, lighting and small power can be difficult to sub-meter separately and cost-effectively. Lighting and small power can be combined for metering purposes, as long as sub-metering is provided for each floor plate.

M1.3 Modular boiler systems
Modular boiler systems (se Definitions D9) can be metered as a whole.

M1.4 Residential institutions (see definitions): self-contained dwellings with individual utility meters
If self-contained dwellings covered by the assessment have their own individual energy supply and utility meters (e.g. gas or electricity), this supply can be excluded from the scope of this issue. All shared energy supplies and communal areas must still be included in the assessment. For example, if self-contained flats in an assisted living development have individual gas supplies with their own utility meters, this supply will be excluded from the assessment. However, if the lighting and small power comes from a shared distribution board on each floor, this shared supply will need to be sub-metered in accordance with the criteria.

M2 Sub-metering of high energy load and tenancy areas

M2.1 Relevant function areas or departments
The lists below summarise the most common function areas by building type. These lists are not exhaustive and where there are other areas/departments, these should also be separately metered.

For smaller tenanted areas, one meter per unit for electricity and one meter for heating is sufficient to achieve this criterion. (If heating is with electricity, sub-metering of how much electricity is consumed for electric heating is required). Individual areas within each unit do not need to be sub-metered. For the purpose of this BREEAM-NOR issue, a small unit is defined as less than 200m².

For larger units (i.e. more than 200 m²), sufficient sub-metering is required that provides the opportunity for monitoring the relevant functional areas or departments within the unit, in addition to the total energy consumption.

Relevant functional areas or departments:

M2.1.1 Office buildings
1. Office areas (metering per floor or wing depending on what is considered the most relevant when considering adaptation to future changes in the tenant structure.)
2. Catering

M2.1.2 Retail buildings
1. Sales area
2. Storage room and warehouse
3. Cold storage
4. Offices
5. Catering
6. Tenant units

M2.1.3 Industrial units

1. Office areas
2. Operational areas
3. Ancillary areas (e.g. canteens, etc.)

M2.1.4 Education buildings

Requirements sub-metering per functional area, see also note 2.1 in «especially for building type» above.

1. Kitchens (excluding small staff kitchens and food technology rooms)
2. Computer suites
3. Workshops
4. Lecture halls
5. Conference rooms/multi-use areas
6. Drama studios/auditoriums
7. Swimming pools (with changing room)
8. Sports halls (with changing room)
9. Process areas
10. Laboratories
11. High containment suites within laboratories
12. Controlled environment chambers
13. Animal accommodation areas
14. Data centres
15. IT work and study rooms, including IT-equipped library space and any space with provision of more than one computer terminal per 5m²
16. Offices

Individual sub-metering of standard classrooms or seminar rooms is not required. There is no requirement for sub-metering of the specified functional areas in the building if the functional area is less than 200 m².

For buildings situated on campus developments, the metering systems must be monitored using either an appropriate energy monitoring and management system or another automated control system, e.g. outstations linked to a central computer, for monitoring energy consumption. The criteria only apply to the assessed building. Where energy services are supplied from an existing building on campus, they shall be metered by fuel at the entry points to the assessed building. Provision of a pulsed or other open protocol communication output is not sufficient to award a credit for these building types.

M2.1.5 Hotel buildings

1. Office areas
2. Catering (e.g. kitchen, restaurant)
3. Conference suites
4. Swimming pool or leisure facilities
5. Hotel bedrooms metered per floor, core, floor plate in a strategy that would benefit the facilities management

M2.1.6 Hospitals and other healthcare facilities

1. Operating departments
2. Imaging departments
3. Radiotherapy departments
4. Pathology departments
5. Dialysis departments
6. Medical physics facilities
7. Mortuary and post mortem rooms
8. Rehabilitation when including hydrotherapy pools

9. Central sterile supplies departments (or equivalent)
10. Process areas (e.g. commercial-scale kitchens and laundries)
11. IT rooms
12. Pharmacy departments
13. Laboratories
14. Tenancy areas (e.g. catering, retail, laundry)

In small healthcare buildings (< 1000m²) with no high energy load areas (as defined above), a single meter per floor plate is sufficient to achieve this credit. Individual areas within each floor plate do not need to be sub-metered.

Medical equipment or systems can be excluded (although it is recommended that sub-metering is considered in such instances).

M2.1.7 Other buildings

Other types of single occupancy buildings should use the above lists of function areas for guidance purposes regarding the level of sub-metering provision that is required in order to comply. In these cases the aim of the credit is to encourage the installation of energy sub-metering that facilitates the monitoring of in-use energy consumption (in this case by area).

M2.2 Centralised air handling units

If one or more of the ventilation systems supply heat to multiple tenants/floors, there is no requirement for electrical and thermal energy use for the operation of these ventilation systems to be measured per tenant or floor/wing.

M2.3 Small function areas or departments

For buildings comprising of several small function areas or departments, sub-metering of heating, hot water and total electrical energy consumption is sufficient to achieve this credit. Individual electrical energy consumption within each unit does not need to be sub-metered. For the purpose of this BREEAM issue, a small function area or department is defined as less than 200m².

M2.4 Large function areas or departments

For a development comprising one or more larger units (i.e. greater than 200m²), sufficient sub-metering to allow for monitoring the relevant function areas or departments within the unit must be specified, in addition to metering of the unit as a whole.

M2.5 Extensions to existing buildings

If the extension uses the installations from the existing building, the criteria apply to both the extension and the existing building.

M3 Sub-metering of energy consumption in residential buildings

M3.1 Electricity is the primary fuel

Where the primary fuel is electricity and current electricity consumption data are displayed to occupants through a compliant energy display device, which includes heating or cooling, two credits can be awarded.

M3.2 Community heating, cooling or solid fuel systems

If it is not possible to measure energy consumption based on the incoming mains supply using a compliant energy display device, a heat meter must be installed to measure the heat energy. The heat meter must calculate the energy consumption in kilowatt hours (kWh), which can then be transmitted to a compliant energy display device.

M3.3 Metering of heating and cooling

The fuel used to provide most of the heating or cooling to the dwelling under assessment.

M3.4 Monitoring own energy consumption

Residents should have access to a unit to easily monitor their own energy consumption in their homes. As a minimum, the visual unit must be capable of displaying the following information:

1. Local time
2. Current energy consumption (kilowatts and kilowatt hours)
3. Current estimated emissions (g/kg CO_2)
4. Current tariff
5. Current cost (per hour)
6. Visual presentation of data (i.e. non-numeric) to allow residents to easily identify high and low levels of consumption
7. Historical consumption data so that consumers can compare their current and previous usage in a meaningful way. This should include cumulative consumption data in all of the following forms: daily, weekly or monthly billing period. The data must be stored internally for a minimum of two years or be connected to a separate device with automatic upload from the energy display device.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A confirmation / obligation from the developer that they will meet all energy measurement requirements. Applies to those cases in which the relevant party is not selected. --------------------- OR Documentation showing the contractual obligations for the relevant parties to meet all energy measurement requirements. -------------------------- OR Documentation showing energy measurement. AND Estimated annual energy consumption by energy carrier.	Updated estimated annual energy consumption by energy carrier with as-built information AND Documentation showing location and marking of sub-meters. AND (if applicable) Documentation showing that energy monitoring systems are in operation. AND Auditor's inspection report and image documentation showing the installed EOS systems.

Definitions

D1 Residential institutions – short-term stay

“Short-term residential institutions" applies to the following: hotels, hostels, boarding houses, and the like.

D2 Residential institutions – long-term stay

“Long-term residential institutions” applies to care homes and other types of housing for the elderly and/or the disabled, colleges, student housing or other types of housing for students, relief housing, as well as military barracks.

D3 Building users

The building users are responsible for monitoring the building's energy consumption (tenants, facility managers, building owner).

D4 Energy supply

This refers to any energy supplied to a building area (function area, department, tenancy or unit) within the boundary of the assessed development. Types of energy include electricity, gas, heat or other forms of energy or fuel that are consumed in each relevant area of the building.

D5 Energy monitoring system

A system specially developed for oversight and monitoring of energy consumption in buildings, with features that enable the analysis of energy use to detect any errors and/or operational improvements. An energy monitoring system can be purchased as software for BEMS or as an online service from a remote energy monitoring system provider. A suitable energy monitoring system will give transparent, reliable, updated information, alerts for abnormal operating conditions, and will indirectly contribute to a greater awareness of energy consumption.

An energy monitoring system, as defined in BREEAM-NOR, shall contain the following features as a minimum:

- Automatic data collection, storage and reporting of energy consumption on an hourly level
- Useful graphical presentations of energy consumption in specified time frames, down to one hour (or higher detailing), as well as an ET diagram (Energy/Temperature diagram)
- Alarm management in the event of deviations in energy consumption

During the final post-construction phase, the project must be able to document at least two weeks of complete registration, i.e. all meters have submitted data and the system has generated graphical representations of energy consumption, etc.

D6 Energy meters – Primary meters and sub-meters

Energy meters measure the amount of energy used on a circuit where energy is flowing. Primary meters measure the main incoming energy and are used for billing purposes by the utility company(e.g. grid owner and district heating supplier). They include the main smart and advanced electricity and gas meters for a site.

Sub-meters constitute the second tier and are installed to measure energy consumption divided and/or distributed per tenant area or distributed between specific parts of the building (functional areas).

D7 Common areas

Developments that have multiple tenant units, particularly large retail developments or residential buildings, may also share common facilities and access that is not owned or controlled by any one individual tenant, but are used by all. Common areas are typically managed and maintained by the development's owner, i.e. landlord or their managing agent.

Examples of common areas include atriums, stairwells, main entrance foyers or reception areas as well as external areas,
e.g. parking.

D8 Unit for monitoring own energy consumption in homes

Residents should have access to a unit to easily monitor their own energy consumption in the home via a system comprising a self-charging sensor fixed to the incoming mains supply, in order to measure and transmit energy consumption data to a visual display unit in real time.

D9 Modular boiler systems

A modular boiler system consists of a series of boilers that are linked together to meet a variety of heating demands. They generally comprise mutliple identical boiler units, sometimes stacked, although a combination of condensing and conventional boilers could be used. They operate in increments of capacity, each of them close to their full capacity and their peak efficiency, so that the overall part load efficiency is greater than it would be for a single boiler.

D10 Real time

Real time is used to refer to a computer system that provides an "immediate" response. https://snl.no/sanntid_-_IT This means that data are immediately displayed in the unit for monitoring energy consumption directly after data transfer takes place. *Real time* does not mean continuous measurement/reading.

D11 Self-charging sensor

A mains-powered sensor and/or transmitter that transmit energy consumption data to a visual display unit. Long life batteries, with a minimum life expectancy of seven years, can be used in place of a self-charging sensor/transmitter where the project is able to demonstrate that the functionality of the system can be maintained.

D12 Major fans and pumps

Major fans typically include fans in air handling units. Where multiple fans form part of an air handling unit, they can be metered as one unit. These energy meters can also include electricity for the motor for rotor drive, circulation pumps for cooling and heating coils, as well as other forms of automation. However, electric heating and cooling coils may need to be metered. Small fans such as individual extraction fans for single rooms, such as kitchens, bathrooms and toilet areas, are not required to be included where they only account for a small proportion of the total annual energy use.

Major pumps refer to the main circulation pumps used for distributing hot water for space heating, ventilation heating, hot tap water and ice water for space and ventilation cooling. It is not required to include the measurement of other circulation pumps that are distributed around the building. It is also unnecessary to include radon pumps or other pumps that are unrelated to the building's thermal energy supply.

D13 Accessible meters

Energy meters located in an area of the building that permits easy access to facilitate regular monitoring and readings by the building's occupants or facilities manager. This will typically be the plant room, main distribution room or control room (where a building energy management system (BEMS) has been installed).

D14 Significant majority

Most of the energy supply to the tenanted areas or departments covers most of the energy consumption but does not have to include negligible consumption. For guidance purposes, cumulative energy consumption that comprises less than 10% of the energy supply for that area may be excluded.

Additional information

None.

Ene 03 External lighting

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	–	–	–	–	–

Aim

To reduce energy consumption through the specification of energy efficient light fittings for external areas of the development.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
2.0	**Prisons and other secured buildings** Prisons in this issue are defined as: - High security prison - Standard secured prison - Young offender institution and juvenile prisons - Local prison - Remand centre - Holding centre The prison categories include any building type that is part of a prison establishment, including residential blocks or a hybrid of building types. The criteria only to general external lighting, e.g. way-finding, car parking, decorative, signage, landscape, storage areas, etc. Lighting specified for specific security purposes within secured buildings such as prisons can be excluded from the assessment of this issue.

Assessment criteria

This issue is split into two parts:

- No external lighting within the developed area (1 credit)
  OR
- External lighting within the developed area (1 credit)

No external lighting – 1 credit

1. No external lighting within the developed area (see Definitions). See Methodology for details regarding which external lighting can be accepted.

OR

External lighting – 1 credit

2. External light fittings within the developed area with:
   a. average initial luminous efficacy (see Definitions) for the lighting installation as a whole ≥70 lm/W (see Methodology).
   b. automatic control (see Methodology) to prevent operation during daylight hours.
   c. presence detection in areas of intermittent pedestrian traffic (see Definitions).

Methodology

M1 External lighting

M1.1 Average initial luminous efficacy of external light fittings

The individual initial luminous fluxes (in lumen) of all lighting installations within the developed area are summed then divided by the total power usage (watts) for all lighting installations.

For lights other than LED lamps, the luminous flux of a lighting installation for such lamps can be determined by multiplying the sum of the luminous fluxes produced by all the lamps in lighting installations by the light output ratio of the lighting installations (LOR) (see Definitions) (as confirmed by the luminaire manufacturer).

LED lamps are typically integral to lighting installations (LED installations). As such, the manufacturers' literature will encompass both light and lighting installations as a whole.

M1.2 Temporary lighting, decorative lighting and floodlighting

Temporary lighting such as theatrical lighting, stage lighting or local display installations can be excluded from the assessment of this issue. However, decorative lighting and floodlighting must be assessed for this issue.

M1.3 Emergency lighting

Emergency light fittings, including security lighting, which are also used for normal operation, must be assessed for this issue. Non-maintained lighting which only activates in an emergency can be excluded from the assessment of this issue.

M2 Automatic control

An automatic external lighting control system must prevent operation during daylight hours through either a time switch or a daylight sensor (see Definitions). A manually switched lighting circuit with daylight sensor or time switch override is also acceptable. In addition to the above, the system should provide presence detection (see Definitions) in areas of intermittent traffic. For external lighting not fitted with presence detectors, time switches must provide automatic switch off after a specified curfew hour, except in cases where there is a specific requirement for lighting to be left on all night.

M3 Presence detector

Presence detectors must be compatible with the lamp type used as very frequent switching can reduce the operational life of certain types of lights.

In certain circumstances, other forms of presence-related control could be used, provided that it switches off the lighting when nobody is in the area. Examples could include absence detection, where people switch on the lighting using a push button or similar control but switching off happens automatically; and key control in secure areas, in which people use a swipe card or type a code upon entering a space, and the lighting then comes on and remains on until they leave. Presence related controls need careful design and commissioning to ensure that people are not left in the dark while still in an outdoor area.

M4 Single building assessments on larger developments or campuses and extensions to existing buildings

If the assessed building is part of a larger development containing common areas and other buildings, or is a new extension to an existing building, the external lighting criteria only apply to external new and existing lighting within the construction zone of the assessed building.

M5 Existing external lighting within the developed area

Where a developed area is redeveloped and existing external lighting is left in place, the lighting that has been retained must comply with the requirements of the issue; replacement fittings may be necessary. The responsible disposal of any replaced fittings is recommended (but is not required by BREEAM).

M6 Lighting not managed by the building owner

External lighting not managed by the building owner or building users is exempt from the assessment, i.e. lighting managed by statutory or alternative public bodies.

Evidence

Criteria	Design stage	Post-construction stage
All	A confirmation/commitment from the developer that EITHER all requirements for outdoor lighting will be met OR that no outdoor lighting will be installed. Applies to those cases in which the relevant party is not selected. OR Documentation showing the contractual obligations of the relevant parties to meet EITHER all requirements for outdoor lighting OR that no outdoor lighting will be installed. OR Documentation showing EITHER no outdoor lighting and operations OR the location of all outdoor lighting.	Updated location of all outdoor lighting with as-built information. AND Auditor's inspection report with photo documentation showing that outdoor lighting and operations are installed (where inspection is possible). OR Documentation showing that no outdoor lighting and controls are installed AND Auditor's inspection report with photo documentation showing that no outdoor lighting and operations are installed.

Definitions

D1 Light output ratio of the luminaire (LOR)

The ratio between the luminaire's total luminous flux, measured under specified real conditions with its own lamps and equipment, and the sum of the individual luminous fluxes for the same lamps operated outside the luminaire with the same ballast and under specified conditions. (Source: Lyskulturs Lysveileder)

D2 Daylight sensor

A type of sensor that detects daylight and switches lighting on at dusk and off at dawn.

D3 Luminous efficacy (lm/W)

The ratio between the emitted light flux from luminaires (lumens) and the applied electrical power (watts) to the light source and associated equipment.

D4 Areas of intermittent pedestrian traffic

An area can be considered to have intermittent pedestrian traffic where a pedestrian is in or approaching the area for less than two-thirds of the time during the period when the lighting, without presence detection, would be switched on.

D5 Time switch

A switch with an inbuilt clock which will allow the lighting to be switched on and off at programmed intervals.

D6 Presence detector

A sensor that can turn the lighting on when a presence is detected in the scanned area, and off after a pre-set intervals when no presence is detected.

D7 Developed area

A developed area is defined as any area that is being developed (and therefore disturbed) by buildings, hardstanding, landscaping, parking areas and site access.

Additional information

None.

Ene 05 Energy efficient cold storage (non-residential only)

Number of credits available	Minimum standards				
	P	G	VG	E	O
2	–	–	–	–	–

Aim

To encourage the installation of energy efficient refrigeration systems, in order to reduce operational greenhouse gas emissions resulting from the system's energy use.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	Not applicable
Assessment type specific notes	See ref. 1.0	See ref. 1.0 See Appendix D	None See Appendix D

Specific notes

Notes for Fully fitted/shell and core/shell only	
1.0	Where cold storage systems are specified or installed, all assessment criteria relevant to the building type and function apply.

Building type specific notes	
2.0	This issue is not relevant for residential buildings

Assessment criteria

This issue is split into two parts:

- Design of energy efficient cold storage (1 credit)
- Indirect greenhouse gas emissions (1 credit)

Design of energy efficient cold storage – 1 credit

1. Energy efficient cold storage must be designed, installed and commissioned (see Methodology):
    a. In accordance with the “Kulde- og varmepumpenorm 2018” (see Additional information) and NS-EN 378-2:2016 Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation
2. Robust and tested refrigeration systems or components must be used (see Methodology). The refrigeration plant must be commissioned compliance with the commissioning criteria in Chapters 12 and 13 of “Kulde- og varmepumpenorm 2018”

Indirect greenhouse gas emissions – 1 credit

3. Criteria 1 and 2 must be achieved.
4. A saving in indirect greenhouse gas emissions (CO_2-eq) (see Definitions) must be demonstrated from the installed refrigeration system over the course of its operational life and compared with a reference system.

Methodology

M1. Design of energy efficient cold storage

M1.1 Scope of Ene 05 issue

This issue is only applicable in instances where commercial or industrial refrigeration, freezing and storage systems, designed as building integrated systems, are used, for example:

- Storage and refrigeration of food in supermarkets and commercial or industrial kitchens
- Cold storage facilities in industrial, laboratory, healthcare and other buildings.

The criteria do not apply to:

- Domestic refrigeration and freezer appliances or
- Refrigeration, freezing rooms and storage systems for kitchen and catering facilities where these are self-contained units not connected to building cooling systems.

These types of installation are covered by BREEAM issue Ene 08.$

If the building contains no refrigeration systems or only standalone refrigeration systems, i.e. not integral to the building and served by the building services, this issue is not applicable to the assessment.

M1.2 Robust and tested refrigeration systems or components

Where specified as part of the refrigeration system, products used for the following components must meet the criteria of "Eco Design of Energy using Products (EuP) directive" https://lovdata.no/dokument/SF/forskrift/2011-02-23-190:

a. Air-cooled condensing units
b. Automatic air purgers
c. Cooling equipment for wine and beer cellars
d. Commercial service cabinets (cold food storage)
e. Curtains, blinds, sliding doors and covers for refrigerated display cabinets
f. Evaporative condensers
g. Forced air pre-coolers
h. Refrigerated display cabinets
i. Refrigeration compressors
j. Refrigeration system controls

Where components do not comply with the regulations, the technical department at Grønn Byggallianse must be contacted.

M2 Indirect greenhouse gas emission

Indirect GHG emissions must be calculated in accordance with the procedures in NS-EN 378-1:2016+A1 2020 Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria, Annex B.

Calculations must be carried out by appropriately qualified personnel (see Definitions), including calculations to justify the assumptions made and methodologies used for savings in indirect greenhouse emissions.

M2.1 Modelling a baseline building

The Suitably qualified engineer must confirm details of the baseline system used and that it is based on a typical installation/technology for that building type. The systems being compared must have the same duty and service conditions and include the relevant consumption from the refrigeration systems ancillary equipment.

M3 Extensions to existing buildings

If assessing a new extension to an existing building and there is a cold storage plant in the existing building that will serve the new extension, this plant must meet the criteria in order to achieve any available credits.

Evidence

Criteria	Design stage	Post-construction stage
1-2	A confirmation / obligation from the developer that requirements will be set to meet the design of energy-efficient refrigeration and/or freezing rooms. Applies to those cases in which the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to meet all requirements for the design of energy-efficient refrigeration and/or freezing rooms. ----------------- OR Documentation of energy efficient refrigeration and/or freezing room.	Updated documentation of energy efficient refrigeration and/or freezing rooms with built-in information. AND Documentation showing that cold storage has been put into operation, checked and handed over in accordance with Chapters 12 and 13 of "Kulde- varmepumpenorm: 2018".
3-4	A confirmation / obligation from the developer that they will meet all requirements for the design of the refrigeration and/or freezer room refrigeration system with low greenhouse gas emissions. Applies to those cases in which the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to meet all requirements for the design of the refrigeration and/or freezing room refrigeration system with low greenhouse gas emissions. ----------------- OR Documentation of the refrigeration and/or freezing room refrigeration system with low greenhouse gas emissions.	Updated documentation of the refrigeration and/or freezing room refrigeration system with built-in information. Documentation of skills and experience of the qualified person.

Definitions

D1 Indirect operational greenhouse gas emissions and direct emissions

These are the indirect greenhouse gas emissions that result from the production of energy used to power the refrigeration system's cooling plant. This includes emissions from the production of grid electricity or an on-site source of energy generation, e.g. gas CHP.

In the case of refrigeration systems, the term 'direct greenhouse gas emissions' is also used; this refers to the emissions that occur as a direct result of the leakage of refrigerant from the system. The impacts of direct greenhouse gas emissions from refrigeration systems are dealt with in the BREEAM-NOR issue Pol 01. Thus, only indirect emissions resulting from the energy consumption of the system are covered in this issue.

D2 Qualified personnel

Please follow the requirements for design in "Kulde- og varmepumpenorm 2018" Section 3.9 Requirements for qualifications and training.

Additional information

T1 Kulde- og varmepumpenorm 2018

Kulde- og varmepumpenorm 2018 is available for download:
https://nkf-norge.no/wp-content/uploads/2019/11/Kulde-og-varmepumpenorm-2018.pdf

Ene 06 Energy efficient transportation systems

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	–	–	–	–	–

Aim

To encourage the specification of energy efficient transportation systems within buildings.

Fully fitted/ shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/shell and core/shell only	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into two parts:

- Energy consumption (1 credit)
- Energy efficient features (up to 2 credits)

Transport needs and usage patterns – 1 credit

1. For specified lifts, escalators or moving walkways (transportation types):
   The transportation demand and usage patterns for the building must be analysed in order to determine the optimum number and size of lifts, escalators or moving walkways. In addition, the possibility of increasing the use of stairs (attractive design and placement of stairs) must be considered, while at the same time meeting the requirements for universal design (UD.

Energy efficient features – Up to 2 credits

2. Achieve criterion 1 above.

Lifts: 1 credit

3. Energy class A must be achieved according to NS-EN ISO 25745.2:2015. Hydraulic lifts must achieve energy class C or higher.

OR

4. The following three energy efficient features must be specified for each lift:
   a. A standby condition for off-peak periods.

   b. Lift car lighting and display lighting must provide an average luminous efficacy across all fittings in the car of > 70 luminaire lumens per circuit watt.
   c. A drive controller must be used that is capable of variable speed, variable voltage and variable frequency (VVVF) control of the drive motor.
5. Regenerative drives must be specified where it can be demonstrated that their use will save energy according to the specification in Method M2.

Escalators or moving walks: 1 credit

6. Energy class B must be achieved according to NS-EN ISO 25745.3:2015.

OR

7. At least one of the following must be specified for each escalator or moving walkway:
   a. A load-sensing device that synchronises motor output to passenger demand through a variable speed drive

   OR

   b. A passenger-sensing device for automated operation (see Definitions) so the escalator operates in auto start mode when there is no passenger demand.

Methodology

M1 Transport needs and usage patterns

The transport analysis can be in the form of a written statement justifying the lift selection for the following conditions:

- where a single lift is provided in a low rise building for the purpose of providing disabled access only

OR

- where a goods lift is selected based on the size of the goods it is intended to carry.

M2 Regenerative drives

Regenerative drives should only be considered where they produce an energy saving that is greater than the additional standby energy used to support the drives. Regenerative drives will typically be appropriate for lifts with high travel and high intensity use.

If it can be documented that the electricity grid does not allow electricity generated on site to be returned to the grid, and there is no demand for, or there can be no feasible way to use this electricity elsewhere in the building or on the development site, the second credit can be considered and will be awarded on the basis that criteria 4a–c have been met.

M3 Buildings that have only one or no transportation systems

This issue will not be assessed where a building contains no lifts, escalators or moving walkways.

The criteria for lifts do not apply to lifting platforms, stair lifts/wheelchair lifts or other similar facilities to assist people with impaired mobility. However, any lifting device with a rated speed greater than 0.15 m/s must be assessed, including goods, vehicle and passenger lifts.

Where only lifts, escalators or moving walkways are present, only one credit is available for the energy efficient features credit. Where lifts, escalators or moving walkways are present, then two credits are available.

M4 Extensions to existing buildings

If assessing a new extension to an existing building, lifts in the existing building fall outside the scope of Ene 06 and do not need to be assessed. This only applies where the lifts are not being renewed or undergoing major refurbishment.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	A confirmation / obligation from the developer that there will be a requirement to meet all the criteria for the analysis of transport needs and usage patterns, including an assessment of the possibilities for the increased use of stairs. Applies to those cases in which the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to fulfil all requirements for the analysis of transport needs and usage patterns, including an assessment of the possibilities for the increased use of stairs. ----------------- OR An analysis of transport needs and usage patterns, including an assessment of the possibilities for the increased use of stairs.	Updated analysis of transport needs and usage patterns with as-built information.
2-7	A confirmation/obligation from the developer that there will be a requirement to meet all the criteria for energy efficient functions. Applies to those cases in which the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to fulfil all requirements for the energy efficient functions. ----------------- OR Documentation of energy efficient functions.	Updated documentation of energy efficient functions with as-built information. AND The producer’s documentation, including drawings showing that the installed transport systems meet the criteria. AND Assessor’s inspection report with photographic documentation showing that the transport systems are installed.

Definitions

D1 Auto start condition – escalators and moving walkways

A condition whereby the escalator or moving walkway are stationary, powered up and ready to start, initiated by passenger detection.

D2 Idle condition

A condition whereby a lift is stationary on one floor and has reduced its energy consumption to the minimum level for the elevator in question. For example, this could mean that the lift's regulator and other operating equipment, such as lift chair lighting, control panel and ventilation fans switch off when the lift has been inactive (see Definitions) for a specified period. The period between when an elevator was last used and when it enters sleep mode must be set at 5 minutes in NS-EN ISO 25745-1:2012.

D3 Lift car lighting

The level of lift car lighting shall be determined by the relevant standards. For example, NS-EN 81-20:2014 requires at least 100 lux on the control devices and at 1m above the floor at any point not less than 100mm from any wall.

D4 Standby condition – lifts

A condition in which an elevator is stationary on one floor after operation before switching to standby mode.

Additional information

T1 NS-EN ISO 25745 – Energy performance of lifts, escalators and moving walkways

ISO 25745 comprises three parts, under the general title of Energy performance of lifts, escalators and moving walkways:

- Part 1: Energy measurement and verification (2012)
- Part 2: Energy calculation and classification for lifts (elevators) (2015)
- Part 3: Energy calculation and classification for escalators and moving walkways (2015).

In Part 1, it has been estimated that approximately 5% of a building's total energy consumption can be attributed to the operation of lifts and a large proportion of this can be attributed to standby mode in many situations.
NS-EN ISO 25745 Parts 2 and 3 have been prepared in response to the rapidly increasing need to ensure and support the efficient and effective use of energy, providing:

1. A method to estimate energy consumption on a daily and an annual basis for lifts, escalators and moving walkways.
2. A method for the energy classification of new, existing or modernised lifts, escalators and moving walkways.
3. Guidelines for reducing energy consumption that can be used to support building environmental and energy classification systems.

Ene 07 Energy efficient laboratory systems

Number of credits available	Minimum standards				
Up to 5	P	G	VG	E	O
	Crit. 1–4	Crit. 1–4	Crit. 1–4	Crit. 1–4	Crit. 1–4

Aim

To encourage laboratory areas that are designed to minimise their operational energy consumption and associated CO_2 emissions.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	Not applicable	Not applicable
Assessment type specific notes	None	None See appendix D	None See appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
2.0	**Further education, higher education and offices** This issue is only applicable to further education, higher education, offices with research and development areas, and other buildings with research and development facilities that contain laboratory space and containment devices or areas. This issue is not applicable to school buildings (primary and secondary level).

Assessment criteria

This issue is split into two parts:

- Design specification (1credit)
- Best practice energy efficient measures (up to 4 credits)

Design specification – 1 credit

1. No later than step 3, a user process shall be carried out with the participation of representatives of the developer and users to determine user needs and define the criteria for the laboratory (see Definitions D1). Performance criteria will include, but will not be limited to:
   a. Description of purpose
   b. Occupant or process activities
   c. Containment requirements and standards for protective ventilation
   d. Selection of type of equipment for protective ventilation
   e. Interaction between systems
   f. Flexibility and adaptability of laboratory facilities.
   g. Any other specific requirements (for example, requirements relevant to ventilation, heating or cooling).
   h. User manual and training at takeover

2. Services system equipment must be correctly sized (see Definitions), including ventilation supply and exhaust.

3. The minimised energy demand of the laboratory facilities resulting from the achievement of the defined design performance criteria must be demonstrated (see criteria 1).

4. Laboratory containment devices and containment areas (criteria only applicable to buildings containing these facilities).
   When ducted fume cupboards are specified:
   a. It must be demonstrated that the average nominal front speed in the fume hood is not higher than 0.5m/s. (see Methodology).
   b. The volume flow rate must be measured according to NS-EN 14175-4:2004 Fume cupboards – Part 4: On-site test methods
   c. It must be demonstrated that a reduction in air flow does not compromise the defined performance criteria and does not increase the health and safety risk to future building occupants.

Best practice energy efficient measures – up to 4 credits

If the laboratory area accounts for at least 10% of the total building floor area (see Definitions):

5. Criteria 1 to 4 above must be achieved (or criteria 1 to 3 above where there are no ducted fume cupboards).
6. Laboratory installations and systems must be designed, specified and installed to promote energy efficiency. Compliance with two or more elements must be documented in Table Ene07-1 (see 6.a and 6.b for the available credits).
   a. Up to 2 credits: laboratory areas (see Definitions) must account for at least 10% (but less than 25%) of the total building floor area (GFA/BTA)
      OR
   b. Up to 4 credits: laboratory areas must account for 25% or more of the total building floor area (GFA/BTA).
7. The project must demonstrate using calculations or modelling that the chosen measures have a reasonably significant effect on the total energy consumption of the laboratory, i.e. 2% reduction or greater.
8. The project must demonstrate that the energy efficient measures specified in Table Ene07-01 do not compromise the defined performance criteria for the laboratory facility (criteria 1) and/or do not increase the health and safety risk to future building occupants, the environment or product.

Table Ene07-1 Best practice energy efficient measures in laboratories

Item description	Number of credits
Fume cupboard volume flow rates (further reduction)	
The average nominal front speed in the fume hood must not be higher than 0.4m/s (see Methodology).	0.5
Grouping or isolation of high filtration or ventilation activities	
In order to limit the extent of the area with high air changes and requirements for filtration, document that these functions and requirements have been proposed to be co-located.	0.5
Energy recovery – heat	
Heat recovery from exhaust air (where there is no risk of cross-contamination) or via refrigerant or water-cooling systems.	0.5
Energy recovery – cooling	
Cooling recovery via exhaust air heat exchangers (where there is no risk of cross-contamination) or via refrigerant or water-cooling systems.	0.5
Grouping of cooling loads	
Cooling loads must be grouped in order to reduce the scope of refrigeration installations.	0.5
Free cooling	
Free cooling coils in chillers or dry air coolers related to laboratory-specific activities must be specified.	0.5
Load responsiveness	
Effective demand management of ventilation, cooling and heating through modularity, variable speed drives and pumps, and other mechanisms is required.	0.5
Optimised customisation	
High levels of generality/flexibility must be facilitated in central plant sizing and laboratory duct sizing, where compatible with safety.	0.5

It must be documented the clarifications have been conducted with the user regarding concurrency considerations. There must be agreed concurrency at room level and agreed concurrency for zones/areas adapted to the tenant's use of equipment for protective ventilation	
Room air change rates	
Air change rates must be reduced by matching ventilation airflows to air conditioning and the demands of protective ventilation.	0.5
Fan power	
Specification and achievement of specific fan power (SFP) must be described according to best practice (as shown below) for all air handling units, laboratory exhaust systems, local exhaust ventilation, containment area extracts (where applicable) and fume cupboard extracts (where applicable).	1
Laboratory system	**Best practice specific fan power (W/(L/s))**
General laboratory supply air handling unit (AHU) with heating and cooling	2.5
Air handling units for supply air and exhaust with HEPA filtration, heating and cooling for laboratories.	3.0
Only whole credits can be awarded in BREEAM. Thus, to achieve a credit for items with partial credits, the laboratory must comply with at least two of the items. In an instance where, for example, 3.5 credits are achieved, this figure would need to be rounded down to three credits.	

Methodology

M1 Applicable standards

NS-EN 14056:2003 Laboratory furniture – Recommendations for design and installation
NS-EN 14175-1:2003 Fume cupboards – Part 1: Vocabulary
NS-EN 14175-2:2003 Fume cupboards – Part 2: Safety and performance requirements
NS-EN 14175-3:2019 Fume cupboards – Part 3: Type test methods
NS-EN 14175-4:2004 Fume cupboards – Part 4: On-site test methods
NS-EN 14175-6:2006 Fume cupboards – Part 6: Variable air volume fume cupboards
NS-EN 14175-7:2012 Fume cupboards – Part 7: Fume cupboards for high heat and acidic load
NS-EN 12469:2000 Biotechnology – Performance criteria for microbiological safety cabinets
NS-EN ISO 14644-7:2004 Clean rooms and associated controlled environments – Part 7: Separative devices (clean air hoods, gloveboxes, isolators and mini-environments) (ISO 14644-7:2004).

M2 Average nominal front speed in fume cupboards

Acceptance criteria in the Nor-test method can be used as a limit value when testing "robustness" in accordance with NS EN 14175: 1–6 Exhaust cabinet.

Evidence

Criteria	Design stage	Post-construction stage
1-4	A confirmation/commitment from the developer that there will be a requirement to meet all the criteria for the design specification. Applies to those cases in which the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to fulfil	Updated design specification with as-built data. AND Documentation of the time for preparation of the design specification. AND

	all requirements for the design specification. ----------------- OR Design specification AND Documentation of the time for preparation of the design specification.	User manual and user training for handover of buildings.
6-8	A confirmation/commitment from the developer that there will be a requirement to meet all the criteria for the energy efficient measures. Applies to those cases in which the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to fulfil all requirements for the energy efficient measures. ----------------- OR Documentation of the laboratory area. AND Documentation showing the planned energy efficiency measures. AND Documentation showing that the chosen measures have a reasonably significant effect on total energy consumption. AND Confirmation that the measures do not deviate from other performance criteria or increase the health and safety risk for building users.	Updated documentation of the laboratory area with as-built data. AND Documentation showing completed energy efficiency measures. AND Documentation that shows that the chosen measures have a reasonably significant effect on total energy consumption. AND Documentation showing that the measures do not deviate from other performance criteria or increase the health and safety risk for building users.

Definitions

D1 Laboratory areas

Laboratory areas are defined as:

- highly controlled environment (temperature, ventilation, relative humidity or/and containment controlled)
- high concentration of installations (with control devices for temperature/ventilation/humidity/containment)
- where physical, biological or chemical processing or testing is carried out.

Such areas will have inherently high energy demands. In order to maintain controlled conditions to enable experiments and to comply with HMS, typically laboratories:

1. Contain various protective ventilation equipment (such as fume cupboards and microbiological safety cabinets)
2. Are heavily serviced to circulate air and to supply heating, cooling, humidity and clean air
3. Often require 24-hour access and failsafe redundant backup systems and uninterrupted power supply or emergency power to enable experiments that are irreplaceable.

Thus, for the purpose of assessing this BREEAM-NOR issue, the definition of laboratory areas must exclude any laboratory support areas such as:

1. Write up or offices
2. Meeting rooms
3. Storage

4. Ancillary and other support areas with lower maintenance requirements.

Teaching and other laboratories or workshops with a limited number of fume cupboards or other protective ventilation equipment and/or no energy-intensive process equipment specified must be excluded from the assessment.

If the design team can provide evidence that their energy consumption is at least 50% higher than a typical office due to laboratory process-related activities, this can be included in the assessment.

In buildings in which 40% of the floor area is laboratory related, only 10% will actually constitute laboratory areas as per the BREEAM-NOR definition. Different types of laboratories have different requirements for heating, ventilation and air-conditioning, plug load equipment and access. This can lead to enormous variations in energy and water requirements.

D2 Right sizing

Principles of right sizing encourage the use of precise estimates of equipment loads in order to optimise the design of technical installations. This system differs from traditional calculation methods based on nominal data from the manufacturer's technical documentation or design assumptions based on experience of previous projects.

The right sizing principle can lead to lower construction costs and other benefits associated with life cycle costs, while taking into account the need for appropriate capacity.

Additional information

T1 Synergy with issue Ene 01 Reduction of energy use and carbon emissions

This has been developed to recognise improvements made to new laboratory areas or buildings that are not currently fully recognised in the National Calculation Methodology, which is used to assess and award credits in Ene 01 Reduction of energy use and carbon emissions.

T2 The main types of laboratories include:

1. Wet laboratories – in which chemicals, drugs or other material or biological matter tested and analysed require water, direct ventilation and specialised piped utilities. They typically include chemical science laboratories. These laboratories require specially designed facilities.
2. Dry laboratories – contain dry stored materials, electronics or large instruments with few piped services. They typically include engineering or analytical laboratories that may require accurate temperature and humidity control, dust control and clean power.
3. Microbiological or clinical laboratories – often work with infectious agents. They typically require higher levels of primary containment and multiple secondary barriers including specialised ventilation systems to ensure directional air flow, air treatment systems to decontaminate or remove agents from exhaust air, controlled access zones, airlocks as laboratory entrances, or separate buildings or modules to isolate the laboratory.
4. In vivo laboratories – these require highly controlled environments for the care and maintenance of flora, and fauna. The facilities are complex and expensive to build and operate. Stringent environmental control of the facility is required to avoid the introduction of contaminants or pathogens, prevent the possibility of infectious outbreaks, and avoid the transmission of odours.
5. Teaching laboratories – unique to academic institutes, they require space for teaching equipment, storage space for students' belongings and less instrumentation than research labs.
6. Clean rooms – this refers to a controlled environment (air quality, temperature and humidity) which prevents contamination and regulates environmental conditions to facilitate accurate research and production needs. They are typically used in UK universities for nanotechnology, medical and pharmaceutical research or studies, as well as microelectronics applications.

Ene 08 Energy efficient equipment

Number of credits available	Minimum standards				
	P	G	VG	E	O
2	–	–	–	–	–

Aim

To encourage installation of energy efficient equipment to ensure optimum performance and energy savings in operation.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	Not applicable	Not applicable
Assessment type specific notes	1.0, 1.1, 1.2, 1.3, 1.4	None See Appendix D	None See Appendix D

Assessment type specific notes	
1.0	Where there are no systems specified that contribute to the unregulated energy load, this issue is not applicable.
1.1	This issue does not apply to lifts, escalators and moving walkways. These systems are covered within the scope of Ene 06 Energy efficient transportation systems and should be removed from the list of unregulated loads with respect to this issue.
1.2	This issue does not apply to laboratory ducted fume cupboards. These systems are covered within the scope of Ene 07 Energy efficient laboratory systems and should be removed from the list of unregulated loads with respect to this issue.
1.3	This issue does not apply to unregulated energy loads related to outdoor lighting. These systems are covered within the scope of Ene 03 Outdoor Lighting.
1.4	This issue does not apply to unregulated energy loads for electric charging of vehicles, bicycles or other chargeable equipment.

Building type specific notes

Building type specific notes	
2.0	**Health care** All medical equipment is exempt from complying with these criteria.
2.1	**Residential buildings and buildings with multiple dwellings** Requirements for white goods under point A5b (individual and joint installations) only apply to assessments of buildings with multiple residential units. This criterion does not apply to nursing homes (for safety reasons, to minimise ligature risk for specific residents). It is also not applicable to projects where occupancy is transient, such as hotel or hostel type developments.

Assessment criteria

This issue consists of one part:

- Reduction of the building's significant unregulated energy consumption (two credits)

Reduction of the building's significant unregulated energy consumption – 2 credits

1. The building's unregulated energy consuming loads must be identified (see Definitions). Their contribution to the total annual unregulated energy consumption of the building, assuming a typical or standard specification, must be estimated (see Methodology).
2. The systems or processes that use a significant proportion of the total annual unregulated energy consumption of the building must be identified (see Methodology).
3. A meaningful reduction in the total annual unregulated energy consumption of the building (see Methodology) must be demonstrated. Table Ene08-01 lists some alternatives for significant contributors to unregulated energy consumption and the associated criteria. If the mapping in criterion 1 and 2 identifies other significant unregulated energy loads than those stated in the table, the project team should justify how a meaningful reduction in energy demand is to be achieved for these energy loads.

Table Ene08-01 Significant contributors to unregulated energy consumption, for a number of different building types or functions, and the solutions that are deemed to comply

Alternative	Specification
A	**Domestic-scale appliances (individual and communal facilities)** Any white goods (see Definitions) available to purchase from the developer must achieve the ratings below (or better) under the EU Energy Efficiency Labelling Scheme. The requirement applies to energy certificates based on the energy label scheme for white goods and consumer goods that came into force on 1 March 2021: 1. Fridges, fridge-freezers: E 2. Washing machines: B 3. Dishwashers: D 4. Washer-dryers: D 5. Tumble dryers: EITHER a. D OR b. For multi-residential assessments only (see Definitions), adequate space must be provided for internal or external space capable of holding drying lines (see Methodology).
B	**Health care (see Definitions)** The procurement of large-scale equipment (See Definitions) and sets of electrical equipment (more than 50) must been informed and selected by a life cycle cost analysis (LCC). 'Large-scale equipment' includes commercial-scale catering and laundry equipment and all other equipment with connected electrical loads in excess of 10kW rated input power.
C	**Swimming pools** 1. Automatic or semi-automatic pool covers, or 'liquid' pool covers with an automatic dosing system to ALL pools, including spa pools and hot tubs, must be specified 2. The covers must envelop the entire pool surface when fully extended. 3. The air temperature in the pool hall must be controlled so that it is 1°C higher than the water temperature.
D	**Laundry facilities with commercial-sized appliances** At least one of the following must be demonstrated for commercial-sized appliances: 1. Specification of heat recovery from wastewater. 2. Use of greywater for part of the washing process. This may be recycled from the final rinse and used for the next pre-wash.

E	**Data centres and server rom (see Definitions)** 1. Power Usage Effectiveness (PUE), calculated according to EN 50600-4-2:2016+A1:2019: Information technology. Data centre facilities and infrastructures Power Usage Effectiveness. PUE should not be higher than 1,4. $\text{PUE} = \frac{E_{\text{DC}}}{E_{\text{IT}}}$ Where: E_{DC}: Total data energy consumption (annual) in kWh E_{IT}: IT equipment energy consumption (annual) in kWh that includes energy consumption for UPS (Uninterruptible Power Supply) and chillers. 2. Temperature set points must not be less than 24°C, as measured at the inlet of the equipment in the rack.
	Kitchen and catering facilities (see Definitions) At least two-thirds of the energy efficiency measures outlined in the 'section summary' boxes of each of the following sections of the CIBSE Guide TM50[1] must be incorporated (unless otherwise specified). Section 8 – Grease separator, drainage and kitchen waste removal, if they use energy Section 9 – Energy controls – specifically controls relevant to appliances Section 11 – Appliance specification – excluding fabrication or utensil specifications Section 12 – Refrigeration and freezer installations Section 13 – Warewashing: dishwashers and glass washers Section 14 – Equipment used for the preparation of hot food Section 15 – Water temperatures, taps, faucets and water-saving controls. Refrigeration for kitchen and catering facilities should be assessed here, not in Ene 05 Energy efficient cold storage.
G	**Snow melting installation** This issue applies to snow melting installations that remove snow and ensure good access to the building. 1. Materials and design (see Methodology): – The snow melting installation must be designed in such a way that ensures efficient snow melting when needed, using the least possible energy and power. – The installation must be equipped with local temperature and humidity sensors. The sensors must be positioned in such a way that the measurement gives representative values and that error detection is avoided as much as possible (see Methodology M3 section 2-4). – The installation must have its own energy meter according to Ene 02. – For larger installations that have areas with different heating needs, the system must be zoned and designed so that each zone has the opportunity to be controlled as needed (see Methodology M3 section 4c-8). 2. Control (see Methodology): – The system must be integrated with and monitored by the building's SD system – Local sensors control “melt function” and “emergency function”. For larger facilities, weather forecasts should be used to put the facility on standby (see Methodology M3 section 6-7) – Frost protection and protection against overtemperature on the pipe loops must be addressed (see Methodology M3 section 5) – For facilities with multiple zones, each zone must be able to be controlled individually and as required (see Methodology M3 section 8)

[1] CIBSE TM50: Energy Efficiency in Commercial Kitchens, CIBSE, 2009. http://www.cibse.org/knowledge/knowledge-items/detail?id=a0q20000008I7f3AAC

	– Larger plants must have the option of power limitation (see Methodology M3 section 9) 3. Energy supply (see Methodology): – The plant must be connected to the building's heating system * – The plant must be supplied with climate-friendly energy just like the building, according to criteria 5–7 under Ene 01. * In order not to occupy electrical capacity on the grid, the use of waterborne heat and waste heat is preferred. The project must justify the possible use of electric heating.
H	**IT-intensive operating areas (see Definitions)** 1. A natural ventilation and cooling strategy must be specified as standard. Forced ventilation must only be used if the internal temperature exceeds 20°C and active cooling must only be used when the internal temperature exceeds 22°C. 2. A mechanism to achieve automatic power-down of equipment when not in use, including overnight use, must be specified.

Methodology

M1 Reduction of the building's significant unregulated energy consumption

M1.1 Estimating annual unregulated energy consumption

A method should be used to estimate actual energy consumption, based on expected equipment loads and hours of operation. The energy consumption may be estimated by using simple hand calculations, or benchmark data, or by the methods described in CIBSE TM54: Evaluating operational energy performance of buildings at the design stage.

M1.2 Identifying a significant proportion of annual unregulated energy consumption

This methodology is used to estimate which energy consumption makes up a significant proportion of unregulated energy consumption, meaning that detailed calculations are not required. The approach should focus on identifying the larger energy consumption that should be included and the smaller energy consumption that can be excluded. For guidance purposes, energy consumptions that makes up at least 90% of the estimated total annual energy consumption should typically be included.

BREEAM-NOR does not specify a level or percentage that defines a meaningful reduction in unregulated energy demand. The project team must justify how they have determined or judged a meaningful reduction in the unregulated energy demand and the assessor must be satisfied that this is an appropriate justification.

M1.3 Calculating a meaningful reduction in energy consumption

For equipment that makes up a significant proportion of the annual equipment energy consumption, demonstrate that a meaningful reduction in energy consumption has been achieved. Equipment types which met the criteria listed in Table Ene08--01 are deemed to achieve a meaningful reduction without further justification or calculation.

For equipment types not listed in Table Ene08-01, or where alternative solutions are provided for equipment listed in Table Ene08-01, calculations must be provided that demonstrate that when combined these lead to a 5% reduction in energy consumption compared to equipment with typical or standard specifications.

M2 Domestic-scale appliances

M2.1 Drying lines

Domestic-scale appliances (individual and communal facilities) require the provision of an adequate internal or external secure space with posts and footings, or fixings capable of holding:

1. For self-contained dwellings:
   a. One to two bedrooms: 4m+ of drying line
   b. Three or more bedrooms: 6m+ of drying line.
2. For individual bedrooms:
   a. Two metres or more of drying line per bedroom for developments with up to 30 individual bedrooms, plus
   b. One metre of additional drying line for each bedroom over the 30 individual bedroom threshold.

M2.2. Adequate internal drying space

A heated space must be provided with adequate controlled ventilation that complies with the national building regulations relevant to the location of the building (rooms that commonly meet these requirements are bathrooms or utility rooms)

OR

An unheated outbuilding, where calculations by a member of the project team with appropriate competence demonstrate that ventilation in the space is adequate to allow drying in normal climatic conditions and prevent condensation and mould growth. The fixing or fitting must be a permanent feature of the room. Internal drying spaces in the following rooms does not comply:

1. Living rooms
2. Kitchens
3. Dining rooms
4. Main halls
5. Bedrooms

M2.3 Reuse of equipment

Reuse of electrical equipment does not comply by default, as it may not be the most energy efficient option. However, the credit could be awarded if either of the following criteria are demonstrated:

1. The existing electrical appliances meet the criteria in the Ecodesign Directive: https://lovdata.no/dokument/SF/forskrift/2011-02-23-190
2. Reusing old equipment during its operational life would be a more energy efficient option than specifying new equipment.

M3 Snow melting plant

Sections 1–6 apply to all snow melting plants with a total coverage area greater than 20 m².
Sections 7–9 apply to all snow melting plants with a total coverage area greater than 100 m².

1. Materials and design
   a. Material selection and design according to the recommendations in Section 3 of Prenøk 6.5.
2. Temperature sensors:
   a. As a minimum, the system must have a temperature sensor for measuring the surface temperature of the ground and a sensor for measuring the outdoor temperature. For the latter, an outdoor temperature sensor for the building can be used. The outdoor temperature sensor is used to ensure that the system is turned off when not needed and when it is too cold to melt snow.
3. Humidity sensors:
   a. As a minimum, the snow melting system must have a humidity sensor for snow detection.
   b. The system should have a humidity sensor for measuring the relative humidity of the outdoor air, for calculating the current dew point temperature to be used when defrosting the ground.
4. Sensor location and fault detection:

a. A temperature sensor for measuring the surface temperature of the ground shall be placed so that the measurement is made on the part of the coverage area that is assumed to be most exposed to snow and where the snow is assumed to melt last. This is to ensure that the installation is managed according to real needs.
b. If a moisture meter for the detection of snow is placed on the ground, the location must be such that it is not located on a natural walkway or roadway (wheel tracks).
c. If the system covers multiple zones, each zone must have its own sensors.

5. Frost protection and protection against overtemperature:
   a. Frost protection against frost burst in a heat exchanger.
   b. Protection against overtemperature of the water/glycol mixture in pipe loops, which could damage the pipes. The temperature limit must be defined according to the recommendations for the selected pipe type.
6. Features, as a minimum:
   a. Manual override OFF/ON
      i. Alarm to SD system in case of manual override ON, with repeated warnings every 24 hours
   b. Melting function
      i. Function/operating mode for melting snow. Highest temperature setpoint.
   c. Standby function
      i. Function/operating mode to preheat the ground before snowfall in order to ensure rapid melting with the least possible effect. Also called *Standby function*. Lower temperature setpoint than for melt function.
7. Contingency function with use of weather forecasts:
   a. Weather forecasts and temperature sensor for the ground surface temperature control the emergency preparedness function. If no snow is reported during the next few hours and no snow is detected by the local sensor, the snow melting system must be switched OFF. The facility can have several emergency levels whereby the ground is preheated to a higher level, depending on the proximity of the forecast snowfall .
8. Zoning with individual control:
   a. Zoning with individual control must be assessed on the basis of different types of roofing, particularly in critical areas (such as descent ramps and stairs) and particularly in public areas.
9. Power limitation:
   a. A function that reduces the heat application to ensure compliance with the defined upper limit for power consumption.

Evidence

Criteria	Design stage	Post-construction stage
All	A confirmation/commitment from the developer that a requirement will be made to analyse and install energy efficient equipment in the areas that contribute most to the total annual unregulated energy consumption. Applies to those cases in which the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for the relevant parties to analyse, design and install energy efficient equipment in the areas that contribute most to the total annual unregulated energy consumption -------------- OR	Documentation of the updated analysis and the location and/or specification for energy efficient equipment in the areas that contribute most to the total annual unregulated energy consumption AND Manufacturers' product information and/or documentation showing that the relevant criteria are met. Assessor's inspection report with photographic documentation showing that energy efficient equipment is installed, (where inspection is possible). The BREEAM-NOR Assessor Report with completed values.

	Documentation of the analysis and the designed location and/or specification for energy efficient equipment in the areas that contribute most to the total annual unregulated energy consumption AND Manufacturers' product information and/or documentation showing that the relevant criteria are met.	

Definitions

D1 Multi-residential

Multi-residential buildings are defined as residential dwellings, residential care homes, sheltered accommodation, residential colleges or schools (halls of residence), local authority secure residential accommodation, military barracks.

D2 Data centre

For the purpose of this BREEAM-NOR issue, the term 'data centres' includes all buildings, facilities and rooms which contain enterprise servers, server communication equipment, cooling equipment and power equipment, and may provide some form of data service (e.g. large-scale mission critical facilities all the way down to small server rooms located in office buildings).

D3 Healthcare

Healthcare buildings are defined as: teaching or specialist hospitals, university hospitals, general acute hospitals, nursing homes, emergency rooms, psychiatric hospitals, health centres and clinics and GP's surgeries.

D4 White goods

Domestic appliances, for example, washing machines, fridges, freezers, fridge-freezers, tumble dryers, washer-dryers, etc.

D5 IT-intensive areas

These include computer areas where more than one computer per 5m² is provided, e.g. IT areas in training suites, design studios, libraries, and other areas with a high density of computer devices.

D6 Refrigeration equipment

The criterion applies to building-integrated and non-building-integrated refrigeration and freezing rooms for storing food at the correct temperature, which are not connected to the building's cooling system. These include:

1. Air-cooled capacitors
2. Cooling systems used for wine cellars and beer cellars
3. Commercial refrigerators
4. Curtains or blinds for refrigeration cabinets
5. Refrigeration compressors
6. Cooling system controls
7. Refrigeration display cabinets

The criterion only applies to refrigeration equipment for commercial kitchens and not to other commercial/ industrial dimensioned refrigeration and cooling systems. These systems are covered by the scope of Ene 05 Energy-efficient cold stores and will be removed from the list of unregulated loads in this issue.

D7 Regulated energy

Building energy consumption resulting from the specification of controlled, fixed building services and fittings, including space heating and cooling, hot water, ventilation and lighting.

D8 Secure space

For self-contained dwellings, this can be defined as an enclosed space only accessible to the residents of the dwelling. For buildings with a communal drying area, it must be an enclosed area with a secure entrance, only accessible to the building's residents.

D9 Large-scale healthcare equipment

This includes commercial-scale catering and laundry equipment and all other equipment with connected electrical loads in excess of 10 kW rated input power.

D10 Unregulated energy consuming loads

Building energy consumption resulting from a system or process that is not 'controlled', i.e. energy consumption from systems in the building on which the building regulations do not impose a requirement. This may include energy consumption from operational-related equipment, e.g. computers, servers, printers, laptops, mobile fume cupboards, cooking, audio-visual equipment and other appliances, etc.

D11 Equipment used in the preparation of hot food

All equipment for preparing hot food, i.e. ovens, microwaves, stoves, grills, fryers, pasta cookers, heating cabinets, etc.

Additional information

None

Transport

Summary

This section encourages better access to local services, and to sustainable transport solutions, i.e. public transport and other alternative transport solutions for the building users. The aim of this section is to acknowledge good site choices and adapted transport solutions that contribute to reduced transport needs and therefore less car use and lower CO_2 emissions during the building's life cycle.

Photo: Eirik Skarstein

Category summary table

Issue	Credits	Aim
Tra 01 Transport assessment and travel plan	3	To acknowledge awareness of existing local transport and identify improvements to make it more sustainable.
Tra 02 Sustainable transport measures	Up to 10	To maximise the potential for local public, private and active transportation through the provision of sustainable transport measures appropriate to the site.

Tra 01 Transport assessment and travel plan

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	–	–	–	Crit. 1-5 Crit. 6	Crit. 1-5 Crit.6

Aim

To acknowledge awareness of existing local transport and identify improvements to make it more sustainable.

Fully fitted/shell and core

	Fully Fitted	Shell and core	Shell only
Applicable Assessment criteria	All	All	All
Assessment type specific notes	None	None See appendix D	None See appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into two parts:

- Transport assessment and travel plan (2 credits)
- Travel plan emissions evaluation (1 credit)

Transport assessment and travel plan – 2 credits

1. A site-specific transport assessment and a draft for a travel plan is prepared no later than step 3. It shall be documented that this is part of the basis for the preparation of the development area's layout and built form. See Methodology.
2. The site-specific travel assessment (or statement) shall cover as a minimum:
   a. Travel patterns and attitudes of the site's existing users (or equivalent users) (see Definitions) towards walking, cycling and public transport, if relevant, in order to identify relevant constraints and opportunities for the development.
   b. Evaluation of the existing local environment for pedestrians and cyclists, as well as an account of accessible design (see Methodology) for users and guests.
   c. Reporting of the number and type of existing accessible amenities (see Definitions), from table Tra01-01, within 500 meters of the site.
   d. Calculation of the existing Public Transport Accessibility Index (AI), see Methodology and Definitions.
   e. Current facilities for cyclists, as well as facilities for shared mobility.
   f. Evaluation of the predicted travel patterns and travel impact of the future building or site users.
   g. The site solutions for accessible design (see Methodology).
3. Based on the site-specific transport assessment (in accordance with the requirements set out in criteria 2), a site-specific travel plan shall be developed that provides a long-term management strategy that encourages more sustainable travel. The plan shall include measures to increase or improve more sustainable modes of transport and movement of people, goods, and services during the building's operation (see Methodology).

4. The developer must play an active role in the further development of the drafted travel plan from step 3. If the occupier is known to the developer, they shall be involved in the development of the travel plan.
5. It must be demonstrated that the travel plan will be implemented and supported by the building's management in operation. For residential buildings the travel plan will be implemented and supported by the developer/cooperative management.

Table Tra01-01 Amenities close to the site

Amenities
Appropriate food outlet (see Definitions)
Access to an outdoor open space (see Definitions)
Access to a recreational or leisure facility for fitness or sports (see Definitions).
Publicly available services for mail and goods transport
Community facility (see Definitions)
Pharmacy
Public sector GP's surgery or general medical centre
Childcare facility or school
Bicycle shop or bicycle repair shop

Travel plan emissions evaluation – 1 credit

6. The travel plan shall include quantifiable figures for greenhouse gas emissions related to the transport of people, goods, and services. Reduction of emissions related to measures in criterion 3 must be included.

Methodology

M1 Transport assessment and travel plan

The transport assessment should include information which gives a foundation to conduct greenhouse gas emission calculations, see method M5.

A travel plan is a strategy for handling all travel and transportation needs in an organisation. It contains both physical and behavioural measures to increase choice and limit car dependency by improving access to sustainable modes of transport in one location or development.

BRE Global / NGBC does not have a fixed format for this travel plan, which can be a basic plan or a more complex plan, depending on the building and its operation/use.

See more at https://www.transport-statement.co.uk/

M1.1 Timing of the transport assessment and travel plan

If the transport assessment and draft for the travel plan is carried out late in the process, this can reduce the assessment to a paper exercise, with minimal value for the project. The process has been broken down into steps because there are benefits from conducting such an assessment early in the project.

M1.2 No existing or equivalent users

Where there are no existing or equivalent users for the site or the existing users are not relevant to the mapping, the mapping can be carried out for "equivalent users".

For an assessment where the users/tenants are not known, the project group can assess the potential users towards the list in definition D2 Users, based on their knowledge. Signed lease agreements are not required to evaluate the user types. The list and the data quality can be further detailed as the project develops.

The criteria for site specific transport assessment can be met by using data from a survey for a similar building, with the same type of users, in the same area. If there are no existing surveys with transfer value, a simple mapping of travel patterns and attitudes can be carried out for an existing building in the same area, as a basis for the assessed building. Alternatively, the methodology given in the criteria for Futurebuilt Zero-T vers3.0 for calculating climate gas emissions can be used.

The criteria for green mobility in Futurebuilt Zero-T version 3.0, chapter 5, describes mapping of the current situation for BREEAM. Appendices A and B contain an overview of data for calculating transport needs per building category, location and reference location. The data is, among other things, based on national and regional travel pattern surveys.

M2 Calculation of the Public Transport Accessibility Index (AI)

1. The following information should be collated in order to determine the Public Transport Accessibility Index (AI) of the assessed building:
   a. Distance (m) from the main building entrance (see Definitions) to each compliant public transport node (see Definitions).
   b. Public transport types serving the compliant node, e.g. bus or rail
   c. Average number of services per hour at each compliant node during the operating hours of the building for a typical day (see table Tra01-02 and Methodology below).
2. Use the BREEAM Accessibility Index tool to calculate the AI.

Table Tra 01-02 Default hours of operation by building type on a typical day

Building type	Default hours
Commercial	08.00–19.00
Preschool, Primary, and lower secondary school (see Definitions)	07.30–10.00 / 15.00–17.30
Higher and further education (see Definitions)	08.00–19.00
Healthcare	07.00–20.00 (including visiting hours and typical shift patterns)
Retail: Shopping centre	09.00–21.00
Retail: Supermarket	08.00–22.00
Retail: Service provider	08.00–18.00
Retail: Convenience store	07.00–22.00
Commercial building: Building supplier or retail park	08.00–20.00
Retail: Shop	09.00–18.00
Residential accommodation	08.00–19.00
Court	08.00–15.00
Prison	07.00–20:00 (including visiting hours and typical shift patterns)
Other Buildings	08.00–19.00 (or use the hours above that are best suited to the building type)
Building in 24-hour use	07.00–20.00
Note: These hours are provided as a guideline: Where justified by the project team, different hours can be used. The assessor may accept this based on regional/national culture, customs, or procedures.	

M2.1 Calculating the average number of services

For the AI calculation, the frequency of public transport is the average number of services per hour. This average is calculated by determining the number of services that stop at the node (during the peak arrival and departure times for the typical daytime operating hours of the building, see M2.5 of 'operating hours') divided by the number of hours during that period.

For example, the average number of services for a building that operates between 08:00–19:00 hrs (11 hours) close to a bus stop served by 35 services during this period is 3.2 (equivalent to an average service frequency of approximately 20 minutes).

M2.2 Multiple services

Services that operate from more than one node close to the building, i.e. the same bus serving two separate bus stops, must only be considered once, at the node that is closest to the building. Different services at the same node count as separate services.

M2.3 Bidirectional services

In accordance with the Institute of Transport Economics (TØI) all services are considered unidirectional and should be considered as such for the purpose of calculating the index.

M2.4 Campus or campus-style developments - entrance to consider when calculating the AI

The main entrance to a campus or similar larger shared sites, e.g. site of further or higher education, can be used to determine the distance to a compliant node if 80% or more of the buildings are within 1000 meters of this entrance. If the site has more than one main entrance, either entrance can be used for the calculation.

Where less than 80% of the buildings are within 1000 meters of the campus' main entrance, the assessed building's main entrance must be used to determine the distance to a compliant node. The purpose is to encourage the location of public transport nodes within or close to large campuses.

M2.5 Operating hours on a typical day

A typical day represents the period when commuting to and from the building by its users and visitors will be at its highest. For most buildings this should be taken as a weekday. In choosing a typical day, the assessor should check that the timetable for that day are, within reason, representative of the public transport provision for the entire operating week (excluding Sundays).

BREEAM considers a building's accessibility to be defined by how readily the public transport system can be used by the majority of building users travelling to and from the building. In most cases the normal operating hours of the building can be used. Where shift patterns see the majority of building users (over 80%) arriving or leaving during a certain period, for example an office building where the majority of office workers arrive between 8.00–10.00, that period can be used as an alternative to the operating hours of the building. This accounts for some building types that operate a 24-hour day and on a shift work basis. During typically deemed unsociable hours, where there is little if any public transport operating, such periods do not need to be accounted for in the assessment of this issue.

Where the assessed building operates on a 24-hour basis or the operating hours are unknown at the time of assessment, use table Tra01-02.

M3 Inclusive design

The design team must consider universal design according to NS-EN 17210:2021 Accessibility and usability in the built environment, against chapter 5.3 Key areas for accessibility and usability of the built environment and chapter 6 through 8 in the standard. The design team must justify their choice if other standards are used. The assessment of inclusive design for this issue is limited to outdoor areas and access strategy.

In criteria 2b, the project team must analyse the degree of accessibility in existing neighbouring areas in order to assess which measures are to be implemented to make the area more accessible to all.
In criteria 2g, the design group must, on the basis of criteria 2b, describe a list of measures that are considered implemented in the project that will make the development area more accessible to all.

M4 Travel plan measures

As a minimum, the following measures shall be considered when developing the travel plan:

- Negotiation with local bus, train or tram companies for an increase in the local service provision for the development (see Tra 02 Sustainable transport measures: option 8)
- Provision of a public transport information system in a publicly accessible area (see Tra 02 Sustainable transport measures: option 9)
- Provision of electric charging stations (see Tra 02 Sustainable transport measures: option 11)
- Provision of prioritised parking for car pooling (see Tra 02 Sustainable transport measures: option 12)
- Consultation with the local authority on the state of the local cycling network and on improvements (see Tra 02 Sustainable transport measures: option 4)
- Provision of dedicated and convenient cycle storage (see Tra 02 Sustainable transport measures: option 5)
- Provision of cyclists' facilities (see Tra 02 Sustainable transport measures: option 6)
- Lighting, landscaping and shelter to create attractive pedestrian and public transport waiting areas
- Restrictions or charging for car parking
- Pedestrian and cyclist friendly (for all types of users regardless of level of mobility or visual impairment) with the provision of cycle lanes, safe crossing points, direct routes, appropriate tactile surfaces, good lighting and signposting to other amenities, public transport nodes and adjoining off-site pedestrian and cycle routes
- Provision of suitable taxi drop-off points or waiting areas
- Ensure rural buildings (see Definitions) have appropriate access to transport to serve the local community centre (see Definitions) adequately.

Guidance for preparing a travel plan can be found here:
Statens vegvesen (Norwegian Public Roads Administration):
http://www.vegvesen.no/_attachment/454714/binary/751984?fast_title=Veileder+for+mobilitetsplanlegging.pdf

See Table Tra02-02 for references.

M5 Travel plan emissions evaluation

See methodology from NS 3720:2018 Method for greenhouse gas calculations for buildings part 7.6 operational transport.

<u>Operational transport directly tied to the building's function should not be included in the assessment.</u>

Greenhouse gas emissions shall be calculated for the transport of people, goods, and services. This means that calculations should be based on travel behaviour data (travel patterns, distances, and travel frequency) as well as an estimated need for deliveries of goods and services. Data should be relevant for the future use of the building. If there are no relevant travel behaviour data, a travel behaviour study must be conducted. Guidelines in NS 3720:2018 regarding emission calculations for transport gives a foundation for layout of a travel behaviour study.

The effect of the travel plan measures in criteria 3 should then be calculated. This means that it should be evaluated how the measures affects the need for transport, and thereby the greenhouse gas emissions.

As per today, parts of the foundation needed to conduct such calculations are limited. A goal with criteria 6 is to improve the existing data. If there is not sufficient data to conduct calculations, qualitative evaluations will also be accepted. The evaluations may be conducted individually or combined for multiple measures.

Evidence

Criteria	Design stage	Post construction stage
1 – 2	Documentation showing a site-specific travel assessment. A plan or map specifying the following: location of the assessed building(s) location and type of amenities location of all public transport nodes Safe access routes to amenities and transport nodes Plan/map scale Timetables for each service at each public transport node have been considered. The calculated Accessibility index for the building (Tra 01-calculator). The BREEAM-NOR Assessor Report with completed values.	As design stage Documentation showing how the assessments have affected the development area's layout and form. Assessor's inspection report with photographic documentation showing: the existence of the local amenities and public transport nodes the route and distance to the amenities and public transport notes If the period between design and post construction stage reporting is greater than 12 months, then the AI must be re-calculated using up-to-date public transport timetable information.
3 – 5	Travel plan Documentation showing how the developer and users (if known) are involved in the development of the travel plan	As design stage with as-built data. Assessor's inspection report with photographic documentation showing compliant measures supporting the travel plan are installed.
6	Documentation showing greenhouse gas calculations based on local and specific travel behavioural data or other forms of registrations or travel projections from intended users of the building, or from users of the building. The BREEAM-NOR Assessor Report with completed values.	As design stage with as-built data.

Definitions

D1 Child care or school
Provides child support for potential building users. For example, a nursery, child minding facilities or a school local to the development.

D2 Building users
This refers, as appropriate to building type, to the following:
1. Staff (commuter journeys and business travel)
2. Pupils and students
3. Visitors
4. Patients
5. Customers
6. Community users
7. Personnel delivering and collecting to and from the development
8. Contractors or service providers, who regularly work at and access the building or development
9. Facility management
10. Residents of multi-residential buildings.

D3 Main building entrance
The main building entrance is the entrance to the assessed building that is directly connected to the main building reception, circulation routes, lifts or stairs, and is accessible to most of the building's staff and visitors upon arrival. It is not the site entrance (unless the site entrance is also the building entrance, e.g. building with a boundary on a public highway). For prison or MOD site assessments, the main entrance should be regarded as the gatehouse entrance.

D4 Recreational or leisure facility
A facility that allows building users to exercise and maintain a healthy lifestyle. For example, a local leisure centre, football pitch, on-site gym or, for a school a local playground.

D5 Primary and lower secondary school
Children start primary school at the age of six. The first ten years of schooling is compulsory. After seven years of primary school, pupils progress to lower secondary school. Most schools are run by municipalities and are free of charge.

There are two levels:
- Primary levels: Years 1–7
- Lower secondary levels: Years 8–10

D6 Higher and further education
Higher education is based on upper secondary education or equivalent experience and can be taken at university or college. BREEAM-NOR also includes higher vocational education such as vocational schools.

Higher education is divided as follows:
- vocational school
- yearly study
- bachelor's degree
- master's degree
- professional education
- college graduate
- doctorate (Ph.D.)

– supplementary training, in-service training and post-graduate courses

D7 Accessibility index

An indicator of the accessibility and density of the public transport network at a point of interest (the BREEAM-NOR-assessed building). The index is influenced by the proximity and diversity of the public transport network and the frequency of services at the accessible nodes. The greater the number of compliant nodes, services, and their proximity to the building, the higher the AI. In BREEAM-NOR the AI is calculated using the Tra 01-calculator.

D8 Rural location

A rural location is defined in this context as a site that is clearly not within or on the boundary of a small, medium or large urban area. We use SSB's (Statistics Norway) definition of urban area, and set a limit for urban areas with a total population of 3,000 people. Smaller urban areas rarely have an established downtown area, and have limited services and public transport.

D8.1 Rural location-sensitive buildings

This definition includes any of the building types with a demonstrable social or economic need from a rural population for the service provided by the new building, to an extent that it is not feasible to locate it at an alternative site. Examples of building types that may fall into this category are as follows:

1. Offices where providing services to the local community
2. Industrial where providing services to the local community
3. Retail where providing services to the local community
4. Preschool, primary and secondary school
5. GP's office.

D9 Community centre

A building or internal space that will facilitate community activities for the assessed building and its users. The centre must be owned and operated by a public authority or other body that ensures the physical, social, cultural or intellectual development in the local area. Examples include libraries, senior centres, town halls, churches, multi-purpose halls, park areas and schools.

D10 Appropriate food outlet

Access to a food supply that is affordable to most of the building users as well as being appropriate for their day-to-day needs. For example, a small office building with a small shop selling sandwiches or snacks, or a multi-residential building with a restaurant in the local area.

D11 Compliant transport node

A compliant transport node includes any bus-, tram- or metro service with a stop within 650 meters and any railway station within 1000 meters of the assessed building's main entrance, measured via a safe pedestrian route (not 'as the crow flies'/ in a straight line), but along the actual route. Services stopping at each node must provide transport from, or onward travel to, either an urban centre, major transport node or a community focal point, e.g. doctor's office, library, school or town centre.

Only local services should be assessed and any national or regional public transport services should be excluded from the analysis, unless such services provide a local commuter service.

Prisons and MOD sites: The distance requirement for a compliant node for buildings on these sites is 1000 meters for both bus and rail.

D12 Tra 01 Calculator tool

A spreadsheet-based calculator used to determine the Accessibility Index (AI) for the assessed building. The Tra 01-calculator can be found on NGBC's website under BREEAM-NOR tools.

D13 Accessible amenities

Amenities (as listed) that are accessible via safe pedestrian routes, e.g. pavements, paths and safe crossing points or, where provided, dedicated pedestrian crossing points. The distance should not be measured in a straight line, but along the actual route.

D14 Outdoor space (public or private, suitably sized and accessible to building users)

A large enough and accessible space, either public or private, that enables building users to take a break from internal building activities. For example, an office building with an outside eating area. The area must be suitably sized for the building users associated with the project and not form part of the public highway.

D15 Upper secondary school

Upper secondary education is based on lower primary school and qualifies for employment or further studies. The training is divided into higher education preparatory- or vocational education programmes.

Additional information

None.

Tra 02 Sustainable transport measures

Number of credits available	Minimum standards				
	P	G	VG	E	O
Up to 10	–	–	–	–	–

Aim

To maximise the potential for local public, private and active transport through provision of sustainable transport measures appropriate to the site.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable Assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into two parts:

- Prerequisite: Transport assessment and travel plan (no credits)
- Transport options implementation (up till 10 credits)

Prerequisite: Transport assessment and travel plan – no credits

1. Meet criteria 3-5 in issue Tra 01 Transport assessment and travel plan.

Transport options implementation – up till 10 credits

2 Identify the sustainable transport measures, see Table Tra02-02 (see Methodology).
3 Award credits according to the existing Accessible Index (AI) of the project, and the total number of points achieved

for the options implemented, see Table Tra02-01 (see Methodology).

Table Tra 02-01 Credits available relating to the Accessibility Index (AI) of the site and the number of points achieved from Table Tra 02-02

Number of points that must be achieved based on the assessment options in Table Tra02-02 given the calculated AI			Credits
AI < 25 points	AI≥25 & < 40	AI of ≥ 40 points	
1	1		1
2		1	2
3	2		3
4		2	4
5	3		5
6	4	3	6
7	5		7
8	6	4	8
9	7	5	9
10	8	6	10

Table Tra 02-02 Sustainable public, private and active transport measures

Assessment option	Sustainable transport measures	Applicable building types	Points
	Measures for reduced transport needs		
1	Home office (see Definitions): 1. A home office has been provided within each dwelling with adequate space and services, as follows: a. For dwellings with one or two bedrooms or studio homes, space is provided in the living room, one of the bedrooms or any other suitable area in the home such as a large hall or dining area. b. For dwellings with three or more bedrooms, sufficient working space (as defined below) is provided within a room other than the kitchen, living room or main bedroom c. In all cases, the room is sufficiently large enough for its intended use, i.e., a home office set up in the main bedroom does not prevent the inclusion of a double bed and other necessary furnishings in that room. OR	Residential building	1
	2. A local community office (see Definitions) has been provided within the building site. The community office is large enough to service all the dwellings without them having to have their own home office. A community office should be specified with the facilities given in the definitions. Dwellings without access to a community office should have a home office provided in accordance with item 1 to award 1 point.	Residential building	1
2	Existing amenities: At least three existing accessible amenities (see Definitions) must be present. See Table Tra02-04, where relevant for the Building Group (see Definitions).	All	1
3	Enhanced amenities: 1. Ensure that there is a minimum of one new accessible amenity, in accordance with Table Tra02-04, for the relevant Building Group (see Definitions)	All	2

	OR 2. Ensure that more than one new accessible amenity, in accordance with Table Tra02-04 for the relevant Building Group, is provided.	All	3
	Active travel measures		
4	1. When preparing the brief, the design team must consult with the local authority (LA) on the state of the local cycling network and accessible pedestrian routes, in order to focus on whatever the LA deems most relevant to the project, and how to improve it. 2. One proposal chosen with the local authority should be implemented. The proposal supported by the development is additional to existing local plans and has a significant impact on the local cycling network or on public pedestrian routes open to the public.	All	2
5	Cycle storage: Install compliant cycle storage spaces (see Definitions) to meet the minimum levels set out in Table Tra02-03, see Definitions.	All	1
6	Cyclists' facilities: 1. Option 5 has been achieved. 2. Provide at least two compliant cyclists' facilities for the building users, (including pupils/students where appropriate to the building type) see Definitions for the scope of each compliant facility: – Changing facilities (see Definitions) – Drying spaces (see Definitions) – Lockers (see Definitions) – Showers (see Definitions)	All non-residential	1
	Public transport measures		
7	Existing Accessibility Index: 1. The existing AI calculated in Tra 01 achieves the following: – ≥ 4 for prison or MOD sites, rural location sensitive buildings, and other group 3 buildings. – ≥ 8 for all other building types	All	1
8	Improved Accessibility Index: 1. Demonstrate an increase in the existing AI through negotiations with local bus, train or tram companies to increase the frequency of the local service provision for the development. OR	All	2
	2. Demonstrate an increase in the existing Accessibility Index. This could be through provision of a diverted bus route, a new or improved bus stop, or other similar solutions. OR		3
	3. Provide a dedicated service, such as a bus service (See Definitions).		3
9	Public transportation information system 1. Provide a public transport information system in a publicly accessible area, to allow building users access to up-to-date information on the available public transport and transport infrastructure. This may include signposting to public transport, cycling, walking infrastructure or local amenities.	All	1

	Private transport measures		
10	1. The development is without parking.		2
11	EV charging stations: 1. Establish charging stations for at least 50% of the total project car parking capacity using a dynamic load management system with continuous utilization of the available capacity with a minimum of 2 kW per. charging station.	All	1
12	Carpool: 1. Set up a carpooling group to facilitate and encourage building users to carpool. 2. Raise awareness of the pooling scheme with marketing and communication materials. 3. Provide priority spaces for car poolers for at least 5% of the total caparking capacity for the development. 4. Construct priority parking spaces nearest the development entrance used by the participants of the pooling scheme.	All	1
13	Implement one site-specific improvement measure that is not covered by the options already listed in this issue, in line with the recommendations of the travel plan. Submit this for review by NGBC.	All	1-3

Table Tra 02-03 Cycle storage criteria for each building type (option 5).

Building type	Number of spaces	Notes
Commercial		
Offices, Industrial	1 per 10 staff	None.
Retail		
Retail Large	1 per 10 staff	Use the maximum number of staff at any one time or shift. Provide staff cycle spaces in addition to customer cycle spaces. Separate cycle spaces are encouraged but not essential as long as there is a minimum of 10 customer cycle spaces. Any retail development with at least 50 customer cycle storage spaces is deemed compliant regardless of the number of cycle spaces.
	1 per 20 public car parking spaces	The requirement for staff cycle spaces would still need to be fully met.
Retail Small	4 spaces	Spaces are publicly accessible within proximity of a main building entrance. Compliant cyclist facilities are only needed for staff.
Education		
Preschool	1 per 5 staff	None.
Primary and lower secondary school (see Definition)	1 per 5 pupils and staff	None
Upper secondary schools, further and higher education (see	1 per 5 staff and pupils/students in total	Universities and higher education: student numbers account for both under-graduate and post-graduate students, as well as PhD students and post-doctorate students where such individuals are not counted as staff. Use the sliding scale of compliance to determine the number of cycle spaces if more than 200 people use the building.
Healthcare		
All healthcare building types	1 per 10 staff OR	Use the largest unit of measure for the building type. For example, use beds for a hospital, use consulting rooms for a GP surgery. A minimum of four compliant cycle storage spaces is required. Special healthcare building types, e.g. chemotherapy outpatient centre or maternity ward - for such building types, given the nature of the building's
	1 per 2 consulting	

	rooms or 10 beds	function, cycle storage spaces for “two consulting rooms OR 10 beds” (i.e. those intended for patients and visitors), might be excluded, as it is unlikely that patients and accompanying visitors would be cycling to and from the building.
Courts and prisons		
Prison establishment located building	1 per 10 staff	None.
Law court	1 per 10 building occupants (staff and visitors)	None.
Residential buildings containing		
Individual dwellings	2 spaces per 1 bedroom (up to 2 people)	None.
	2 spaces per 2 and 3 bedrooms (3 – 4 people)	
	4 spaces per 4+ bedrooms	
Student residences, key worker accommodatio	1 per 10 staff	A minimum of one compliant space is required.
	1 per 2 residents	
Sheltered housing, Care homes, Supported living facility	1 per 10 staff	None
	1 per 10 visitors or beds	
Other building transport types (see definitions)		
Type A, see D2	Use office building criteria. The unit of measure for visitors or beds does not apply to hotels.	
Type B, see D2	1 per 10 staff	None.
	1 per 10 visitors or beds	
Type C, see D2	1 per 20 staff	A reduction to the cyclist provision in rural locations has been accounted for in the unit of measure for this mode of transport. It should therefore not be applied again.
	1 per 20 building visitors or beds	
Transport hubs	1 per 10 public users	Apply the sliding scale (see Methodology) to a maximum of 5000 daily public users. Public users are regular peak time users of the service who start or finish their journey on public transport at the assessed building.
MOD non-residential	1 per 10 personnel living off site	These criteria apply to MOD buildings where the majority of personnel live off-site.
MOD residential	1 per 2 residents	None
Where the number of building users (based on the unit of measure) exceeds 200, the sliding scale of compliance can be used to identify the appropriate number of cycle spaces required.		

Table Tra 02-04 Amenities applicable for options 2 and 3 for different Building Groups (BG) (see Definitions).

Criteria	BG 1	BG 2	BG 3	BG 4	BG 5	BG 6
Proximity (metres)	500	500	500	500	500	500
Suitable food outlet (see Definitions)	✓	✓	✓	✓	✓	✓
Access to an outdoor open space (see Definitions)	✓	✓	✓	✓	✓	✓
Access to a recreational or leisure facility for fitness or sports (see Definitions).	✓	✓	✓	✓	✓	✓
Publicly available services for mail and goods transport	✓	✓	✓	✓	✓	✓
Community facility (see definitions)	✓	✓	✓		✓	✓
Pharmacy	✓	✓	✓	✓	✓	✓
Public sector GP surgery or general medical centre			✓		✓	✓
Childcare facility or school	✓		✓		✓	✓
Bicycle shop or bicycle repair shop	✓	✓	✓	✓	✓	✓

Key:
✓ - Amenity relevant to building type.

New amenities may be considered on their own merits, without reference to existing amenities.

Methodology

M1 Calculation of credits

The achievement of credits for this issue is based on the project's calculated Accessibility Index (AI) prior to the implementation of measures. The achieved points using the Accessibility Index-tool determine how many points the project must take in Table Tra02-02 to achieve the desired number of credits.

For example:

The project has calculated an AI of 30 in TRA 01Tra01 criterion 2d. The project implements sustainable transport measures from Table Tra02-02 which gives four points in the Table. The project will then achieve six credits in Tra 02 in accordance with Table Tra02-01.

M2 Campus or campus-style developments - entrance to consider

(options 2,3, 7 and 8 in Table Tra02-02)

The main entrance to the campus, e.g. on further or higher education sites, can be used to determine the distance to amenities, if 80% or more of the buildings are within 1000 metres of this entrance.

If the site has more than one main entrance, either entrance can be used for the calculation.

Where less than 80% of the buildings are within 1000 metres of the campus' main entrance, the assessed building's main entrance must be used to determine the distance to a compliant node. The aim is toencourage the location of public transport nodes inside or on the periphery of the campuses.

M3 Number of building occupants unknown

(option 5 in Table Tra02-02)

If the number of building occupants commuting to the development cannot be confirmed, e.g. speculative developments, use the default occupancy rates given in Table Tra02-05 (see Additional information) to determine a default number of users. Alternatively, the number of building occupants in an existing development of similar type and size can be used (the project team must justify or validate the number used).

M4 Rural locations

(option 5 in Table Tra02-02)

For sites in rural locations (see Definitions):

1. Where the distance to the nearest urban location is greater than 16 kilometres, the number of compliant cycle spaces (see Definitions) can be reduced by 50%.
2. Where the distance to the nearest urban location is greater than 32 kilometres, the number of compliant cycle spaces can be reduced by 70%.
3. Where the distance to the nearest urban location is greater than 48 kilometres, the number of compliant cycle spaces can be reduced by 90%.

The reduction will also reduce the requirement for compliant showers and lockers by the same margin for most building types by default, since the calculation is based on the number of cycle storage spaces. Building types for which the number of required showers or lockers is not based on cycle storage provision can reduce the actual requirement for compliant showers or lockers by 50%, 70% or 90% as appropriate. This reduction cannot be applied in addition to the 50% reduction due to the building's level of Public transport Accessibility (as described in M6).

M5 Cycle spaces reduction

(option 5 in Table Tra02-02)

Sites at which the existing Accessibility Index (AI) indicated in option 7 is met, can reduce the number of compliant cycle spaces by 50%.
This reduction cannot be combined with the sliding scale.

M6 Cyclists' facilities reduction

(option 6in Table Tra02-02)

Sites at which the existing Accessibility Index (AI) indicated in option 7 is met, can reduce the number of compliant cyclists' facilities by 50%.
This reduction cannot be combined with the sliding scale.

M7 Sliding scale of compliance

(option 5in Table Tra02-02)

To recognise the increased confidence in availability that occurs when there is larger scale provision of cyclist's facilities, it is acceptable to reduce the provision requirement for building users by increasing the standard unit of measure (defined in Table Tra02-03):

1. For buildings with more than 200 users but less than or equal to 300 users, the unit of measure can be increased by a ratio of 1.5.
2. For buildings with more than 300 users but less than or equal to 400 users, the unit of measure can be increased by a ratio of 2.
3. For buildings with more than 400 users, the unit of measure can be increased by a ratio of 2.5.

The calculation starts from the first 200 building users, with no ratio, and continues, taking into account the ratio for the remaining building users only.
For example, an office building with 800 users would be required to provide the following number of cycle storage spaces:

- 1–200 users @ 1 space per 10 users = 20 spaces
- 201–300 users @ 1 space per 15 users (standard unit of measure x 1.5) = 7 spaces
- 301–400 users @ 1 space per 20 users (standard unit of measure x 2) = 5 spaces

- 401+ users @ 1 space per 25 users (standard unit of measure x 2.5) = 16 spaces
- Total compliant cycle storage spaces required = 48 spaces.

The sliding scale of compliance does not apply to the following building types: large retail buildings, primary and lower secondary schools, multi-residential buildings and MOD residential buildings.

M8 Minimum cycle storage provision

(option 5 in Table Tra02-02)

Where the calculated number of required cycle storage spaces is less than four, total provision should be based on the lower of the following:

- A minimum of four compliant storage spaces must be provided
  OR
- One space per user (staff and where appropriate other user groups).

M9 Provision of cycle storage and facilities on sites with multiple buildings

(option 5 and 6 in Table Tra02-02)

Where a new or infill building is built on an existing site, or multiple new buildings are to be built on the same site, compliance with this issue may be assessed based on the standalone building or on a site-wide basis. The way in which this is determined depends on the configuration of the proposed cycle storage and cycle facilities. The assessor may use their discretion in the assessment.

M10 Standalone approach

(option 5and 6 in Table Tra02-02)

Cycle storage and associated facilities for the assessed building(s) only:

M10.1 Cycle storage:

- The number of cycle storage spaces is compliant based on the number of users in the assessed building. The sliding scale of compliance can be used (where applicable) when determining the number of storage spaces required.
- All storage spaces provided must be BREEAM-NOR compliant and these must be located within or in close proximity to the assessed building.
- Access arrangements, demarcation and positioning clearly associates the cycle storage provided with the assessed building only, within or in close proximity to the assessed building.
- Access arrangements, demarcation and positioning clearly associates the cycle storage provided with the assessed building only.

M10.2 Cyclists' facilities:

- All new and existing facilities may be included, provided they are BREEAM-NOR compliant.
- Facilities should be located within the assessed building, or in an accessible adjacent building, for the sole use of the assessed building's users.

M11 Site-wide approach

(option 5and 6in Table Tra02-02)

Cycle storage and associated facilities accessible to users of the entire site, or where there is a distinct group of local buildings within a site that would share facilities:

Cycle storage:

- The number of cycle storage spaces is compliant based on the number of on-site users or within a group of local buildings. The sliding scale of compliance can be used (where applicable) when determining the number of storage spaces required.
- All new storage spaces must be BREEAM-NOR compliant. Existing storage spaces may also be counted provided they allow bikes to be easily stored and accessed, as well as securely locked to a fixed structure.

Cyclists' facilities:

- The number of compliant cyclists' facilities is based on the number of on-site users who would be able to use these facilities.
- Cyclists' facilities may be located anywhere on site. However, the total route that cyclists must take to access the nearest cycle storage, cyclists' facilities and building entrances, must not be greater than 100 metres via a safe and convenient route, as measured from the first to the last point on the route. Where possible, different types of cyclists' facilities should be grouped together in designated areas for ease of access and use.
- All new and existing facilities may be included, provided they are BREEAM-NOR compliant and conform to the 100 metre requirement above.

M12 Combination of the two approaches

(option 5 and 6in Table Tra02-02)

A combination of the two approaches can be applied where cycle storage is provided on a site-wide basis and facilities are being met for the assessed building only. However, where the opposite is being proposed (i.e. storage spaces are provided only for the assessed building and facilities are provided on a site-wide basis); the number of compliant cyclists' facilities must be based on the number of on-site users and the facilities must be located in an accessible location in close proximity to the storage spaces.

M13 Phased developments

(option 5in Table 7.4 on page 187)

Where cycle storage cannot be installed during the construction stage, due to phasing work or pending demolition works, compliance may still be demonstrated provided:

- Clarification and justification are given as to why the cycle storage is currently not available.
- A written contractual agreement is in place to provide BREEAM-NOR compliant cycle storage within a clear and justifiable time frame taking into account any related works that could reasonably delay the final installation of facilities relating to the development
- In the meantime, alternative storage is provided that allows bikes to be easily stored and removed, as well as securely locked to a fixed structure.

The methodology above applies to cycle storage only and cannot be applied to the provision of cyclists' facilities that must be assessed as normal.

M14 More onerous requirements

Where local authorities require more onerous requirements than BREEAM-NOR regarding the number of installed cycle storage spaces, these requirements have to be met in order to award credits. The criteria for compliant cycle storage spaces are only relevant to the number of cycle spaces determined in option 5.

Compliant cyclist's facilities are based on the number of compliant cycle storage spaces determined in option 5 only, and not the more onerous requirements.

M15 Public Bicycle sharing systems

Up to 50% of the BREEAM-NOR requirement for cycle racks may be provided by a public bicycle sharing system where it complies with the following:

1. The programme is implemented by the municipality or through a public-private partnership.
2. The system must be open to casual users who wish to use a bicycle for one-way journeys to work, places of education or shopping centres.
3. Bicycles are available at unattended urban locations, and they operate in a manner that could be regarded as 'bicycle transit'
4. Service terminals must be available throughout the city
5. The average distance between service terminals is a maximum of 500 metres in inner city areas.
6. A service terminal is available within 500 metres of the main building entrance.
7. The service terminals do not need to comply with the design requirements listed above.

The number of compliant facilities is calculated based on the total number of cycle racks required. For retail projects, public bicycle racks can also count towards the number of customer cycle racks required.

M16 Car parking

For projects that choose alternative 10, all adjacent or "off-site" public car parks shall be excluded as long as there is no agreement to use such car parks for the assessed building. This means that the extent of the assessment will not be solely limited by the demarcation of the development area.

If users have access to adjacent car parking, this will not comply with the criteria.

The assessed building's permanent parking capacity will form the basis for alternative 11, not just what is within the development area itself. Thus, even if it is on an adjacent site, if a planned future phase is to provide additional parking for the assessed building, this must be included in the calculation at the time of the assessment.

M17 Operational transport

Operational transport directly tied to the building’s function should not be included in the assessment of this issue.

Evidence

Criteria	Design stage	Post construction stage
All	Calculation of the Accessibility Index (AI) Documentation of the options from Table Tra 02-02 are to be implemented. Documentation showing the contractual obligations for the relevant parties to install the designed options OR design drawings for the relevant chosen options. The following should also be included if they are relevant to the selected options: - assumptions and calculations to determine the number of public transport users - consultation documentation and answers /measures in connection with feedback from hearings - marketing materials Documentation on the proximity to amenities in Table Tra02-04	As design stage Assessor’s inspection report with photographic documentation showing that the compliant facilities have been installed. Where changes have occurred since the design stage that could affect compliance, full details of the changes are required in order to demonstrate compliance.

	The BREEAM-NOR Assessor Report with completed values.	

Definitions

D1 Childcare or school
Provides child support for potential building users. For example, a nursery, childcare facilities or school close to the development.

D2 Building classifications
Building Types:

BG 1: Offices, Retail, Industrial, Courts and Prisons
BG 2: Preschool,primary and lower secondary school
BG 3: Upper secondary school, further and higher education
BG 4: Healthcare
BG 5: Multi-residential
BG 6: Other building types

Other building transport type A: A building predominantly occupied by staff or employees with occasional business-related visitors. This includes residential buildings with temporary visitors, e.g. hotels, hostels, training centres where the visitor typically resides for less than one month.

Other building transport type B: A building occupied by a number of core staff or employees with a high volume of consistently frequent visitors or users (either resident or non-resident). This includes secure accommodations.

Other building transport type C: As type B, but building transport types that are specifically required to be located rurally due to their function, i.e. buildings that would never be located in an urban area, e.g. a national park visitor centre.

D3 Dedicated service
The option for the provision of a dedicated bus service is available for any building type with a fixed shift pattern. Examples could include schools, offices, retail, factories, prisons etc. The bus must provide transfer to the local centre of population, public transport interchange or be a door-to-door service.

D4 Recreational or leisure facility
A facility that allows building users to exercise and maintain a healthy lifestyle. For example, a local leisure centre, tennis courts, an on-site gym or, for a school, a local playground.

D5 Primary and lower secondary school
Children start primary school at the age of six. The first ten years of school are compulsory. After seven years of primary school, pupils progress secondary school. Most schools are run by municipalities and are free of charge.

The levels are two levels:

- Primary levels: Year 1-7
- Lower secondary levels: Year 8-10

D6 Home office
There must be a sufficient number of installations that include, as a minimum

- two double sockets

- adequate internet access at the address
- sufficient daylight. Any room intended to be used as a home office must have an average daylight factor as specified in criteria 1-6 in Hea 01
- sufficient ventilation as specified in criteria 2 in Hea 02

D7 Rural location

A rural location is defined in this context as a site that is clearly not within or on the boundary of a small, medium or large urban area. We use SSB's (Statistics Norway) definition of urban area and set a limit for urban areas with a total population of 3,000 people. Smaller urban areas rarely have an established downtown area and have limited services and public transport.

D7.1 Rural location-sensitive buildings

This definition includes any of the building types with a demonstrable social or economic need from a rural population for the service provided by the new building, to the extent that it is not feasible to locate it at an alternative site. Examples of building types that may fall into this category:

1. Offices where providing services to the local community
2. Industrial where providing services to the local community
3. Retail where providing services to the local community
4. Preschool, primary and secondary school
5. GP's office.

D8 Community scenter

A builing or internal space that will facilitate community activities for the assessed building and its users. The center is owned and operated by a public authority or other body and which ensures the physical, social, cultural or intellectual development in the local area. Examples include libraries, senior centers, town halls, churches, multi-purpose halls, park areas and schools.

D9 Appropriate food outlet

Access to a food supply that is affordable to most of the building users as well as being appropriate for their day-to-day needs. For example, a small office building with a small shop selling sandwiches or snacks, or a multi-residential building with a restaurant in the local area.

D10 Local community office

A community office must have the following installations, as a minimum:

- The office must be large enough to accomodate all intended users
- There must be adequate access to sockets for the office's function, use and number of simultaneous users
- There must be adequate access to internet and other relevant office functions
- There must be adequate daylight with an average daylight factor as specified in criterion 2a in Hea 01
- There must be adequate ventilation as specified for office buildings in Hea 02

The community office can also be adapted for multi-functional purposes as long as this does not compromise its main purpose of being an on-site office.

D11 Compliant showers

Compliant showers are defined as those that meet the following:

- Provision of one shower for every 20 cycle storage spaces, subject to a minimum provision of one shower.
- Any building providing nine showers or more shall be deemed as complying regardless of the number of cycle storage spaces provided
- All users must be catered for regardless of gender expression and gender identity, either separate showers in shared facilities (required provision split in 3) or single shower cubicles and gender-neutral changing space for mixed use.

- The showers do not need to be dedicated to cyclists and can be shared with other users.

D12 Compliant changing facilities

Compliant changing facilities are defined as those that meet the following:

- Appropriately sized for the likely or required number of users. The assessor should use their judgement to determine whether the changing area is appropriately sized given the number of cycle storage spaces or showers provided. See SINTEF Building Research Design Guides, 379.205 Wardrobes for employees and for the public for indicative dimensioning.
- Changing facilities are located near the bicycle parking or main entrance. The project team shall give their judgment to justify the appropriate placement.
- The need for privacy, for all users, must be taken into account in changing rooms.
- Changing areas must include adequate space and facilities to hang or store clothing and equipment while changing or showering, e.g. bench seat or hooks
- Toilets or shower cubicles cannot be regarded as compliant changing facilities.

D13 Compliant lockers

Compliant lockers are defined as those that meet the following:

- The number of lockers is at least equal to the number of compliant cycle spaces required
- Lockers are in or adjacent to compliant changing facilities, where provided
- The lockers are sized appropriately for the storage of a cyclist's equipment.

D14 Compliant cycle storage spaces

Compliant cycle storage spaces are defined as those that meet the following:

- Cycles can be locked to cycle racks with overhead covering.
- The cycle racks are set in or fixed to a permanent structure (building or hardstanding) or alternatively, may be located in a locked structure fixed to, or part of, a permanent structure with appropriate CCTV.
- At least 30% of the cycle racks are adapted for all types of bicycles.
- The distance between each cycle rack, and other obstructions, e.g. a wall, must allow appropriate access to the cycle storage space for easy storage and access to bikes.
- The storage facility or entrance to the facility must be in a prominent location visible to potential users from either an occupied building or the main access point to a building.
- The cycle storage facility has adequate lighting; demonstrated by meeting the lighting criteria in BREEAM-NOR issue Hea 01 Visual Comfort.
- The lighting must be controlled to avoid out-of-hours use and operation during daylight hours, when there is sufficient daylight in or around the facility.
- There must be an arrangement in place for washing road salts, etc., off bicycles by at least one of the project's cycle storage spaces. This must be available for all users and visitors during the building's opening hours.
- There must be an arrangement in place for servicing bicycles and pumping tyres

D15 Compliant drying spaces

A compliant drying space is defined as an area that is specifically designed and designated for this purpose. It should be provided with suitable finishes, adequate heating and ventilation and the option to hang wet clothes that can be sufficiently aired in order for them to dry effectively.

Examples of non-compliant spaces:

- Plant rooms: these are not specifically designed for the purpose of drying and their use as a drying space may create a health and safety hazard.
- Coat hooks in cloakrooms or staff changing areas: these are not specifically designed and are unlikely to provide adequate ventilation or allow a sufficient flow of air to dry clothing effectively.

D16 Retail type – small

Includes smaller retail units or shops that may form part of a wider retail or business district, city, town centre, or mixed-use sites, and typically do not have the scope to provide their own dedicated cyclists' facilities.

D17 Retail type – large

Includes large retail developments, such as shopping centres, retail parks and supermarkets, which typically will have covered or uncovered parking, or external areas, and therefore the scope to provide their own dedicated cyclists' facilities.

D18 Higher and further education

Higher education is based on upper secondary education or equivalent experience and can be taken at university or college. BREEAM-NOR also includes higher vocational education such as vocational schools.

Higher education is divided as follows:

- vocational school
- yearly study
- bachelor's degree
- master's degree
- professional education
- college graduate
- doctorate (Ph.D.)
- supplementary training, in-service training and post-graduate courses

D19 Accessible amenities

Amenities (as listed) that are accessible via safe pedestrian routes, e.g. pavements, paths and safe crossing points or, where provided, dedicated pedestrian crossing points. The distance should not be measured in a straight line, 'as the crow flies', but along the actual route.

D20 Outdoor space (public or private, suitably sized and accessible to building users)

A large enough and accessible space, either public or private, that enables the building users to take a break from internal building activities. For example, an office building with an outside eating area. The area must be suitably sized for the building users associated with the project and not form part of the public highway.

D21 Upper secondary school

Upper secondary education is based on lower primary school and qualifies for employment or further studies. The training is divided into higher education-preparatory or vocational education programmes.

Additional information

Table Tra02-05Default occupancy rates by building type

Building type and function area	Occupant density
Business	
Office area (including reception areas)	0.111
Food preparation area (staffed)	0.108
Small workshop or category lab space	0.050
Industrial	
Food preparation area	0.213
Industrial process area	0.050
Laboratory	0.050
Reception	0.110

Warehouse storage	0.050
Generic office area	0.108
Hospitals, care homes	
Reception	0.152
Post Mortem facility	0.050
Food preparation area	0.161
Physiotherapy studio	0.200
Bedroom unit	0.105
Laundry	0.117
24-hours consulting or treatment areas	0.070
Assembly areas or halls	1.000
Hydrotherapy pool hall	0.100
Industrial process area	0.124
Laboratory	0.080
Operating theatre	0.125
Classroom	1.000
Diagnostic imaging	0.100
Generic ward	0.175
Office and consulting area	0.195
Primary Healthcare	
Reception	0.110
Office and consulting areas	0.082
Upper secondary school, Further and Higher Education	
Residents' bedrooms	0.120
Classroom	0.203
Food preparation area	0.096
Hall, lecture theatre or assembly area	0.202
Computer laboratory	0.231
Laboratory	0.106
Laundry	0.105
Reception	0.112
Workshop – small scale	0.068
Office and consulting areas	0.103
Hotels	
Bedroom	0.050
Food preparation area	0.108
Reception	0.105
Generic office area	0.106
Secure Residential Institution	
Cell	0.190
Reception	0.121
Hall, lecture theatre or assembly area	0.183
Eating and drinking area	0.141
Workshop – small scale	0.048
Laundry	0.086
Classroom	0.183
Office and consulting areas	0.093
Food preparation area	0.111
Libraries, Museums, Galleries	
Reception	0.095
Food preparation area	0.176

Hall, lecture theatre or assembly area	0.150
Laboratory	0.098
Workshop – small scale	0.062
Display and public areas	0.150
Generic office area	0.099
General Assembly and Leisure, Clubs, Theatres	
Dry sports hall	0.047
Fitness studio	0.132
Fitness suite or gym	0.170
Food preparation area	0.131
Hall, lecture theatre or assembly area	0.175
Auditorium	0.341
Ice rink	0.225
Performance area (stage)	0.049
Public circulation areas	0.241
Reception	0.126
Sales area – general	0.102
Swimming pool	0.163
Workshop – small scale	0.067
Generic office area	0.116
Community scenters or Day Centres	
Reception	0.108
Dry sports hall	0.047
Food preparation area	0.143
Workshop – small scale	0.064
Hall, lecture theatre or assembly area	0.169
Office and consulting areas	0.106
Other Spaces and Buildings	
Data centre	0.096
Server room	0.096
Heavy plant room	0.096

1. The net floor area for each function must be multiplied by the equivalent occupant density to determine an overall occupancy for the function area.
2. Not all potential building areas are listed, only those required to reflect the estimated building occupancy for the building type. For example, an office building may have a canteen but it will be the staff who predominantly use the canteen. Office staff numbers will be estimated using the default occupancy rate for the office area. Thus, the inclusion of the canteen would result in the occupancy rate being counted twice.
3. If a building type is not listed, occupancy rates for a similar building type or function area may be used.
4. The above occupancy rates have been sourced from the activity database of the Simplified Building Energy Model (SBEM), v.5.4a.

Water

Summary

This category encourages sustainable water use in the operation of the building and its site. Issues in this section focus on identifying means of reducing potable water consumption (internal and external) over the lifetime of the building and minimising losses through leakage.

Category summary table

Issue	Credits	Aim
Wat 01 Water consumption	5	To reduce the consumption of potable water for sanitary use in new buildings through the use of water efficient components and water recycling systems.
Wat 02 Water monitoring	1	To reduce the consumption of potable water in new buildings through the effective management and monitoring of water consumption.
Wat 03 Water leak detection and prevention	2	To reduce the impact of water leaks that may otherwise go undetected
Wat 04 Water efficient equipment	1	To reduce water consumption by encouraging the specification of water efficient equipment.

Wat 01 Water consumption

Number of credits available	Minimum standards				
	P	G	VG	E	O
5	–	–	–	Crit. 1–3 (2 credits)	Crit. 1–3 (2 credits)

Aim

To reduce the consumption of potable water for sanitary use in new buildings through the use of water efficient components and water recycling systems.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	Not applicable
Assessment type specific notes	None	see refs. 1.0 and 1.1 see Appendix D	see ref. 1.2 See Appendix D

Assessment type specific notes	
1.0	Components to be included as a minimum: – WCs – Wash hand basin taps – Showers – Urinals – Kitchen taps: kitchenette If the developer is not installing some of these components, use the baseline values for any unknown components. All water-consuming components and greywater or rainwater systems (see Definitions) specified and installed by the developer must be assessed. Components not listed above and located within tenant areas that are not specified by the developer, but will be specified by the tenant, do not need to be assessed. In cases where the end client is known and makes a commitment to specify and install specific water-consuming components, assess the issue based on the relevant information.
1.1	For components not specified and installed by the developer (i.e. they are not within the remit of the shell and core developer and will be provided as part of the fit-out works) a green fit-out agreement (see Attachment D) that is contractually required from the tenants in their fit-out works can be used for documentation for criteria 1-3. This rule applies only to those areas of the building that the scope of the green fit-out agreement covers.
1.2	Wat 01 is not applicable to Shell only assessments. No credits will be awarded.

Building type specific notes

Building type specific notes	
2.0	**Healthcare:** Components in clinical areas (see Definitions) may be omitted. Furthermore, in some cases, the use of water efficient fittings and appliances may not be appropriate to the needs of the patient, and inappropriate specifications may adversely affect the incidence and propagation of infections. In such instances, the assessor will need to confirm with NGBC whether components from the relevant building areas are exempt.

Building type specific notes	
	The design team should also consult FHI (Norwegian Institute of Public Health) guidelines concerning the appropriate selection of sanitary fittings and fixtures and the control of Legionella.
2.1	**Health care** In cases where none of the water components and fittings can be assessed on the basis of clinical requirements, the minimum standard is not applicable. Specialist assisted baths in care homes or similar specialist applications can be excluded from the assessment of this issue.
2.2	**Extensions** Where a project under assessment contains none of the specified components, the performance specification for components provided in facilities in an adjacent and accessible building must be used in the calculation, i.e. those facilities most likely to be used by the occupants of and visitors to the assessed building. This also applies where a project under assessment solely comprises an extension to an existing building, i.e. where the extended building contains no new sanitary facilities because there are facilities in the existing building.
2.3	**Residential buildings** Use “Other Building type Calculator” Where the developer does not specify or install all relevant components or systems, see note 1.0. The minimum standards are still applicable. Where the resident installs all their own components or systems, no credits can be achieved, and the minimum standards are not applicable. Note that the issue will not be filtered out.

Assessment criteria

This issue is split two parts:

- Water efficient components (Up to five credits)
- Exemplary level: Highly water efficient components (one credit)

Water efficient components – up to 5 credits

1. Use the BREEAM Wat 01 calculator (see Definitions) to assess the efficiency of domestic water-consuming components. The water consumption (litres/person/day) for the assessed building should be compared against a baseline performance. Award BREEAM credits based on Table Wat01-01. For some building types, an alternative method of assessment must be used. See Methodology and the Wat 01 calculator

Table Wat 01-01 BREEAM-NOR Credits available for percentage improvement

No. of BREEAM-NOR credits	Improvement
1	12.5%
2	25%
3	40%
4	50%
5	55%
Exemplary level criteria	65%

2. To achieve 2 credits or more, the requirements for water consumption in the EU Taxonomy for sustainable finance (see Definition and Methodology) must be met.
3. The efficiency of the following water consuming components must be included in the calculation where specified. The Wat 01 calculator defines the building types and activity areas for which the following components must be assessed (see Methodology):
   a. WCs

b. Urinals
c. Taps including wash hand basins and, where specified, kitchen taps and waste disposal units
d. Showers
e. Baths
f. Dishwashers (domestic and commercial sized)
Washing machines (domestic and commercial/industrial sized)

4. If a greywater or rainwater system (see Definitions) is specified for repurposing water, its yield in litres/person/day can be used to offset potable water demand from components and be included in the calculation of the building's total water demand. See Methodology.
5. All greywater or rainwater systems specified and installed must comply with:
a. Greywater systems: BS 8525-1:2010 Greywater systems – Part 1 Code of Practice. BSI 2021.
b. Rainwater systems: NS-EN 16941-1:2018 On-site non-potable water systems – Part 1: Systems for the use of rainwater.
6. For healthcare building types only: The flushing control for each WC or urinal must be suitable for operation by patients with frail or infirm hands or must be activated by electronic sensors.
7. For Prison building types only: Sanitary components specified within a prison cell must have a volume controller (see Definitions) specified on the individual fittings or water supply to each cell.

Exemplary level criteria: Highly water efficient components – 1 credit

8. An exemplary performance credit can be achieved if:
   a. Criteria 1 to 5 are achieved, and additionally 6 or 7 if relevant
   b. The water consumption (litres/person/day) for the assessed building achieves the 65% improvement described as exemplary performance in table Wat01-01.

Methodology

M1 Water efficient components

M1.1 General

Where a project under assessment contains none of the specified components, the performance specification for components provided in facilities in an adjacent and accessible building must be used in the calculation, i.e. those facilities most likely to be used by the occupants and visitors of the assessed building.

M1.2 Water-consuming components – data requirements

For each component type, the appropriate data must be collected from the manufacturers' product information to complete the assessment.

Table Wat 01-02 Data requirements for each domestic component type

Domestic component	Data requirements
WCs	Actual maximum flush volume or, where dual flush, effective flush volume (see Definitions and separate Methodology) in litres/use.
Urinals	For single-use flush urinals: flush volume in litres/use. For cistern-fed systems: cistern capacity in litres.
Taps (sanitary and kitchen)	Flow rate of each tap, at full flow rate in litres per minute measured at a dynamic pressure: - high pressure (Type 1) taps: 3 -0/+ 0.2 bar (0.3 -0/+ 0,02 MPa) - low pressure (Type 2) taps: 0,1 -0/+0,02 bar (0.01 -0/+ 0,002 MPa) The flow rate at the lower pressure of 1.5 -0/+ 0.2 bar is ≥ 60% of the maximum available flow rate. This is also relevant where the flow rate has to be lower than 6 L/min.

Domestic component	Data requirements
	Relevant standards: NS-EN 817:2008 Sanitary tapware – Mechanical mixing valves (PN 10) – General technical specifications NS-EN 200:2008 Sanitary tapware – Single taps and combination taps forwater supply systems of type 1 and type 2 – General technical specifications. The effect of any reductions achieved with flow restrictions shall be included.
Showers	The flow rate of each shower at the outlet measured at 38˚C ± 1 ˚C in litres per minute measured at a dynamic pressure: - high pressure (Type 1) taps: 3 -0/+ 0.2 bar (0.3 -0/+ 0,02 MPa) - low pressure (Type 2) taps: 0,1 -0/+0,02 bar (0.01 -0/+ 0,002 MPa) The flow rate at the lower pressure of 1.5 -0/+ 0.2 bar is ≥ 60% of the maximum available flow rate. This is also relevant where the flow rate has to be lower than 6 L/min. Relevant standards: Sanitary tapware – Shower outlets for sanitary tapware forwater supply systemss of type 1 and type 2 – General technical specifications.
Baths	Capacity to overflow in litres. Taps on baths should not be included in the calculations as the water consumption from bath taps is taken into account in the use factor for baths. The calculation of water consumption for baths assumes 40% of the capacity to overflow. This is to reflect that: - Users tend not to fill the bath to overflow - The user's will have a displacement effect on the actual volume of water required for a bath.
Dishwasher	Litres/cycle for domestic applications or appliances or litres/rack for commercial applications or appliances.
Washing machine	Litres/use for domestic applications or appliances or litres/kg for commercial applications or appliances, e.g. in hotels.
Waste disposal unit	Flow rate in litres/minute.

M1.3 Effective flush volume

The volume of water needed to clear the toilet pan and transport any contents far enough to avoid blocking the drain. The effective flush volume (see Definitions) of a single flush WC is the volume of water used for one flush. The effective flush volume of a dual flush WC is the ratio of full flush to reduced flush. This is taken to be one full flush for every three reduced flushes for non-residential buildings and one full flush for every two reduced flushes for residential buildings/areas.

The effective flush volume can therefore be calculated as follows, using a 6/4L dual flush (6 litres for a full flush and 4 litres for reduced flush) volume WC as an example:
Non-residential: {(6L x 1) + (4L x 3)}/4 = 4.5L effective flushing volume
Domestic: {(6L x 1) + (4L x 2)}/3 = 4.67L effective flushing volume

The differing ratio between non-residential and domestic buildings reflects the different patterns of user behaviour between these building types.

Where buildings have both domestic and non-residential function areas, the calculations should be conducted accordingly for the WCs specified in the relevant spaces. For example, in a hotel building, for WCs in hotel rooms, the 'domestic' effective flush volume calculation should be used and for WCs in staff areas and common areas, the 'non-residential calculation should be used.

M1.4 Water consumption calculation for push and automatic shut-off taps

For input into the Wat 01 calculator, the water consumption of push and automatic shut-off taps should be calculated using the following steps:

Step 1: Calculate the water consumption per person per use.

If a tap runs for less than 20 seconds per activation, assume it will be activated twice per person for the timed duration. For example, for a tap with a flow rate of 9 litres/min and a 15-second usage duration, the water consumed per person would be: 9 x 15/60 x 2 = 4.5 litres/min.

If a tap runs for 20 seconds or more per activation, one activation per person should be assumed for the timed duration. For example, for a tap with a flow rate of 9 litres/min and a 20-second usage duration, the water consumed per person would be: 9 x 20/60 x 1 = 3 litres/min.

Step 2: Multiply the water consumption figure per person by 1.5 and enter this figure into the calculator tool.

Multiplying by 1.5 adjusts the consumption figure to compensate for the typical non-timed tap use of 40 seconds that has already been taken into account in the tool. Taking the first example above, 4.5 litres/min x 1.5 = 6.75 litres/min., when this is used in the tool as the flow rate specification, the consumption is 4.57 litres/person/day, which more closely reflects the true level of water consumption of the push tap.

M1.5 Flow rates for click taps present

The flow rate for click taps shall be taken as the maximum flow rate, as quoted by the manufacturer, of the lower range before the water break or 'click'.

M1.6 Components not included

Water fittings used for a process-related function, e.g. low level ablution taps, laboratory/classroom taps, scrub up taps, cleaners' sinks etc., should be excluded from the assessment of regulated water consumption.

Only kitchen taps and taps used for general hygiene washing are to be included in the assessment of regulated water consumption.

M1.7 Wat 01 calculator methodology

The BREEAM Wat 01 calculator determines a figure for whole building water consumption from domestic scale components and some non-residential components, e.g. taps, washing machines and dishwashers in food preparation areas. This figure is derived from the actual component specification and default component usage factors for a range of building users/types.

The BREEAM Wat 01 calculator contains data for component use and building occupancy rates, which are used to calculate the water consumption for the building, given the specified fittings. It is not expected that these rates would change appreciably between assessed buildings within the same building type. However, if there is robust data available on component usage and building occupancy rates that relate to the assessed building, and the data are appreciably different to the figures currently used, please contact NGBC with detailed information. Subject to peer review of the data, it may be possible to amend the Wat 01 calculator to include the relevant data for that assessment (and thus result in a more accurate reflection of the modelled water consumption for the building).

The BREEAM water efficiency calculation includes an allowance for fixed water use. This includes water consumption for vessel filling (for building user drinking water), cleaning in kitchens and food preparation in buildings with a catering facility. Fixed uses are included to provide greater accuracy in reporting the building's overall estimated water consumption. As these uses are fixed for both the actual and baseline building models, their totals do not influence the achievement of BREEAM credits.

One of the following methods should be used to determine the building's water efficient performance:

- Standard approach for common building types
- Alternative method for other building types

See additional methodology for buildings with a mix of different functional areas.

Each method is summarised below.

M1.8 Standard Wat 01 method

This method uses the building's actual component specification and default usage patterns for the building type and its activity areas to determine water efficiency (measured in litres/person/day and m³/person/year) for a building. The modelled output is compared with the output for a baseline component specification and the water demand saving determined as a percentage improvement. The percentage improvement determines the number of BREEAM credits achieved.

The calculator assesses whether the components meet the EU Taxonomy for sustainable finance requirements (see Definitions). To achieve 2 credits, the minimum requirements must be met. See Table Wat 01-03 for an overview of the levels of water required to achieve the taxonomy requirements. Answer “Yes” to questions on the EU Taxonomy to achieve credits.

The baseline component specification is equivalent to the water efficiency of industry standard components and regulations for technical requirements (TEK), see Table Wat 01-03. The BREEAM-NOR percentage improvement benchmarks are based on several published sources (see Additional information) and reflect the robust levels for normal, good, best and exemplary practice. For the higher levels of performance, the specification of greywater and rainwater systems is required.

For Norway, precipitation zone 1 in the Wat 01 calculator should be used.

The standard approach is the default method for calculating the water efficiency of the assessed building. It is used for most of the common building types for which usage data are available. For building types for which usage data are not available, the standard approach cannot be used. An alternative approach to compliance described below must be used instead.

This applies even in cases in which the Wat 01 Excel calculator tool includes a section for a broader building type, but the defined activity areas do not match the specific project under assessment. For example, although the Wat 01 calculator includes a retail calculator, bars and restaurants should be assessed using the alternative calculation method, as no relevant data are available for specific activity within retail.

Refer to the Wat 01 calculator for building types that can currently be assessed using the standard approach.

Table Wat 01-03 Water efficient consumption levels by component type

Component	**Performance levels (quoted numbers are minimum performance requiredto achieve the level)**						
	Base	1	2	3	4	5	Unit
WCs	6*	4.5	4	3.75	3.5*	3	Effective flush volume (litres) (see Definitions)
Wash hand basin taps	10	8	6*	5	3.75	3	litres/min
Showers	12	10	8*	6	4	3.5	litres/min
Baths	200	180	160	140	120	100	litres
Urinal (2 or more urinals)	7.5	6	3	1.5/ 2*	0.75	0	litres/bowl/ hour
Urinal (1 urinal only)	10	8	4	2*	1	0	litres/bowl/ hour
Urinals with citerne systems	1	1	1	1	1	1	Maximum flush volume (litres)

Component	Performance levels (quoted numbers are minimum performance requiredto achieve the level)						
	Base	1	2	3	4	5	Unit
Greywater and rainwater system	0	0	0	25	50	75	% of WC or urinal flushing demand met using recycled non-potable water (see Definitions)
Kitchen taps: kitchenette	10	8	7	6*	5	5	litres/min
Kitchen taps: restaurant (pre-rinse nozzles only)	10.3	9	8.3	7.3	6.3	6	litres/min
Domestic sized dishwashers	17	13	13	12	11	10	litres/cycle
Domestic sized washing machines	90	60	50	40	35	30	litres/use
Waste disposal unit	17	17	0	0	0	0	litres/min
Commercial sized dishwashers	8	7	6	5	4	3	litres/rack
Commercial or industrial sized washing machines	14	12	10	7.5	5	4.5	litres/kg

* minimum requirements according to the EU Taxonomy for sustainable finance.
For WCs: 6 litres for single flush. 3.5 litres for dual flush

Specifying components for a building in accordance with the above levels might result in the corresponding number of BREEAM credits being achieved. However, the component specifications above are akin to thresholds between each level. Thus, caution should be exercised when defining a component specification for a BREEAM-assessed building using identical levels as the threshold levels. It is recommended that, where Wat 01 credits are being targeted, the performance of a particular building's component specification is verified using the BREEAM Wat 01 calculator before committing to a particular specification and ordering or installing components. This will provide greater assurance that the component specification will achieve the targeted number of BREEAM credits.

As the methodology and BREEAM credits for water efficiency compare the building's modelled water consumption performance against the performance of a baseline specification for the same component types, where a component type is not specified, it is not accounted for in the methodology, i.e. the component is excluded from both the proposed and the baseline building. Thus, no benefit is gained in terms of BREEAM performance by deciding not to specify a particular component. However, the methodology will reflect the reduction in overall water consumption (litres/person/day) for the building, as a result of not specifying a particular component.

Where multiple fittings are specified with various flow rates, e.g. three makes of tap with differing flow rates, the flow rates for each type of fitting will need to be determined and the average flow rate for the sanitary component using the BREEAM Wat 01 calculator.

If the component is present in the building but the appropriate data are unavailable from the manufacturer's product information, i.e. it uses a different unit of measurement, then the baseline performance level for the specified component should be used in the WAT 01 calculator. This might be relevant for commercial sized dishwashers.

M1.9 Buildings with a mix of different functional areas

For the majority of buildings using the standard Wat 01 method, the BREEAM Wat 01 calculator defines the building type and range of different water-consuming activity areas within that building. For example, a retail development may contain a sales area and goods storage or an office building may include a canteen and gym. However, when carrying out a single assessment of a building or development comprising a range of activity areas or building types, each one of which can be assessed separately with the calculator, the following applies:

The building's total water consumption should be determined by carrying out separate assessments for each relevant activity area or building type. Upon completion of all individual assessments, the assessor will need to determine the percentage improvement as follows:

$$I = 100 \times \left[1 - \frac{(T_{1Act} \times T_{1Occ}) + \ldots + (T_{nAct} \times T_{nOcc})}{(T_{1Base} \times T_{1Occ}) + \ldots + (T_{nBase} \times T_{nOcc})} \right]$$

Where:
I = Overall improvement (%)
Tn_{Act} = modelled net water consumption (litres/person/day) for each building type
Tn_{Base}= modelled baseline water consumption for the corresponding building type
Tn_{Occ} = total default occupancy rate for the corresponding building type

Where greywater or rainwater systems are specified, the project team should take care to avoid unintentional double counting of the yield from such systems and use it to offset demand for each activity area or building type.

M1.10 Alternative Wat 01 method

Where it is not possible to use the standard approach to determine the building's total water consumption (litres/person/day), the assessment can be completed on an elemental basis, as follows:

1. The list of applicable domestic-scale water-consuming components should be used to determine those components that are specified or present in the assessed building.
2. The actual specification for each component type should be compared with the table of water efficient consumption levels by component type in Table Wat 01-03 to determine the level of performance for each type. Note that the volumes quoted are maximum volumes for that level and the % WC or urinal flushing demand is the minimum volume for that level.
3. Each component's level of performance should be defined in the "Other building type calculator" worksheet of the BREEAM Wat 01 calculator.
    a. For the alternative approach, the calculator applies a building type specific weighting to each component level to reflect its 'in-use' consumption relative to the other components present. Thus, a component with high 'in-use' water consumption has a larger weighting than one with lower 'in-use' consumption and contributes relatively more to the building's overall level of performance under this BREEAM issue.
    b. The weightings are derived from data on actual water consumption per day from non-residential buildings, sourced from BNWAT22[1]. They can be found in the BREEAM Wat 01 calculator.
4. Based upon the performance categorisation of each component type and the component weighting, the calculator will determine an overall level of performance and award the relevant number of BREEAM credits as follows:

Table Wat 01-04: Using the alternative Wat 01 method – credits available

	Credits	**Greywater and rainwater level achieved**	
Overall component level	–	4	5
Baseline	0 credits	1 credit	2 credits*
Level 1	1 credit	2 credits *	3 credits
Level 2*	2 credits	3 credits	4 credits
Level 3 or 4	3 credits	4 credits	5 credits
Level 5	4 credits	5 credits	5 credits

* To achieve 2 credits, the EU Taxonomy for sustainable finance must be met.

Note:
1. An innovation credit for exemplary level performance can be awarded where the component specification achieves level 5 and >95% of WC or urinal flushing demand is met using recycled non-potable water.

[1] BNWAT22: Domestic water consumption in domestic and non-domestic properties (version 1.). Market Transformation. Programme, 2007

2. Achieving a specific overall component level does not necessarily mean that an equivalent number of credits is awarded. The levels are not directly linked to the improvement percentages and the greywater and rainwater levels achieved also have an influence.
3. Due to the use of the weightings, the overall component level achieved will not necessarily be a whole number, e.g. component level 4. Where this is the case, the methodology will always round down to the nearest component level and therefore BREEAM credits level, e.g. if the component specification achieved is 3.6 credits, the actual number of credits awarded will be 3 credits (the methodology will not round up to 4 credits because the performance specification for 4 credits has not been achieved).
4. Where the assessed building development has multiple specifications for the same water-consuming component type, the number of fittings and component level achieved for each specification can be entered in the 'Other building type calculator'. Using this information, the calculator will determine the building's aggregated performance level for that component type.
5. Compliance with the EU Taxonomy for sustainable finance must be documented separately.

Please note: while attempts have been made to align the benchmarking of both methodologies described above, they determine performance in different ways. The number of BREEAM-NOR credits awarded by each method could therefore differ for the same water component specification. This could lead to variation in the credits achieved when applying the BREEAM-NOR New Construction to a number of different building types that form part of the same overall development.

M1.11 Other permissible sources of non-potable water

The focus of this BREEAM-NOR issue is the performance of the building's permanent domestic-scale water-consuming components. Where a greywater or rainwater system is specified, the yield from the system should be prioritised for such uses, i.e. WC or urinal flushing.

However, where the building demonstrates that it has other consistent (i.e. daily) and equivalent levels of non-potable water demand, and such demands are intrinsic to the building's operation, it is then permissible for the demand from these non-residential uses to be counted, i.e. the demand for rainwater or greywater yield from such systems or components can be used as well as, or instead of, non-potable water demand from the building's WC or urinal components. Examples of consistent and intrinsic demands could include laundry use in hotels or residential institutions, or horticultural uses in garden centres, botanical gardens and golf courses. Demand for general landscaping and ornamental planting irrigation are not considered as equivalent or intrinsic demands by BREEAM-NOR.

The methodology allows for the collection and recycling of non-potable water from the relevant components listed in the criteria, i.e. taps, showers, baths and dishwashers or washing machines. In addition, where non-potable water is collected from a non-residential component or source that are intrinsic to the building, then the amount collected can be accounted for in the methodology. This could include, for example, wastewater from active hygiene flushing, i.e. a regular hygiene flushing programme to minimise poor water quality in a potable cold or hot water system. In order for the method to account for this total, the design team will need to confirm the yield from the component or system (in litres) and the frequency of that yield (in days), i.e. if once a week, the frequency would be 7 days.

M1.12 Greywater and rainwater system data

The following information is required where a greywater and/or rainwater system is specified:

Rainwater in accordance with NS-EN 16941-1:2018 (A.2.1 basic approach):

1. Collection area (m^2).
2. Yield co-efficient, a coefficient (%) to recognise that some rainwater is lost due to splashing, evaporation, leakage and overflow, etc. This coefficient will vary depending on the surface from which the rainwater is collected.
3. Hydraulic filter efficiency, a coefficient (%) to recognise the efficiency of a hydraulic filter.
4. Annual rainfall (average mm/year).

   OR

   Rainwater in accordance with NS-EN 16941-1:2018 (A.2.2. detailed approach):

5. Daily rainfall collection (L) calculated in accordance with credible and verifiable national or local data, e.g. a regional, national or international meteorological organisation, data source or equivalent.

Greywater in accordance with BS 8525-1:

1. Manufacturer or system designer details.
2. The percentage volume of wastewater collected (and re-used) from the following (where relevant): wash hand basins, showers, kitchen basins, dishwashers, baths, washing machines and sources of wastewater from non-residential components.

Where greywater and/or rainwater systems are specified, a minimum level of component efficiency must be achieved to award 4 or 5 BREEAM credits and the exemplary level credit. This is to avoid awarding a higher number of BREEAM credits where the performance of less efficient fittings is offset by the specification of a greywater and/or rainwater collection system, the intention being to ensure demand reduction is prioritised over offsetting consumption.

- Where a greywater/rainwater system is specified/installed, the component specification must achieve a percentage reduction in water consumption (over the baseline specification) equivalent to that required for 2 credits, i.e. a 25% improvement.
- Where this level is achieved, all of the total water demand met by greywater/rainwater sources can contribute to the overall percentage improvement required to achieve BREEAM credits. If it is not achieved, the percentage of greywater/rainwater allowable will be equivalent to the percentage improvement in water consumption achieved for the component specification (i.e. percentage improvement on baseline performance).
- For example, if only a 20% improvement is achieved, and the building consequently does not meet the 25% requirement, then only 20% of the water demand met via greywater/rainwater sources can be used to offset water consumption from 'domestic scale' water consuming components.
- This minimum requirement does not apply where only 1, 2 or 3 credits are sought or where no greywater/ rainwater system is specified, i.e. the percentage improvement is based solely on the water efficiency of the 'domestic scale' water consuming components.
- BRE Global may allow some exemptions to this rule in instances where a particular fitting type requires a high flow rate due to specialised end-user requirements, and its specification prevents compliance with the 25% improvement level.

Evidence

Criteria	Design stage	Post-construction stage
All	A confirmation / obligation from the developer to calculate the water consumption using the calculator and a target water consumption for the relevant appliances. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for the relevant parties to calculate the water consumption using the calculator and achieve the target water consumption for the relevant appliances. -------------- OR 1. A completed copy of the BREEAM-NOR Wat 01 calculator. 2. Documentation confirming technical information for the relevant sanitary equipment including any collection systems for rainwater and greywater. The BREEAM-NOR Assessor Report with completed values.	An updated copy of the BREEAM-NOR Wat 01 calculator. Documentation confirming technical information for the relevant sanitary equipment including any collection systems for rain and greywater. Assessor's inspection report and photographic evidence showing that equipment in accordance with the specifications has been installed, (where it is possible to inspect). The BREEAM-NOR Assessor Report with completed values.

Definitions

D1 Potable water

Water suitable for human consumption taken from a connection to the mains water supply to the building, which may be from the public water supply or from a private supply such as from groundwater via a borehole. The water must meet the requirements of Regulation concerning water supply and water intended for human consumption.

D2 Effective flush volume

The volume of water needed to clear the toilet pan and transport any contents far enough to avoid blocking the drain. Effective flush volume for dual flush water closets with different water volume must be calculated separately. See Methodology for calculating effective flush volume.

D3 EU Taxonomy for Sustainable Finance

A common classification system that determines which activities can be defined as sustainable. This includes minimum water consumption requirements for a number of components. These minimum requirements should be entered in the Wat01 calculator.

D4 Greywater systems

The appropriate collection, treatment and storage of domestic wastewater (which is defined as water discharged from kitchens, baths or showers, laundry rooms and similar) to meet a non-potable water demand in the building, e.g. WC flushing, or other permissible non-potable use on the site of the assessed building.

D5 Domestic-scale water-consuming components

Includes water consumed (potable and non-potable) by internal building components including kitchen taps, wash hand basin taps, baths, showers and dishwashers, WCs, urinals, washing machines and waste disposal units.

Note: This definition can be applied to residential and non-residential building types.

Water fittings used for a process related function, e.g. low level ablution taps, laboratory / classroom taps, scrub-up taps, cleaners' sinks etc., should be excluded from the assessment of water consumption for sanitary use.

D6 Non-potable water

Any water other than potable water, also referred to as *unwholesome water*. See "Potable water".

D7 Clinical areas

Clinical areas refers to all areas with a scrub up trough, clinical sink or clinical basin. Areas of the building in which medical functions are carried out that require specific restricted environmental conditions such as humidity, daylighting, temperature etc. (e.g. x-ray, operating department, delivery room, etc.). This is not an exhaustive list and guidance should always be sought from an appropriate professional to ascertain areas of exemption specific to infection control and other considerations. Appropriate professionals could include a health authority infection control officer or a client infection control representative or equivalent.

D8 Rainwater systems

The collection and storage of rainwater run-off from outdoor surfaces to meet a non-potable water demand in the building, e.g. WC flushing, or other permissible non-potable use on the site of the assessed building.

D9 Volume controller
An automatic control device used to turn off the water supply once the maximum pre-set volume is reached within a defined period.

D10 Wat 01 calculator
The BREEAM Wat 01 calculator is a tool for the assessment of water efficiency in the most common building types. The calculator assesses the contribution of each water-consuming component from Table Wat 01-03 on the building's total water consumption. The calculator and additional guidance can be found at byggalliansen.no.

Note: The calculator is a compliance tool and not a design tool for water demand and drainage systems. The tool uses default usage and occupancy rates to provide a benchmark of typical consumption based on the specified fittings (in litres/person/day and m^3/person/year) and their impact on the building's overall water consumption. Due to the impacts and differences of actual user behaviour and occupancy rates, the results of the method will not directly reflect actual water use during building operation. The results from the methodology should therefore not be used for the purpose of comparison with or prediction of the actual water consumption of a building.

Additional information

T1 European Water Label Scheme: Water efficiency label
The European Water Label is a scheme initiated by bathroom manufacturers across the globe and provides a database of bathroom products of different levels of water efficiency. It includes products made by multiple European bathroom manufacturers and can help project teams identify products appropriate for their specifications.

T2 Useful guidance
The following list of documents may be useful:

- BRE Global. SD129: Certification and listing of low flush WC appliances. 2008.
- BS 6465-3:2006. Sanitary installations. Code of practice for the selection, installation and maintenance of sanitary and associated appliances. BSI; 2006.
- Communities and Local Government. Waterwise: Water efficiency calculator for new dwellings [Internet]. 2009. Available from: www.waterwise.org.uk
- Entec UK Limited. BD 2683: Assessing the costs and benefits of improvements to the water efficiency of new non-household buildings – final research report. Department for Communities and Local Government; 2010.
- Environment Agency. Conserving water in buildings: a practical guide. 2007.
- Market Transformation Programme. BNWAT07: Baths – water efficiency performance tests (version 2.0). 2007.
- Market Transformation Programme. BNWAT23: Reliability of information on water consumption of appliances (version 1). 2007.
- Market Transformation Programme. Sustainable products 2006: policy analysis and projections. Defra; 2006.
- Waggett R, Arotsky C. CIRIA W10 Key Performance Indicators for water use in hotels. CIRIA; 2006.
- Waggett R, Arotsky C. CIRIA W11 Key Performance Indicators for water use in offices. CIRIA; 2006.
- Water UK. Waste macerators – the impact on sewers: 2009.
- BRE Global. SD175: Certification and listing of water efficient baths. 2008.
- Water efficient product labelling scheme: www.water-efficiencylabel.org.uk

T3 Rainwater systems and other systems

Rainwater recycling or harvesting can co-exist with and provide a good supplement to other water sources and utility systems, thus relieving pressure on other water sources. Rainwater harvesting can reduce storm drainage load and flooding in city streets.[2] The system can be designed to maximise water collection during extreme events, contributing to a reduction in runoff, which is recognised in BREEAM-NOR issue LE 08.

[2] UNEP, An Environmentally Sound Approach for Sustainable Urban Water Management: An Introductory Guide for Decision- Makers

Wat 02 Water monitoring

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	–	–	–	–	–

Aim

To reduce the consumption of potable water in new buildings through the effective management and monitoring of water consumption.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	1 and 3–4
Assessment type specific notes	None	see ref 1.0 See Appendix D	None See Appendix D

Assessment type specific	
1.0	Demonstrate compliance with criterion 2 for water-consuming plant or building areas identifiable by the developer. Do not assess water-consuming plant or building areas to be added or installed by the tenant. Where no water-consuming plants are installed by the developer, the credit is awarded based on the remaining criteria.

Building type specific notes

Building type specific notes	
2.0	For healthcare buildings and sites with multiple departments, e.g. large health centres or emergency hospitals, fit separate sub-meters to the supply to the following areas, where present: - Staff and public areas, except small local staff areas located in departments as the occupancy level of these areas is likely to reflect that of the department - Clinical areas (see Definitions) and wards - Letting areas: to the water supply to each tenant unit - Laundries - Main production kitchen - Hydrotherapy pools - Laboratories - Central sterile supply department (CSSD), hospital sterilisation and disinfection unit (HSDU), pathology, pharmacy, mortuary and any other major process water use - Supplementary supply of water from a cold-water tank.

Assessment criteria

This issue comprises of one part:

- Water meter (one credit)

Water meter – 1 credit

1. The specification of a water meter on the mains water supply to each building; this includes instances where water is supplied via a borehole or other private source.
2. Relevant water-consuming plants or building areas are fitted with either easily accessible sub-meters or have water monitoring equipment integral to the plant or area. See Methodology.

3. Each meter (main and sub) has a pulsed or other open protocol communication output to enable connection to an appropriate utility monitoring and management system, e.g. a building management system (BMS), for monitoring water consumption. See Definitions.
4. If the site on which the building is located has an existing BMS that is managed by the same occupier or owner as the new building, the pulsed or digital water meters for the new building must be connected to the existing BMS. See Definitions.

Methodology

M1 Water meter

M1.1 Relevant water-consuming plant or building area

As a minimum, this includes the following, where present:

1. Buildings with a swimming/therapy pool and associated changing facilities (toilets, showers, etc.)
2. On sites with multiple units or buildings, e.g. shopping centres, apartment blocks, industrial units, retail parks, etc. separate sub-meters are fitted to the water supply to the following areas, where present:
   - Each individual occupancy unit/ dwelling supplied with water. For residential institutions with self-contained dwellings: each dwelling/apartment
   - Common areas, also covering the supply to toilet blocks
   - Service areas, also covering the supply to outlets in storage, delivery, waste disposal areas, etc.
   - Ancillary or separate buildings (see Definitions) to the main development with a water supply
3. Laboratory: in any building with a laboratory (or containing laboratories), a separate water meter is fitted to the water supply to any process or cooling loop for plumbed-in laboratory process equipment
4. Other water-consuming plants or building areas consuming 10% or more of the building's total water demand

Other examples where sub-meters will also be required include:

1. Tenanted areas of large developments.
2. Laundries.
3. Main kitchens.
4. The water supply to any process or cooling loop for 'plumbed-in' laboratory process equipment.
5. Any other facility with major water use.

Where a simple deduction calculation based on water meter readings will determine the water use for a function or area, it is not necessary to specify/install a meter for this use.

M1.2 Relevant plants and areas exempted from the sub-metering requirements

The sub-meter requirement does not necessarily apply to the following cases, in which the assessor confirms that there will be no additional monitoring benefit resulting from their installation:

1. Where a building has only one or two small sources of water demand, e.g. an office with sanitary fittings and a small kitchen.
2. Where the building has two sources of water demand, one significantly higher than the other, and the water consumption for the higher demand is likely to mask the lower demand.

This must be documented with calculations showing the expected water consumption and distribution of water demand between the different sources.

M1.3 No new water supply installed

If no new water supply is to be installed because the occupants of the extended building will use the facilities within, and therefore water supply to, the existing building, then the following must be provided in the existing building:

1. A water meter for the mains water supply
2. Sub-meters for large water-consuming plant or facilities, e.g. evaporative cooling, swimming pool, etc. (where present).
3. The meters provided must have a pulsed output or connection to the existing BMS in accordance with the assessment criteria.

Evidence

Criteria	Design stage	Post-construction stage
All	Documentation showing an overview of the necessary meters and sub-meters, including relevant calculations and documentation of the possibility of real-time readings. A confirmation/ obligation from the developer that such a requirement will be made. Applies in those cases where the relevant party is not selected. ------------- OR Documentation showing the contractual obligations for the relevant parties to design and install the meters -------------- OR Documentation of the projected location and/or specifications for the meters AND Manufacturers' product information and/or documentation showing that relevant criteria are met.	Assessor's inspection report with photographic evidence showing that the meters are installed, where it is possible to inspect. As-built technical and systems drawings and specifications showing that the planned meters and sub-meters have been installed. Documentation showing that the meters have been connected to the BMS, where relevant. Must be able to document at least two weeks of complete registration, meaning that all meters have submitted data and the system has generated graphical representations of energy consumption, etc.

Definitions

D1 Utility monitoring and management system
Examples include automatic meter reading systems (AMR) and building energy management systems (BEMs). Automatic monitoring and targeting (AM&T) is an example of a management tool that includes automatic meter reading and data management.

D2 Clinical areas
Areas of the building in which medical functions are carried out that require specific restricted environmental conditions such as humidity, daylighting, temperature, etc. Relevant areas include x-ray, operating department, delivery room, etc.

D3 Staff areas
Areas of the building used mainly by staff, e.g. offices, meeting rooms, staff rooms. This also includes medical areas where patients are admitted but that do not require restricted environmental conditions, e.g. consulting rooms, physiotherapy, etc.

D4 Meter outputs
Examples include pulsed outputs and other open protocol communication outputs, such as Modbus.

D5 Ancillary buildings
Providing necessary support to the primary activities or operation of the main building.

Additional information

None.

Wat 03 Water leak detection and prevention

Number of credits available	Minimum standards				
	P	G	VG	E	O
2	–	–	–	–	–

Aim

To reduce the impact of water leaks that may otherwise go undetected.

Fully fitted/Shell and Core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	1–2	1
Assessment type specific notes	None	See ref 1.0 and Appendix D	See ref 1.1 and Appendix D

Notes for fully fitted/ shell and core	
1.0	Shell & core: Assess the water supply to WC areas or facilities as per criterion 2 regardless of whether or not the WC areas or facilities are fitted out.
1.1	Shell only: Criterion 2 and 3 are not relevant.

Building type specific notes

Building type specific notes	
2.0	Health care This issue does not apply to toilet facilities in clinical areas. See Definitions.
2.1	Short and long-term residential accommodation: Flow control devices in WC areas or facilities are not required for facilities in the residential areas of long-term residential accommodation. This is due to the fact that those occupants have a sense of ownership and would identify and report a potential leak. This applies to the following: ensuite facilities in individual bedrooms, a single bathroom shared between several individual bedrooms, e.g. in halls of residence, or one single bathroom in an independent dwelling e.g. a care home. The requirement for flow control devices still applies to the rest of the facilities in long-term residential accommodation. Where WC facilities are only provided within the residential areas of a long-term residential accommodation assessment for example, there is no staff WC, the credit is filtered out of the assessment. However, for short-term accommodation, the credit still applies to buildings that have guest bedrooms with ensuite facilities, for example, hotel rooms and communal WC areas or facilities, communal WC facilities in hotels and hostels.
2.2	Short-term residential institutions such as hotels Compliance with criterion 2 for WC facilities in hotel rooms can be achieved by providing the required flow control devices to groups of 10 rooms, rather than to each individual room.
2.3	Single dwellings Criterion 3 only applicable
2.4	**Extensions to existing buildings** If the water supply to the new extension is via the existing building, then the water supply to the existing building must be assessed against the criteria of this issue

Assessment criteria

This issue is split three parts:

- Leak detection system (one credit)
- Flow control devices (all buildings except residential) (one credit)
- Leak isolation (residential only) (one credit)

Leak detection system – 1 credit

1. A leak detection system which is capable of detecting a major water leak on the mains water supply in the building and between the building and the utilities' water meter. See Methodology. The leak detection system must be:
    a. A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks
    b. Activated when the flow of water passing through the water meter or data logger is at a flow rate above a pre-set maximum level for a pre-set period of time
    c. Able to identify different flow rates and therefore leakage rates, e.g. continuous, high or low level, over set time periods
    d. Programmable to suit the owner's or occupiers' water consumption criteria
    e. Where applicable, designed to avoid false alarms caused by the normal operation of large water-consuming plant such as chillers

Flow control devices (all buildings except residential) – 1 credit

2. Flow control devices that regulate the supply of water to each WC area or facility (see Definitions) according to demand are installed, and therefore minimise water leaks and wastage from sanitary fittings. See Methodology. The following control device types are acceptable:
    a. A time controller, i.e. an automatic time switch device to switch off the water supply after a predetermined interval
    b. A programmed time controller, i.e. an automatic time switch device to switch the water on or off at predetermined times
    c. A volume controller, i.e. an automatic control device to turn off the water supply once the maximum pre-set volume is reached
    d. A presence detector and controller, i.e. an automatic device for detecting occupancy or movement in an area to switch water on and off once the presence has been removed
    e. A central control unit, i.e. a dedicated computer-based control unit for an overall managed water control system, utilising some or all of the types of control elements listed above.

Leak isolation (residential only) – 1 credit

3. Isolation valves are located in an accessible place that allows hot and cold water to be isolated by hand separately, meaning switched on or off for the following types of supply (see Methodology):
    a. Incoming supply to the dwelling
    b. Taps
    c. Showers
    d. Heating or hot water systems
    e. Appliances, e.g. dishwasher, washing machine, etc.

Methodology

M1 Scope of this issue

M1.1 Water supply to all buildings and all water systems

The criteria apply to the water supply to all buildings that fall within the scope of the assessment. This includes all water systems, including emergency systems such as sprinklers.

M1.2 No water supply to the building or unit.

These credits are still assessed where there are no installed fittings and therefore no water supply to the building. In such instances, the facilities likely to be used by the future occupants of the assessed building must meet the criteria, e.g. those facilities within the nearest accessible building.

M2 Leak detection system

Where there is no distinction between the site boundary and the building, and the utility meter is located on either the boundary or within the building, the leak detection criteria apply to the mains water supply in the building only.

This issue does not specify what the high and low-level leakage rates should be. However, the leak detection equipment installed must have the flexibility to distinguish between different flow rates to enable it to be programmed to suit the building type and owner's or occupiers' usage patterns.

It is anticipated that the leak detection credit will usually be achieved by installing a system that detects higher than normal flow rates at meters or sub-meters. It does not necessarily require a system that directly detects water leakage along part or the whole length of the water supply system.

Where there is a water utilities' meter at the site or building boundary, it may be necessary to install a separate flow meter, or alternative measurement system, just after the utility meter to detect leaks. However, if the water utility company agrees to some form of leak detection being installed on its meter, this would also be acceptable.

There is no requirement for the leak detection system to shut off the water supply when the alarm is triggered (a constant water supply may still be required for certain systems/operations).

M3 Flow control devices

The intent of the flow control criteria is to prevent minor water leaks occurring in the pipework of WC facilities.
A shut-off on the cold-water supply to the whole WC facility provides a simple and effective way of reducing potential water loss.
Taps that contain built in shut-off valves will not prevent any water leaks from the supply to the tap and so do not fulfil this purpose.

Flow control systems may control combined WC areas, such as male and female toilets within a core. They are not required for each individual sanitary appliance. The criteria are set to encourage isolation of the water supply to each WC block when it is not being used.

The flow control criteria for this issue also apply to facilities that only have a single WC (potentially in smaller or low occupancy buildings). In these instances, shut off could be provided via the same switch that controls the lighting (whether proximity detection or a manual switch).

Light fittings in toilets are often controlled by proximity detection, infra red (IR) movement detectors or sensors placed at entry doors (the latter can be less accurate as more than one person can enter or depart in the opening of one door). The sensors used to control the lighting can also be linked to a solenoid valve in the cold water supply. This will then act as a proximity detection shut-off system.

It must not be possible for the water supply system to automatically switch off the cold water in the showers while the hot water is still running, to avoid scalding from hot water.

M4 Leak isolation

Isolation valves (see Definitions) must be located in an accessible location. This could be within a cupboard or access hatch, where the valve can be accessed without undue hazard or difficulty. The valve should be in close proximity to the appliance or fitting and clearly labelled. Examples of non-accessible locations are behind kitchen units or under floorboards. The valve can be placed in the dwelling's water distribution cabinet, if this is the most appropriate solution.

Evidence

Criteria	Design stage	Post-construction stage
All	A confirmation / obligation from the developer that such a requirement will be made. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for the relevant parties to design and install leakage prevention systems. -------------- OR Documentation of the projected location of and/or specifications for leakage prevention systems. AND Manufacturers' product information and/or documentation showing that the relevant criteria have been met.	Assessor's inspection report with photographic evidence showing that leakage prevention systems have been installed, (where it is possible to inspect). Documentation including drawings showing that leakage prevention systems have been installed according to the criteria and methodology.

Definitions

D1 Clinical areas

Areas of the building in which medical functions are carried out that require specific restricted environmental conditions such as humidity, daylighting, temperature, etc. Relevant areas include x-ray, operating department, delivery room, etc.

D2 Isolation valve

An isolation valve is a valve in a plumbing system that stops the flow of water to a given location for maintenance purposes. This enables the flow of water to a terminal fitting, appliance or whole system (e.g. tap, washing machine, heating system or whole home) to be isolated, thus allowing maintenance or replacement of components or systems.

D3 WC areas or facilities

WC areas or facilities refer to the cold-water supply to taps, WCs and urinals.

Other information

None.

Wat 04 Water efficient equipment

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	–	–	–	–	–

Aim

To reduce water consumption by encouraging the specification of water efficient equipment.

Fully fitted/Shell and Core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	See ref 1.1	See ref 1.0 and 1.1 See Appendix D	see ref 1.0 and 1.1 See Appendix D

Assessment type specific notes	
1.0	Where the only non-domestic scale, non-sanitary water demand comes from an irrigation system specified or installed by the developer, this system should be used to assess compliance.
1.1	Where there is no water demand beyond that of Wat 01, the issue will be filtered out.

Building type specific notes

Building type specific notes	
2.0	In single dwellings with a garden, the provision of a water butt is sufficient to demonstrate compliance with the criteria. No requirements have been stipulated for the type of water butt or storage capacity required. The assessor should be satisfied that, within reason, the installation is adequate for the size of development and climatic conditions of the region.

Assessment criteria

This issue comprises of one part:

- Reduction of water consumption (one credit)

Reduction of water consumption – 1 credit

1. The design team has identified all water demand from uses other than those listed under the definition "Water-consuming components" in Wat 01 that could be realistically mitigated or reduced. Where there is no water demand from uses other than domestic scale, sanitary use components in the building, this issue is not applicable.
2. Systems or processes have been identified that reduce water demand and demonstrate through either good practice design or specification, a meaningful reduction in the total water demand of the building.

Methodology

M1 Reduction of water consumption

BREEAM-NOR does not prescriptively define all potential means of or solutions for reducing water consumption. The design team needs to demonstrate to the assessor that it has identified key areas of water consumption in the building and that a reduction in water consumption has been achieved using existing 'tried and tested' solutions or new innovative solutions relevant to the building and its functional requirements. The water demand for the relevant function should be one of the most important contributors to water consumption on the site.

Below are some examples of solutions deemed to satisfy compliance for outside watering systems.

a) Drip-fed subsurface irrigation incorporating soil moisture sensors. The irrigation control should be zoned to permit variable irrigation to different planting assemblages.
b) Reclaimed or recovered water from a rainwater collection or wastewater recovery system with appropriate storage, i.e. greywater collection from building functions or processes that use potable water, e.g. vehicle wash systems, sanitary facilities, irrigation, etc.
c) External landscaping and planting that solely relies on precipitation throughout the year.
d) All specified planting is restricted to contextually appropriate species that thrive without irrigation and will continue to do so in conditions that will likely result from climate.

M1.2 Microbial contamination

Where vehicle wash systems are specified, the design team must clarify that the installed systems are designed to minimise any risk of Legionella.

Evidence

Criteria	Design stage	Post-construction stage
All	Documentation detailing all water demand from uses other than domestic-scale drinking and sanitary use components, including identification of the most important possibilities for reduction. A confirmation / obligation from the developer that such a requirement will be made. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to design solutions to reduce water consumption. -------------- OR Documentation of the projected location and/or specifications for solutions for reducing water consumption. AND (if relevant) Manufacturers' product information and/or documentation showing that the relevant criteria have been met.	Assessor's inspection report with photographic evidence showing that solutions for reduced water consumption have been installed, (where it is possible to inspect). Documentation including drawings showing solutions for reduced water consumption according to the criteria and methodology.

Definitions

D1 Vehicle wash system

A commercial scale automatic, semi-automatic or manual system for washing vehicles. This includes wheel and chassis wash, fixed gantry and screen wash systems using brushes, spray or handheld jet hoses.

D2 Non-domestic scale, non-sanitary water uses

For the purposes of this BREEAM-NOR issue, non-domestic scale, non-sanitary water uses refer to any building-integrated water uses not assessed under Wat 01. This includes, but is not limited to, the following:

- Swimming pools
- Recreational hot tubs and hydrotherapy pools
- Equipment used for irrigation
- Vehicle wash equipment
- Project-specific industrial processes
- Water filtration and treatment processes
- Building services (e.g. cooling towers and humidification systems)

Additional information

None

Materials

Summary

This category encourages decisions which reduce the environmental and social impact of construction products used on a project. It takes a 'whole life cycle' approach to construction product impacts, encouraging consideration of impacts during manufacture, design, procurement, installation, in-use and end-of-life. The category focuses on construction product efficiency and reuse, environmental impact, responsible sourcing and product durability.

Category summary table

Issue	Credits	Aim
Mat 01 Environmental impacts from construction products – LCA and greenhouse gas calculations	5	To recognise and encourage the use of construction materials with a low environmental impact (including embodied carbon) over the full life cycle of the building.
Mat 02 Environmental impacts from construction products – product requirements	3	To encourage the availability of robust and comparable data on the impacts of construction products through the provision of EPD, in addition to recognising and encouraging the use of building products with low environmental impact over the full life cycle of the building.
Mat 03 Responsible sourcing of construction products	3	To facilitate the selection of products that involve lower levels of negative environmental, economic and social impact across their supply chain, including extraction, processing and manufacture.
Mat 05 Designing for durability and climate adaptation	4	To reduce the need to repair and replace materials resulting from damage to exposed elements of the building and landscape
Mat 06 Material efficency and reuse	3	To promote reuse and avoid unnecessary materials use
Mat 07 Design for disassembly and adaptability	3	To avoid unnecessary material use, cost and disruption arising from the need for future adaptation works as a result of changing functional demands and to maximise the ability to reclaim and reuse materials in future renovation, disassembly or final demolition works.

Mat 01 Environmental impact of construction products - LCA and greenhouse gas calculations

Number of credits available	Minimum standards				
	P	G	VG	E	O
5	Crit. 1- 2	Crit. 1- 2	Crit. 1-2 Crit. 3 (1 credit)	Crit. 1- 2 Crit. 3 (1 credit)	Crit. 1- 2 Crit. 3 (2 credits)

Aim

To recognise and encourage the use of construction materials with a low environmental impact (including embodied carbon) over the full life cycle of the building.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	See ref.1.0 See Appendix D	See ref.1.0 See Appendix D

Assessment type specific notes	
1.0	Shell and core and shell only assessments will potentially not have installed all building elements that are included in the calculation of reference values given in table Mat 01-03. In order to obtain a correct basis of comparison in the percentage reduction of greenhouse gas emissions, adjusted reference values shall be used if building elements described under methodology are not installed. The adjusted reference value can be obtained by NGBC at the request of the assessor. The assessment shall use the reference values in Table Mat 01-03 for the fitted areas of the building and the adjusted reference values for the shell and core/shell only areas of the building.

Building type specific notes

Building type specific notes	
2.0	See Methodology for building specific reference values (kgCO2 eqv./BTA m² year)

Assessment criteria

This issue is split into four parts:

- Prerequisite: early stage greenhouse gas calculation (no credits)
- Reduction of greenhouse gas emissions (up to 3 credits)
- Exemplary level: 60% reduction of greenhouse gas emission (1 credit)
- Life cycle assessment of the building (up to 2 credits)

Prerequisite: Early stage greenhouse gas calculation – no credits

1. The project must carry out an early stage calculation – before the end of step 3 – of the greenhouse gas emissions from materials that the project incorporates into the building according to NS3720:2018. See Methodology for selecting tools and scope.
2. The early stage calculation shall contain alternative assessments and be used as a basis for choosing foundations, designs, solutions and materials with the aim of achieving a low climate impact. If an alternative solution with a lower climate impact has not been chosen, this must be justified.

Reduction of greenhouse gas emissions – up to 3 credits

3. The project must calculate greenhouse gas emissions from materials used in the building in accordance with NS 3720:2018. See Methodology for selecting tools and scope. Points are awarded after achieving a percentage reduction of greenhouse gas emissions (see Table Mat 01-01 below) from building materials compared with a reference value (see Methodology).

Table Mat 01-01: Percentage reduction of greenhouse gas emission and credits awarded

Percentage reduction of greenhouse gas emissions	Credits
20%	1
30%	2
40%	3

Exemplary level: 60% reduction of greenhouse gas emissions – 1 credit

4. The project must calculate greenhouse gas emissions from materials used in the building in accordance with NS 3720: 2018. See Methodology for selecting tools and scope. Greenhouse gas emissions from material used in the building must be reduced by 60% compared to the reference value (see Methodology).

Life cycle assessment (LCA) of the building – up to 2 credits

5. The project must use a pre-approved life cycle assessment (LCA) tool to measure the life cycle environmental impact of the building elements.
6. The LCA must include the mandatory building elements indicated in the 'Materials assessment scope' section of the BREEAM International Mat 01 calculator as a minimum (see Definitions), where present in the building (see Methodology).
7. The mandatory requirements identified in the 'Materials assessment tool, method and data' section of the BREEAM International Mat 01 calculator must be met.
8. A member of the project team uses the BREEAM International Mat 01 calculator to determine a score based on the robustness of the LCA tool used and the scope of the assessment in terms of the elements considered (see Methodology). Credits are awarded according to Table Mat 01-02

Table Mat 01-02 Percentage of BREEAM International Mat 01-calculator and credits awarded

Percentage of BREEAM Int. Mat 01 calculator points (%)	Credits
75	1
85	2

Methodology

M1. Early stage greenhouse gas calculation

Calculations must follow the Norwegian standard NS 3720: 2018 Method for greenhouse gas calculations for buildings. NS 3720:2018 complements and concretises the Norwegian practice for calculating greenhouse gas emissions.

For calculations and alternative assessments, the following must be included:

a. The calculations must be conducted in step 3.
b. The calculation must include, as a minimum, building parts 21, 22, 23, 24, 25 ,26, 28 and 47 according to NS 3451:2022 – Table for building elements.
c. The calculation must include, as a minimum, modules A1–A3, A4, A5 (materials only), B2 and B4. For A4, the distance from the place of production to the location of the building shall be used as a basis. Guidance values from Table Mat 01-03 may be used.

Table Mat 01-03 Indicative values for transport distance from production site to construction site

Transport distance category	Distance (km transported by lorry)	Typical materials categories
Local	50	In-situ concrete, asphalt,
Pre-cast concrete elements	200	Pre-cast concrete elements
Norway/Nordics	500	Wood products, plasterboard
Europe	2,000	Plastic, imported steel products

d. If the values for data quality level 1 according to NS 3720:2018 are not available in the early stage calculation, the generic values of data quality level 2 can be used.
e. If the service life of construction products is not specified by the manufacturer in a 3rd party product- specific EPD, the technical service life of the software used for greenhouse gas calculations can be used. Alternatively, the technical service life specified in Building Research series 700.320 – Intervals for maintenance and replacement of building parts – can be used.
f. If the developer has not stated a required service life (see Chapter 6.2.3 in NS 3720:2018) a calculation period of 50 years shall be used.

Regarding alternative assessments, the design team, together with an environmental consultant or BREEAM-NOR AP, must see what the assessment can influence and what is already decided Examples of alternatives could include the geometry of the building and the strategy for technical facilities.

Where building part 47 is building integrated, it should still be assessed as building part 47, not the building part it constitutes.

M2. Reduction of greenhouse gas emissions

M2.1 Percentage reduction of greenhouse gas emission

The following applies to the greenhouse gas calculations that are used to document reductions of a certain percentage compared to the reference value:

a. Estimates should be made throughout the design process as a basis for decisions, but the final documentation must be created after final solutions and product selections have been made (Construction stage).
b. The calculation must include building parts 22, 23, 24, 25, 26 and 28 in NS 3451:2022. Note that building parts 21 and 47 should not be included.
c. The calculation must include modules A1–A3, A5 (materials only) A4, B2 and B4.
d. The calculation shall be based on products that have actually been selected and, as far as possible, shall be based on information from the EPD on production emissions (A1–A3) for the selected products (data quality

level 1 according to NS 3720; 2018, where possible). For A4, the distance from the place of production to the location of the building shall be used as a basis. Guidance values from Table Mat 01-03 may be used.

e. If the service life of construction products is not specified by the manufacturer in a 3rd party product- specific EPD, the technical service life specified in Building Research series 700.320 – Intervals for maintenance and replacement of building parts – can be used.
f. A calculation period of 50 years shall be used to compare greenhouse gas emissions from materials to reference values in Table Mat 01-04. If reference values for FutureBuilt projects are used (Table Mat 01-05), a calculation period of 60 years shall be used.

Climate impact related to material use in building part 21 shall be included in the early stage greenhouse gas calculation for material use, but not in the assessment of reduction of greenhouse gas emissions. Due to considerable uncertainty related to what can be regarded as standard ground conditions, material use in building part 21 is not included in the reference values listed in M2.2, which is used as a starting point for documenting a percentage reduction.

Building part 47 in NS 3451:2022 should not be included in the assessment of reduction of greenhouse gas emissions. Where building part 47 is building integrated, it should still be assessed as building part 47, not the building part it constitutes.

According to NS3720:2018 and NS-EN 16485:2014, the uptake and release of biogenic carbon must be reported in the module where uptake/release takes place. NS 3720:2018 also states that if information from an EPD is used that only contains uptake of biogenic carbon in A1, and data for emissions are not available, uptake in A1 shall be disregarded. Because module C is not to be included in the accounts for greenhouse gas reduction, and it is therefore not possible to include emissions of biogenic carbon in module C, biogenic carbon shall be treated in accordance with the principle of immediate oxidation (GWP-IOBC/GWP-GHG)

M2.2 Reference values

For assessment of greenhouse gas reductions, reference values (kgCO2 eq./BTA m2 year) given in table Mat 01-04 Reference values for each building type should be used. Collected for modules A1 – A3, A4, A5 (materials waste only) B2 and B4.

The reference values are based on the work undertaken in relation to the report *Klimavennlige byggematerialer. Potensial for utslippskutt og barrierer mot bruk* (Enova, 2020). In this study, reference values are proposed for greenhouse gas emissions from material use. The values are calculated based on model buildings for the most common building types, adjusted to represent a national average with consideration to solutions and available materials.
The reference values were revised in 2023, in line with revision of reference values used by the Norwegian Agency for Public and Financial Management for greenhouse gas emissions from materials in buildings.

Table Mat 01-04 Reference values for each building type

Building type	Reference values (kgCO2 eqv./BTA m² year)
Multiple dwellings	7.4
Office	6.6
Education	6.0
Retail	5.7
Care home	6.7
Heated basement	5.3
Unheated basement	3.7
Industrial building	See Methodology M2.2.1

For buildings with a function that does not correspond to any of the categories above, a reference value must be used for the category that is considered to be the most similar to the building's function. For buildings that include several of the functions specified above, the reference value must be calculated as a weighted average on the basis of the area distribution (BTA) for each building function.

The reference values do not include ground and foundations (21) or installations for local electric power generation (47).

If necessary, please submit a technical query to NGBC for further guidance about assessing the correct reference value.

M2.2.1 Industrial building

Greenhouse gas emissions for industrial buildings largely depend on the height of the building. It is therefore not correct to give one general reference value for all industrial buildings based on current knowledge and data. The reference value will therefore depend on the building's room height.

To ensure that the correct reference value is used, all projects comprising industrial or warehouse type buildings must submit a technical query with documentation/drawing(s) showing:

- Designed room height in the production-/warehouse room, height from upper edge of ground floor to lower edge of ceiling.
- Planned Built-up area (BYA) of the building. BYA does not depend on the number of floors, half floors or mezzanines

Other areas with other functions, such as office, multiple dwelling, retail or basement, are not included in the BYA or the calculation of room height. These areas must use the reference value for the relevant category in table Mat 01-04 which is considered to be most similar to the area's function. The project must then use methodology M2.2 and calculate the reference value as a weighted average on the basis of area distribution for each building function.

M2.3 Using FutureBuilt ZERO

Projects that use FutureBuilt ZERO version 2.0, dated 14.06.2021, can use this set of criteria and methods to document greenhouse gas emissions in the early stage calculation and achieve a reduction of greenhouse gases in accordance with criteria 1–3 above.

FutureBuilt ZERO follows NS3720:2018 and is to be regarded as more of a scenario of NS3720:2018 in which a defined set of system delimitations and assumptions has been chosen. These have been chosen to challenge the NS 3720:2018 methodology at some key points, such as introducing a more "dynamic LCA" with time weighting of emissions and uptake, as well as technological development including for material production. It has also been chosen to include module D effects, as is the case in the ZEB definitions. The latter means, among other things, that deductions are made in the greenhouse gas emissions for biogenic carbon according to further specified conditions, the potential for reuse and for export of energy (substitution effect).

In FutureBuilt ZERO method note version 2.0, 14.06.2021, the assumptions and “deviations” from NS3720:2018 are explained in detail. The memorandum can be found on FutureBuilt's website: https://www.futurebuilt.no/FutureBuilt-quality criteria.

Projects using FutureBuilt ZERO should only include emission factors for material use. Energy-related emissions are not to be included. This means the following should be included:

- Building part 22, 23, 24, 25, 26, 28
- Module A1-A3, A4, A5, B2-B5, B_{forbr}, C_{forbr}, D_{ombruk}, B_{biog}, B_{karb}
- Energy-related emissions should not be included (applies to A5, B6 and D_{energy})

Reference values are also calculated for projects using FutureBuilt ZERO. This is in order to get a reference value that reflects the scope of the FutureBuilt ZERO methodology, and can be used as a reference for the percentage reduction of greenhouse gas emissions achieved for materials using this methodology. **Note** that the reference values for FutureBuilt ZERO are calculated based on a 60 year calculation period.

Table Mat 01-05 Reference values for each building type for use in FutureBuilt ZERO projects

Building type	FutureBuilt ZERO (kgCO2 eqv./BTA/ year)
Multiple dwellings	7.0
Office	6.0
Education	5.4
Retail	5.3
Care home	6.2
Heated basement	5.0
Unheated basement	3.4

M3. Life cycle assessment (LCA) of the building

M3.1 LCA tool requirements

All tools (and versions of tools) used for LCA must:

1. Meet the mandatory requirements outlined in the BREEAM International Mat 01 calculator.
2. Have the score generated by the BREEAM International Mat 01 calculator and evaluated by BRE Global.

LCA tools for buildings that have been approved by BRE are recognised as suitable for conducting life cycle analyses of buildings for one or more of the credits in this issue. The BREEAM International Mat 01 calculator provides a list of previously submitted tools (by version) and their associated evaluation score.

If the LCA tool is not present in the Mat 01 calculator, the developer of the tool must complete the BREEAM_2013_Mat 01_calculator_Evidence_Template_V1-0, as well as the current version of the BREEAM International Mat 01 calculator. It is possible to download examples of completed forms from the Assessor's Extranet on BRE's website: Home » Extranet » BREEAM International » BREEAM International New Construction 2013 » Assessment Tools » Mat 01 Calculator.

The completed form and Mat 01 calculator must be sent to the assessor who will then forward to the Norwegian Green Building Council, tech@byggalliansen.no. The Norwegian Green Building Council will forward the application to BRE for final approval. Upon approval, the Mat 01 calculator will be updated with the new tool. All new tools are automatically approved for all BREEAM versions.

Where a project team is considering using a LCA tool which has not been previously evaluated by BRE Global (BREG), the assessor should contact BREG providing all information required for the evaluation of the tool. The evaluation process of LCA tools often requires the involvement and issue of evidence by the tool producer or developer.
Life cycle assessment tools that has fewer environmental indicators will get a lower scoring. The tool must include the following environmental indicators:

- Climate impact (CO2 equivalents)
- **AND** at least two other environmental indicators
- **AND** either water or waste treatment

M3.2 Documentation requirements of the LCA results

An electronic data table or tables of results (suitably cross referenced) generated by the tool, submitted by the assessor to the Norwegian Green Building Council, must fulfil the following criteria:

1. Present results for the total environmental impact over the life span in the following way :
   a. Include individual results for all environmental issues or indicators that the tool or data permits, showing issue or indicator names and units used. Where issues or indicators according to NS-EN 15978:2011 are available, these should be used.
   b. Include individual results for each life cycle stage or module, see NS-EN 15978:2011. Where the tool permits, or where complete measurement of the aforementioned stages is not possible, more details should be provided.
   c. The reporting format should be according to NS-EN 15978:2011 (or equivalent).

2. Results for each element must be presented as follows, to enable project team members and assessors without an IMPACT compliant tool to check the accuracy of the model:
   a. Element impact per issue (as above), with units
   b. Element kg kgCO2eqv per life cycle stage or module (as above)
   c. Element quantity, with units
   d. Element description
   e. For each material in the element:
      i. Installed quantities, with units
      ii. Site wastage quantities, with units
      iii. Replacement, repair, refurbishment quantities, with units
      iv. Reuse, recycling or disposal (landfill, incineration) of quantities, with units.
3. Transmitted in IFC, MS Excel or CSV file format.

M3.3 Scope of BREEAM International Mat01 – calculator

The Mat 01 calculator scores points based on the quality of the life cycle assessment in terms of:
1. The quality of the assessment tool or method and data
2. The scope (of building elements) included in the assessment.

In some buildings, not all elements listed in the BREEAM International Mat 01 calculator will be present or specified, e.g. upper floors in single storey buildings. In such instances, the calculator will re-evaluate the standard and exemplary level benchmarks according to the applicable elements.

Evidence

Criteria	Design stage	Post-construction stage
1–2	A confirmation / obligation from the developer that requirements will be made to prepare an early stage greenhouse gas calculation and alternative assessment in accordance with the criteria and methodology. Applies in those cases where the relevant parties are not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to prepare an early stage greenhouse gas calculation and alternative assessment in accordance with the criteria and methodology. ----------------- OR 1. Documentation showing that the greenhouse gas calculation was completed in the early stage, as well as the results of the early-stage greenhouse gas calculation and the alternative assessments and argumentation for the chosen alternative 2. The documentation shall show compliance with the methodology described in NS3720:2018. ----------------- OR The documentation shall show compliance with the criteria and method requirements in FutureBuilt	As design stage. The BREEAM-NOR Assessor Report with completed values.

	ZERO version 2.0, dated 14.06.2021, (see Methodology)	
3-4	A confirmation / obligation from the developer that greenhouse gas reduction targets will be set in the project with requirements to document these in accordance with the criteria and method. Applies in those cases where the relevant parties are not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties to reduce greenhouse gas emissions and document these in accordance with the criteria and method. ----------------- OR 1. Documentation showing the reduction in greenhouse gas emissions 2. The documentation shall show compliance with the methodology described in NS3720:2018 AND The documentation shall show compliance with the criteria and method requirements in FutureBuilt ZERO version 2.0, dated 14.06.2021, (see Methodology)	As design stage, but with as-built data and copies of EPDs used in the greenhouse gas emission calculation AND The assessor's report and photo documentation that confirm that the specified elements are in place (if visible) The BREEAM-NOR Assessor Report with completed values.
5- 8	A confirmation / obligation from the developer that an LCA analysis of the building will be required according to the criteria and method. Applies in those cases where the relevant parties are not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties that a LCA analysis of the building will be completed according to the criteria and method. ----------------- OR Specification confirming: 1. The name and version of the LCA tool used 2. A copy of the LCA tool results/output 3. Information from the tool provider to demonstrate the answers given in the BREEAM International Mat 01 calculator. 4. A copy of the output from the BREEAM International Mat 01 calculator.	As design stage with as-built data. The BREEAM-NOR Assessor Report with completed values.

Definitions

D1 BREEAM International Mat 01 calculator

A spreadsheet-based calculator required to determine whether a project has used an appropriate LCA tool, and to calculate the number of credits achieved for this BREEAM issue, based on the scope and quality of the life cycle assessment and elements considered in the LCA.

Additional information

T1 Material Guidance

The following can be downloaded from www.byggalliansen.no:

Material guide
This guide has been prepared to raise awareness of the impact of materials on the environment throughout the value chain in the context of the requirements of BREEAM-NOR.

Green material guide:
This is a practical and educational overview of the environmental characteristics of a variety of building materials. The green material guide makes it easier to make environmentally friendly choices when planning a construction project. The latest version of the green material guide also contains threshold values that make the process of setting functional requirements for building materials with low greenhouse gas emissions easier.

Mat 02 Environmental impacts from construction products – Product requirements

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	Crit.1	Crit. 1	Crit.1	Crit. 1	Crit. 1

Aim

To encourage the availability of robust and comparable data on the impacts from construction products through the provision of EPD, in addition to recognising and encouraging the use of construction products with low environmental impact over the full life cycle of the building.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	See ref. 1.0 See Appendix D	See ref. 1.0 See Appendix D

Assessment type specific notes	
1.0	For construction products that will be delivered / installed at a later time, and which are not part of the delivery to the developer, a green fit-out agreement (see appendix D) must be used to document fulfilment of criteria 1. This rule only applies to those areas of the building covered by the agreement on green furnishings.

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into three parts:

- Prerequisite: Absence of environmental toxins (no credit)
- EPD for construction products (1 credit)
- Performance requirements for construction products (up to two credits)

Prerequisite: Absence of environmental toxins – no credit

1. The assessment shall have a complete overview of all construction products used in the project. The project management shall ensure follow-up procedures and keep overview updates in line with procurement to ensure the absence of environmental toxins in the building (See Methodology).

EPD for construction products – 1 credit

2. Environmental Product Declarations (EPDs) (see Definition) must be prepared and verified in accordance with the description in the Methodology chapter and must have been obtained for at least 15 different construction products (see Definition) from the product groups specified in Table Mat 02-02 (see Methodology). Each of the products must include at least 25% of the product group's area, quantity or weight in order to be included (see Methodology).

At least three of these 15 EPDs shall be for technical installations in NS 3451:2022 – Building Element Table. Technical installations should be specified at level 3 in parts 3–6 or part 73-74. Remaining EPDs shall be for product groups included in Table Mat 02-02.

Performance requirements for construction products – up to 2 credits

One credit

3. At least 10 products from the product groups in Table Mat 02-02 must comply with at least one of the following:
    - the requirements of ECOproduct Method v5.3 to achieve at least four "green" marks, where one mark is for global warming. The remaining environmental indicators are either green or white
    - requirements for an EU Ecolabel or Nordic Swan Ecolabel in their respective product group

    Of the 10 product groups, at least four of the following five product groups must be included:
    - 231/232, Insulation in outer walls
    - 233/234, Windows/glass facades
    - 235, External cladding
    - 246, Internal cladding
    - 251, Floors

    Each of the products must include at least 50% of the product groups area, quantity or weight in order to be included (see Methodology). The evaluation of indoor climate (emissions) in an ECO product is not relevant for all product groups. For these product groups, it is sufficient to show compliance with the five remaining environmental indicators.

OR

Two credits

4. At least 15 products from the product groups in Table Mat02-01 must comply with at least one of the following:
    - the requirements of ECOproduct Method v.5.3 to achieve at least four "green" marks, where one mark is for global warming. The remaining environmental indicators are either green or white
    - requirements for an EU Ecolabel or Nordic Swan Ecolabel in their respective product group

    Of the total 15 product groups, at least four of the following five product groups must be included:
    - 231/232, Insulation in outer walls
    - 233/ 234, Windows/glass facades
    - 235, External cladding
    - 246, Internal cladding
    - 251, Floors

    Each of the products must include at least 50% of the product groups area, quantity or weight in order to be included (see Methodology). The evaluation of indoor climate (emissions) in an ECO product is not relevant for all product groups. For these product groups, it is sufficient to show compliance with the five remaining environmental indicators.

Methodology

M1 Absence of environmental toxins

The project's overview of construction products must contain the name of the product, manufacturer and associated information that can confirm the absence of environmental toxins. It is recommended that in the early phase of the project, well in advance of production, a system is established that registers construction products with associated product information on an ongoing basis as they are purchased. Examples of service providers that can deliver such systems are CoBuilder or ProsjektDok. Relevant project documentation that must accompany the product is information that confirms the absence of environmental toxins in the product.

Environmental toxins are defined in the following lists:

- The Norwegian Priority list for Chemicals – Norwegian Environment Agency (https://www.miljodirektoratet.no/ansvarsomrader/kjemikalier/prioritetslista/)
- REACH (Registration, Evaluation, Authorisation and restriction of Chemicals) Substances of Very High Concern (The Candidate list) – (https://echa.europa.eu/candidate-list-table)
- REACH Appendix XIV (Authorisation list) – (https://echa.europa.eu/authorisation-list)
- REACH Appendix XVII (Restricted substances) – (https://echa.europa.eu/information-restricted-substances)

Table Mat 02-01: Limit values for environmental toxins

List		Limit value
The Norwegian Priority list for Chemicals	The priority list	≤ 0.1% of weight
REACH SVHC	The Candidate list	≤ 0.1% of weight
REACH Appendix XIV	Authorisation list	Only to be used with authorisation
REACH Appendix XVII	Restricted substances	Limit values as set out in Appendix XVII

M1.1 Documentation

The requirement in this provision is most easily met by using pre-assessed products. In the following labelling schemes and tools, the content of substances that are harmful to health and the environment is pre-assessed:

a. The Nordic Swan Ecolabel/EU Ecolabel
b. ECOproduct Method v5.3 – green in the indicator of health and environmental toxins
c. SINTEF Technical Approval
d. SINTEF Environmental Certificate

If the product in question has not been pre-assessed by a labelling scheme or in a tool, the project must obtain information about the content and assess the type and content of substances harmful to health and the environment.

The following information *can* be used to get an overview of substance content:

a. Safety data sheet
b. Environmental Product Declaration (EPD). In Norwegian, EPDs as of 2012 contains information on substances from REACH's candidate list. In non-Norwegian EPDs, this information is voluntary.
c. CE marked construction products must document the content of substances on REACH's candidate list in a declaration of conformity. NB! CE marking is a European scheme, so the Norwegian Priority list is not considered in this scheme.

If a product's content or composition cannot be documented, a legal representative of the manufacture must provide written confirmation that the product does not contain substances on the priority list or on the above-mentioned REACH list.

Documentation must be valid at the time of purchase.

NGBC has selected construction products from the Green material guide, version 3.1 (https://byggalliansen.no/wp-content/uploads/2020/09/Gronn-Materialguide-v3_1-002.pdf), For these products, documentation showing absence of environmental toxins, must be presented to the assessor. Experience has shown that these construction products contain environmental toxins and are as follows:

- Epoxy coating
- Carpets
- Vinyl
- Cellulose fibre
- EPS/XPS
- Translucent insulation
- Construction timber
- Laminated wood

- Asphalt roofing
- Copper roofing
- Decks (glued)
- Modified wood (covers and cladding)

M1.2 Requirements for procedures and control

The project must document that procedures are in place for checking and documenting the absence of environmental toxins in the building. To ensure that construction products used in the project do not contain environmental toxins, it is important to have good procedures in place at an early stage to follow-up. The project must, as a minimum:

- Describe a system for following up product information that documents the absence of environmental toxins
- Have procedures in place to ensure that building products do not contain environmental toxins before they reach the construction site
- Have procedures in place to ensure that all building products are registered in the system
- Appoint a person responsible for following up any discrepancies in the system
- Have procedures in place for regular random sampling of building products in the project

During the project period, the assessor shall randomly check that the described routines are being followed and that randomly selected construction products on the construction site can be found in the product overview. If any discrepancies are discovered, the auditor and the project must agree on a deadline for the project to rectify/ handle discrepancies and send the necessary documentation to the auditor.

A report shall be prepared from the random check and shall contain the following:

- Date of inspection
- Who participated (name, company, role in the project)
- What routines were examined
- Which building products were selected on the construction site, identified in the product overview and checked

A report from a random check, with any rectification/follow-up of deviations, must be signed by the assessor and attached as documentation for completion.

M1.3 Substitution obligation and notification of deviations

The substitution obligation requires companies that use products containing chemical substances that may damage health or cause environmental disruption to investigate whether any products are available that entail less risk, cf. the Product Control Act § 3a. Businesses must choose an alternative product if this is possible without causing any unreasonable expense or inconvenience. Projects that do not wish to achieve the certification level Excellent or Outstanding *can* submit a non-conformance report if, for technical reasons,it is felt that a product containing one of the undesirable substances must be used in a particular case. The deviation report must comply with the substitution obligation, be signed by the developer and approved by the auditor in order to be valid as an exemption from the minimum requirements in BREEAM-NOR.

For the certification levels Excellent and Outstanding, a non-conformance report cannot be submitted for products containing substances on the above-mentioned lists in REACH. A non-conformance report may be submitted for the substances on The Norwegian Priority list for Chemicals in accordance with the substitution obligation.

M1.4 Products from reuse or material recycling

For building parts or materials that are reused (whether from own buildings or purchased for the project), treated or renovated, the same documentation requirements apply as if the materials were new.

For building parts that are not moved, treated or renovated, it is not necessary to document compliance with the minimum requirements.

M2. EPD for construction products

M2.1 EPD requirements

To be valid, the EPD must fulfil the following:

1. Be product specific
2. Be compliant with EN 15804:2012+A2:2019 Sustainability of construction works – Environmental Products. EPDs that complies with EN 15804:2012+A1:2013 can also be used if valid at the time of purchase.
3. Be approved and published by an EPD programme operator (for example, EPD Norway) and signed by the programme operator
4. Be verified by a third party
5. Contain a unique reference number
6. Include a reference to the product category rule (PCR) that has been used
7. Be valid (unexpired) at the point of order/purchase.

M2.2 Variations in products

It is acceptable for a product in Mat 02 to have variations regarding where it is produced, how it is produced and the source of its constituents, provided that they are determined by the manufacturer and cannot be chosen by the design team or the contractor. If the design team or contractor can choose between such variations, Mat 02 will consider these separate products.

Examples of acceptable variations for a product:

- If the product is produced at more than one production site, but the design team or contractor cannot select the site.
- If the product is manufactured using two different production lines at the same production site, but the design team or contractor cannot select the production line.
- If the recycled content varies, for example between 10% and 15%, but the design team or contractor cannot select the recycled content.

Examples of unacceptable variations for a product:

- The product has different densities that the design team or contractor can choose between.
- The product has different thicknesses that the design team or contractor can choose between.
- The manufacturer has various specific building products that the design team or contractor can choose.

Exceptions are variations that the design team or contractor can choose from, but where the product is still considered one specific product, provided that this is variations in individual products and the manufacturer has not listed them as separate products in their product overview. This is to make it convenient to produce an EPD for product series with different combinations:

- Different colours that the design team or contractor can choose.
- Different decorative patterns that the design team or contractor can choose.
- Bespoke modules/dimensions determined by the design team or contractor and adapted to the design solutions.

M2.3 Calculation of a specific product’s share of a product group

Examples of specific products that comprise at least 25% of a product group's area, quantity or weight:

- Documented interior doors must comprise at least 25% of the total area of interior doors (244 in NS 3451:2022 Table for building elements) and documented interior paint must comprise at least 25% of the total area of surface treatment on interior walls in order to be included among the 15 required EPDs.
- In cases where two or more EPDs together comprise 25% of a product group, they can be considered as one of the 15 required products.
- An EPD that covers an entire building section can be counted as the number of product groups that are physically present in the building section. The requirement of 25% also applies here. For example, an EPD for a complete exterior wall element can count as several EPDs if the component is used in at least 25% of the total exterior wall area. Another example is pre-painted interior wall panels, which cover both surface treatment and interior wall cladding.

- If the same product is used in several building parts, e.g. the same insulation product in the floor as in the inner and outer wall, the EPD for the product must be counted only once. An EPD that contains variations of the same product, e.g. insulation with a different thickness or density, can only be counted once, even if variations of the product have been used in different building elements.
- To verify whether products in technical installations with an EPD comprises at least 25% of the installation's function/ power, the EPD's declared unit must be examined. For example, if kg is a declared unit, weight should be used for the calculation. The weight of the product with an EPD is then calculated against the weight of other materials included in the installation.

Table Mat 02-02: relevant building elements and product groups from NS 3451:2022

Building elements	Level three code	Product groups
Foundations and substructures (21)	213 214 215 216	Ground reinforcement (injection paste, cement/lime/lime cement, etc.) Supporting structures Pile foundation Foundations
Structural frame (22)	222 223 224 225 226	Separate pillars Separate beams Stiffening structures Fire protection Gypsum, etc.
Exterior walls (23)	231 232 231/232 231/232 231/232 231/232 233/234 234 235 236 237	Load-bearing structures Supporting structures, etc. Wind barrier Insulation Vapour barrier Gypsum, etc. Windows/glass façade Doors Exterior cladding Interior surfaces and cladding Sunscreens
Interior walls (24)	241 242 241/242 243 244 244 246	Load-bearing structures Half-timbered, supporting structures, etc. Insulation System walls Windows/glass Doors Interior surfaces and cladding
Decks (25)	251 252 252 252 253 254 255 255 256/257	Decks Radon barrier Floor/concrete Insulation Casting, lined floor Installation floors and floor systems Necessary pre-treatment of floor coverings Floor coverings, tiles, parquet, paints, etc. Ceiling
Roof (26)	261 261 261 261 261/262 262 263 266 267	Main construction Wind barrier Vapour barrier Suspended ceilings Insulation Roofing Glass roof/skylights Ceiling/Interior surface Prefabricated roof panels

Building elements	Level three code	Product groups
Stairs, balconies, etc. (28)	281 281 282 282 284 285	Interior stairs Coating/surface treatment interior stairs Outdoor stairs Coating/surface treatment exterior stairs Balconies/verandas Stands and amphitheatre
Outdoor structures (72)	721 721 722 725 725	Retaining wall Noise shield Stairs and ramps Fences Noise shield
Outdoor piping (73)	731/732/735/736/737 731/732/735/736/737	Pipes, etc. Insulation
Outdoor electric power (74)	744	Lighting equipment
Exterior hard covers (76)	761/762	Tyres used for roads, paths and places (asphalt, etc.)
Parks and gardens (77)	772 773	Shrubs, trees, etc. Benches, play equipment, etc.

Evidence

Criteria	Design stage	Post-construction stage
1	A confirmation / obligation from the developer that it will be required that the building shall not contain environmental toxins according to the criteria and method. Applies in those cases where the relevant party is not selected ----- OR Documentation showing the contractual obligations of the relevant parties to follow up and confirm the fulfilment of the criterion ----- OR Documentation showing the system and routines to ensure that the building does not contain environmental toxins.	As in design stage AND Extract from the building's product overview, with accompanying product information showing that construction products described in Methodology do not contain environmental toxins AND The report from the random check control, signed by the assessor
2	A confirmation / obligation from the developer that a requirement will be made to collect EPD's according to the criteria and method. Applies in those cases where the relevant party is not selected ----- OR Documentation showing the contractual obligations of the relevant parties to collect EPDs according to the criteria and methodology ----- OR Documentation that confirms: 1. placement of the specified construction products	As in design stage

Criteria	Design stage	Post-construction stage
	2. information about the specified construction products (type of material, product group, share of product group, time of purchase/ order) 3. EPDs for the specified construction products.	
3-4	A confirmation / obligation from the developer that a requirement will be made to document performance requirements according to the criteria and method. Applies in those cases where the relevant party is not selected ----- OR Documentation showing the contractual obligations of the relevant parties to document performance requirements according to the criteria and methodology ----- OR Documentation that confirms: a. placement of the specified products b. b) that the specified products comply with the requirements	Documentation that confirms: a. placement of the specified products b. that the specified products comply with the requirements through: - license number for EU Ecolabel/ Nordic Swan Ecolabel - product documentation from ECOproduct database - EPDs or other known third-party verification schemes that confirm fulfilment of the requirements for the ECOproduct or Nordic Swan Ecolabel.

Definitions

D1 Environmental Product Declaration – EPD

An EPD is a concise document that summarises the environmental profile of a component, finished product or service in a standardised and objective way. The requirements for how to make an EPD are specified in EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

D2 Construction products

A manufacturer-specific product (i.e. with the manufacturer's reference number) specified by the design team (e.g. architect, engineer, interior architect, etc.) or selected by the contractor, and installed in the construction project

Additional information

T1 Material guidance, NGBC

For material guidance, the following are available at NGBC's web page (https://byggalliansen.no/)

- Material guide: This guide has been prepared in order to increase awareness of the impact of materials on the environment throughout the value chain in connection with the requirements of BREEAM-NOR.

Green material guide: This is a practical and informative overview of environmental properties for a number of different building materials. The green material guide makes it easier to make environmentally-friendly choices in the planning of a construction project.

- ECOproduct Method version 5.3.

Mat 03 Responsible sourcing of construction products

Number of available credits	Minimum standard				
3	P	G	VG	E	O
	Crit. 1	Crit. 1	Crit. 1	Crit. 1	Crit. 1

Aim

To facilitate the selection of products that involve lower levels of negative environmental, economic, and social impact across their supply chain, including extraction, processing, and manufacture.

Assessment scope

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific notes	
None	

Building specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into three parts:

- Prerequisite: Legal and sustainable timber (no credits)
- Enabling sustainable procurement (1 credit)
- Responsible sourcing of relevant materials (up to 2 credits)

Prerequisite – Legal and sustainable timber

1. All timber and timber-based products used on the project must be 'Legal' and 'Sustainable' (see Methodology). This requirement applies to all timber and timber-based products used as building materials in the finished building, as well as those temporarily used during construction (e.g. formwork materials in wood).

Enabling sustainable procurement – 1 credit

2. A sustainable procurement plan must be used by the design team to guide specification towards sustainable construction products. The plan must:
   a. Be in place by the end of step 3
   b. Include sustainability aims, objectives and strategic targets to guide procurement activities. Note: targets do not need to be achieved for the credit to be awarded but justification must be provided for targets that are not achieved.
   c. Include a requirement for assessing the potential to procure construction products locally. There must be a policy to procure construction products locally, where possible.
   d. Include details of procedures in place to check and verify the effective implementation of the sustainable procurement plan.

In addition, if the plan is applied to several sites or adopted at an organisational level, it must:

e. Identify the risks and opportunities of procurement against a broad range of social, environmental, and economic issues following the process set out in NS ISO 20400:2017.

Responsible sourcing of relevant materials - Up to 2 credits

3. The Mat 03 calculator should be used to determine the number of credits achieved for the construction products specified or procured (see Methodology). Credits must be awarded in proportion to the number of points achieved, as set out in MAT03-01

Mat 03-01 BREEAM credits available for the number of points achieved in the Mat 03 calculator

Credits achieved	Points achieved
2	15
1	10

Methodology

M1 Legal and sustainable timber

Legal timber means timber that has been harvested in accordance with current legislation in the logging state, cf. the Timber Regulation (EU 995/2010) and which is in accordance with the Norwegian CITES regulations (see Definitions).

Sustainable timber means timber and timber-based products originating in forests that are sustainably managed according to internationally recognised principles and criteria.

Legal and sustainable wood can be documented in one of the following ways:

1. Third party, independent forest certification scheme, such as FSC or PEFC
2. If documentation according to point 1 is not available, project-specific documentation must be prepared based on the "Framework for Evaluating Category B evidence – Category B". In that case, checklist 1 (supply chain information) and/or checklist 2 (forest source information) must be provided. For further information on this method, see: Timber Procurement Policy (TPP): prove legality and sustainability - GOV.UK (www.gov.uk)

M1.1 Reused and recycled wood

The use of reused and recycled wood promotes the purpose of this credit. Documented reused and recycled wood can therefore be used even if it cannot be documented that the wood has been legally harvested and is sustainable. Nevertheless, if the product contains both recycled wood and new (virgin) wood, these products must be documented in accordance with the method described above.

M2 Responsible sourcing of relevant materials

The Mat 03 calculator must be used to calculate points, and credits are awarded according to the number of points obtained. Points can be obtained for a building part if a minimum of 80% of the relevant materials have been purchased responsibly.

Each relevant material must be assessed on the basis of the tier level (see Definitions) and the scope achieved by the material supplier or manufacturer in accordance with Table Mat 03-02: Levels and criteria for responsible purchasing and Table Mat 03-03 EMS criteria. The wider the scope of the certification system, the more points can be achieved.

The following building components can be assessed using the MAT03 calculator:

1. Responsible sourcing of two or more of the following building elements:
   a. Structural frame
   b. Ground floor

c. Upper floors (including separating floors)
d. Roof
e. External walls
f. Internal walls
g. Foundation/substructure
h. Staircase (stairs)

Applicable materials:

- Bricks (including clay tiles and other ceramics)
- Resin-based composites and materials, including GRP and polymer renders
- Concrete (including in-situ and pre-cast concrete, blocks, tiles, mortars, cementitious renders, etc.)
- Tiles
- Glass
- Plastics and rubber (including EPDM, TPO, PVC and VET roofing membranes including polymer renders)
- Metals (steel, aluminium, etc.)
- Dressed or building stone including slate
- Timber, timber composite and wood panels (including glulam, plywood, OSB, MDF, chipboard and cement- bonded particleboard)
- Plasterboard and plaster
- Insulation materials
- Bituminous materials, such as roofing membranes and asphalt
- Other mineral-based materials, including fibre cement and calcium silicate
- Products with recycled content

Note: Fixings, adhesives and additives are excluded from the assessment. For any other materials that form part of an applicable building element, but do not fit into the applicable materials list or the exclusions list, refer to NGBC, who will identify the relevant key process and supply chain process or processes.

Table Mat 03-02 Responsible Sourcing Tier Levels and Criteria

Tier level	Issue assessed	Points available per element	Evidence/ measure assessed	Examples of compliant schemes
1	Legality and responsible sourcing	3	Certification scheme EMS (Environmental Management Scheme)	ISO 14001 or 3rd party certified EMS (e.g. EMAS or Eco-Lighthouse for the key process (see Definitions) and all supply chain processes. Products and materials that are reused (See Definitions) can be entered as level 1. Timber: FSC, PEFC, Nordic Swan Ecolabel
3	Legality and responsible sourcing	1.5	Certification scheme EMS (Environmental Management Scheme)	ISO 14001 or 3rd party certified EMS (e.g. EMAS or Eco-Lighthouse) for the Key Process and key supply chain process. Recycled materials with certified EMS for the key Process Timber: MTCC, Verified (SmartWood), SGS, TFT

Tier level	Issue assessed	Points available per element	Evidence/ measure assessed	Examples of compliant schemes
4	Legality and responsible sourcing	1	Certification scheme EMS (Environmental Management Scheme)	ISO 14001 or 3rd party certified EMS (e.g. EMAS or Eco-Lighthouse) for the key process

Table Mat 03-03 EMS Criteria

Material	Key process	Key supply chain processes
Bricks (including clay tiles and other ceramics)	Product manufacture	Clay extraction
Resin-based composites and materials (including GRP and polymer renders but excluding timber-based composites)	Composite product manufacture	Glass fibre production (or other principle matrix material) Polymer production
In-situ concrete (including ready-mix and cement mortars and renders)	Ready-mixed concrete plant	Cement production (the production of cement and the recovery of the aggregate and limestone used in cement production) Aggregate extraction and production
Precast concrete and other concrete products (including blocks, cladding, precast flooring, concrete or cementitious roof tiles)	Concrete product manufacture	Cement production Aggregate extraction and production
Glass	Glass production	Sand extraction Soda ash production or extraction
Plastics and rubber (including polymer renders, EPDM, TPO, PVC and VET roofing membranes)	Plastic/rubber product manufacture	Main polymer production
Metals (steel, aluminium etc.)	Metal Product manufacture – e.g. cladding production, steel section production	Metal production: Steel: Electric arc furnace or basic oxygen furnace process, Aluminium, ingot production Copper: ingot or cathode production.
Dressed or building stone (including slate)	Stone product manufacture	Stone extraction
Plasterboard and plaster	Plasterboard or plaster manufacture	Gypsum extraction Synthetic gypsum (from flue gas desulphurisation) by default (recycled content)
Virgin timber	Timber from certified sources	Timber from certified sources
Cement bonded particle board	Due to the high cement content, in addition to requiring timber certification, the key supply chain process must also be considered in order to obtain the relevant tier. Timber from certified sources	Cement production Timber from certified sources
Material	Key process	Key supply chain processes
Wood panel and wood-based composite products such as oriented strand board, plywood,	Wood products, including those with recycled content, can only use the timber certification route (e.g. FSC	

Material	Key process	Key supply chain processes
HPL, chipboard/particle, glulam, LVL, etc.)	and PEFC)	
Bituminous materials, such as roofing membranes and asphalt	Product manufacture	Bitumen production Aggregate extraction and production
Other mineral-based materials, including fibre cement and calcium silicate	Product manufacture	Cement production Lime production Other mineral extraction and production
Products with 100% recycled content	Product manufacture	Recycled input by default
Products with a lower % of recycled content	Product manufacture	Supply chain process/processes for any virgin material in the relevant product type above. Recycled input by default
Any other product	Key processes are likely to be product manufacture	One or two main inputs with significant production or extraction impacts should be identified
Excluded products: fixings, adhesives, additives	N/A	N/A

M2.1 Calculation procedure using the Mat 03 calculator

For each element, select the number of different types of elements you wish to enter in the relevant drop-down box and press the select button. If an element is not present, e.g. separating floors because the building has only one floor, the element does not have to be included. If the element is not present, select ‘0’.

For each element, select the ‘data type’ from the relevant drop-down box. There are two options, ‘Volume’ or ‘Percentage’.

User Defined – Volume

a. For all present elements, enter the names of the material types comprising each individual element in the relevant cell of the *material type* column.
b. Enter the volume of each individual material type in the relevant cell of the *percentage/volume of relevant materials present* column.
c. Enter the total combined volume of the material type in the *total volume of elements present* cell.
d. Enter the volume of each material that complies with either tiers 1, 3 or 4, as appropriate. At least 80% of the total volume must comply with one or more of the tiers to achieve any points for that element type.

User Defined – Percentage

a. For all present elements, enter the names of the material types comprising each individual element in the relevant cell of the *material type* column.
b. Enter the percentage of each individual material type (as a percentage of the whole element type) in the relevant cell of the column *percentage/volume of relevant materials present*.
c. Enter the percentage of each material (as a percentage of the whole element type) that complies with either tiers 1, 3 or 4, as appropriate. At least 80% of the materials that make up an element type must comply with one or more of the tiers to achieve any points for that element type.

It is beneficial to include even small percentages of materials that are in the higher tiers to gain more points in the calculator.

Evidence

Criteria	Design stage	Post-construction stage
1	A confirmation / obligation from the developer showing that s requirement will be made that all purchased timber and timber-based products (temporarily on the construction site and used in the building) are legally harvested and sustainable. Applies in those cases where the relevant party is not selected ------------ OR Documentation showing the contractual obligations of the relevant parties to ensure that all purchased timber and timber-based products (temporarily on the construction site and used in the building) shall be legally harvested and sustainable	Documentation confirming that all purchased timber and timber-based products (temporarily on the site and used in the building) are legally harvested and sustainable, documented by invoice/delivery with certificate number. If there is no certificate, project-specific documentation must be presented in line with the requirements.
2	A confirmation / obligation from the developer a requirement will be made to draw up a plan for sustainable procurement has been drawn up by the end of step 3. Applies in those cases where the relevant party is not selected ------------ OR Documentation showing the contractual obligations of the relevant parties to draw up a plan for sustainable procurement by the end of step 3 including necessary procedures and guidelines. -------- OR Documentation showing that a plan for sustainable procurement has been drawn up by the end of step 3 including necessary procedures and guidelines.	Documentation showing that the plan has been followed and that the goals have been achieved, or justification for why they were not achieved.
3	A confirmation / obligation from the developer showing that a requirement will be made for the relevant parties to purchase materials from suppliers that can document certification to the required level. Applies in those cases where the relevant actor is not selected -------- OR Documentation showing that the relevant parties are contractually obliged to purchase materials from suppliers who can document certification to the level required --------	Completed Mat 03 Calculator Documentation showing the quantity of the specified materials within each component part, as well as valid information/ certificate confirming that the environmental management in the production of current material shows that the information in the calculator is correct The BREEAM-NOR Assessor Report with completed values.

Criteria	Design stage	Post-construction stage
	OR Documentation confirming the quantities of the specified materials that will meet the criteria AND Valid certificate/ information that confirms the required level of the specified material within the each component part	

Definitions

D1 Responsible sourcing
The management and implementation of sustainable development principles in the provision, procurement and traceability of construction products. In BREEAM-NOR, this is demonstrated through auditable third party certification schemes.

D2 Recycled material
Any material where waste materials are used in the manufacturing of the new product.

D3 Convention on International Trade in Endangered Species (CITES)
The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) works by subjecting the international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the Convention has to be authorised through a licensing system. Each party to the Convention must designate one or more management authority in charge of administering the licensing system and one or more scientific authority to advise them on the effects of trade on the status of the species. The species covered by CITES are listed in three appendices, according to the degree of protection they need.

1. Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
2. Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilisation incompatible with their survival.
3. Appendix III includes species that are protected in at least one country that has asked other CITES parties for assistance in controlling the trade.

Appendices I and II of the CITES list illustrate species of timber that are protected outright. Appendix III of the CITES list illustrates species that are protected in at least one country. If a timber species used in the project is in Appendix III, it can be included as part of the assessment as long as the timber is not obtained from the country or countries seeking to protect this species.

D4 Key supply chain process
Covers all of the major aspects of processing and extraction involved in the supply chain for the end product. Note that recycled materials are not required to demonstrate a supply chain EMS. The criteria for each of the assessed materials are detailed in Methodology

D5 Key Processes
The final major aspects of processing that are carried out. There may be a single process or multiple processes requiring assessment, depending on the end product. The criteria for each of the assessed

materials are detailed in Methodology.

D6 Tier levels for responsible sourcing
In Table Mat 03-01, levels are defined (see first column) to reflect the rigour of the certification scheme used to demonstrate responsible sourcing, forming the basis for awarding points.

D7 Reused materials:
The new use of existing building components, including building mass that remains in the building. If a building component is dismantled and reused for a similar purpose for which it was originally designed, without significant processing, it can be called *direct reuse*.

Direct reuse can take place internally in the same building from which the used components originate, or externally in other projects.

Additional information
None.

Mat 05 Designing for durability and climate adaptation

Number of credits available	Minimum standards				
	P	G	VG	E	O
4	Crit. 6–8*	Crit. 6–8*	Crit.6–8*	Crit. 6–8	Crit. 6–8

*Compliance with criterion 6-8 is sufficient (see crit.2 in Hea 02). It is not needed to show compliance to the prerequisite in Mat 05.

Aim

To reduce the need to repair and replace materials resulting from damage to exposed elements of the building and landscape.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific	
None	

Building type specific notes

Building type specific	
None	

Assessment criteria

This issue consists of four parts:

- Prerequisite: risk analysis (no credits)
- Protect vulnerable parts of the building from damage (1 credit)
- Protect exposed parts of the building from material degradation (1 credit)
- Moisture protection in the construction phase – (2 credits)

Prerequisite: Risk analysis – no credits

1. By the end of step 2, a risk analysis is conducted in accordance with the methodology in NS 5814:2021 – Requirements for risk assessments. The analysis must be further processed (see Methodology) in step 3. The analysis must be coordinated by a person experienced with risk analysis together with relevant parts of the project group. The analysis must consider the current and future risk of damage. (See Methodology)

Protecting vulnerable parts of the building from damage – 1 credit

2. In accordance with the results of the risk analysis, protection measures must be incorporated into the building's design and construction to reduce damage to the building's fabric or materials in the event of accidental or malicious damage (see Methodology and Definitions). These measures must provide protection against:
   a. Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.).

b. Damage from any vehicle or trolley movements within one metre of the internal building fabric in storage, delivery, corridor and kitchen areas.
c. External building fabric damage by a vehicle. Protection must be provided where parking or manoeuvring areas are within one metre of the building façade and where delivery areas or routes are within two metres of the façade, i.e. bollards or protection rails must be specified.
d. Potential malicious damage to building materials and finishes, in public and common areas, where appropriate.

Protecting exposed parts of the building from material degradation – 1 credit

3. In accordance with the results of the risk analysis, key exposed building elements have must been designed and specified to limit long- and short-term degradation due to environmental factors (see Methodology). This can be demonstrated through one of the following:
   a. The element or product achieving recommended standards in an appropriate quality or durability standard or design guide (see Methodology)

   OR

   b. A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors.
4. The roof and façade have been designed in such a way as to prevent water damage, ingress and detrimental ponding (see Methodology). If the building has a flat compact roof, this must be designed according to the SINTEF Building Research Guide Series 525,207 – Compact roofs.
5. Convenient access to the roof and façade must be included in order to ensure cost-effective cleaning, replacement and repair to the building's design.

Moisture protection in the construction phase – 2 credits

Control plan and moisture measurements – 1 credit

6. No later than during developed- and technical design, a control plan must be prepared in accordance with NS 3514: 2020 Moisture safe construction – planning and execution. The control plan must describe how moisture damage to the building is prevented during the construction phase (see Methodology). The control plan must be clearly linked to the project plan and other plans in the project.
7. Customised checklists for moisture protection must be prepared and used in the design and construction phases (steps 3–5) for all relevant moisture sensitive materials. See Methodology.
8. It must be documented that drying and moisture measurements of the building construction have been carried out. The drying process must follow recognised methods and moisture levels must comply with all relevant standards. See Methodology.

Construction under cover – 1 credit

9. The construction site must be temporarily covered during construction, e.g. using a tent-based cover system (see Methodology).

Methodology

M1 Risk analysis

The method for risk analysis is described in NS 5814:2021 Requirements for risk assessment. The analysis shall identify and propose risk-reducing measures for:

- Parts of the building that are exposed to damage as a result of use (ref. criterion 2)
- Parts of the building that are exposed to material degradation as a result of the current and future climate (ref. criterion 3–5)
- Risk of moisture damage and moisture retention in the construction phase (ref criterion 6–9)

The project team or, as a minimum, the architect, should participate in the risk analysis.

Future climate projections from www.klimaservicesenter.no/climateprojections should be used in the survey. As a general rule, RCP factor 8.5 should be used. For the calculation of future precipitation, the locally applicable IVF curve and climate factor 1.5 should be used. See Table 3 in the Norwegian Climate Service Centre's report 5/2019. https://klimaservicesenter.no/kss/rapporter/rapporter-og-publikasjoner_2

The risk assessment shall be updated in step 3 and if there have been changes that mean that the conclusions and recommendations are no longer robust or valid. Examples of significant changes could be a change in the prerequisites and conditions for the project or new knowledge about risk factors.

M1.1 The risk assessment carried out late in the project

If the risk assessment is carried out late in the process, this can reduce the assessment to a paper exercise, with minimal value to the project. The step-related requirements are there because they provide the advantage of being able to conduct the risk assessment early in the project process.

In special cases, it may be acceptable for the risk assessment to be conducted at a slightly later time, but no later than early in step 4, provided the project can document that the risk assessment has still influenced the planned results, i.e. that the late assessment has not in any way been detrimental to the results, and that it has still provided clear benefits for the project.

Other criteria in the issue must be met in order for the credit to be awarded.

M2 Protecting vulnerable parts of the building from damage

M2.1 Examples of suitable durability measures

In areas of higher risk, suitable durability and protection measures to vulnerable parts of the building could include:

1. Bollards, barriers or raised kerbs in delivery and vehicle drop-off areas
2. Robust external wall construction, up to 2 m high
3. Robust corridor walls specified to Severe Duty (SD) as per BS 5234-21 and, for Healthcare buildings, Health Technical Memorandum 56 - Partitions
4. Protection rails for corridor walls
5. Kick plates or impact protection, e.g. trolleys on doors
6. Hard-wearing and easily washable floor finishes in heavily used circulation areas, i.e. main entrance, corridors, public areas, etc.
7. Door stoppers to prevent door handles from damaging walls
8. Designing out the risk without the need for an additional materials specification, to protect vulnerable areas.

M3 Protecting exposed parts of the building from material degradation

M3.1 Key exposed building elements

Key exposed building elements in the context of this issue are those elements that comprise at least 80% by area of each of the following categories:

1. External walls and cladding
2. Roof, roof terraces and balconies
3. Glazing: windows, skylights
4. Hard landscaping, i.e. roads, parking lots etc.

M3.2 Durability or quality standards and design guides

Based on the building elements in M3.1 and the identified risk areas in the risk analysis, the project team should document that:

a) The planned and implemented measures meet the specific requirements in industry-related legislation, recognised standards or similar. The following regulations or standards are acceptable as reference documents:
   - Building Technical Regulations (TEK) with guidance. These should be specific, preferably quantified durability requirements. General formulations such as "appropriate solutions that provide sufficient quality" are not acceptable as a reference standard.
   - Standard Norway's quality standards for buildings and development areas. www.standard.no
   - The SINTEF Building Research Series www.byggforsk.no/byggforskserien

b) b) If there are no recognised standards or reference documents, those members of the project group with the relevant skills should conduct and document a detailed assessment of the robustness of the designed and built solution. A professional should confirm that the solution will withstand the stress to which it will be exposed, and thereby reducing the risk.

c) c) If the project wishes another standard or design guide to be recognised, this is acceptable if the project can document that the standard is relevant to the element, is suitable for the solution it is being used on, and increases resilience. The assessor must send a technical clarification to tech@byggalliansen.no for approval.

M3.3 Roof and façade designed to prevent water damage

A common and potentially significantly damaging failure mechanism for external envelopes is water ingress or other types of water damage. The design team should demonstrate that they have carefully considered the drainage mechanisms and sealing solutions for the façade and roof on a small and large scale to prevent staining, detrimental oxidation, ponding, rot, ingress, penetration, or any other deleterious effect. This should take the form of a risk assessment, the complexity and detail of which is related to the complexity and innovative nature of the façade and roof. The final design should demonstrate that, where possible, these negative impacts have been avoided.

M3.4 Convenient access

Access to the whole roof and façade must be safe and convenient for routine maintenance, cleaning and repair. A façade access strategy must be established and used as a basis for the design. See the CIRIA guide C686 for guidance.

M4 Control plan and moisture measurements

M4.1 Control plan content

A control plan for moisture protection shall be prepared in accordance with NS3514:2020 – Moisture proof construction – planning and implementation, and should contain the following, as a minimum:

- A description of what is to be designed and constructed
- Critical issues to be controlled and how such controls should be carried out.
- The basis for the controls, i.e. design and construction documents
- When the controls shall be executed
- Who will be responsible for the controls during the construction phase
- Material moisture levels
- Transport and storage of materials
- Protection from precipitation

The control plan shall also contain checkpoints for moisture protection. A template for the checklist can be found in the SINTEF Building Research Series 474.511 Assessment of moisture safety. Checkpoints. It must be clearly adapted to the project.

Further information about moisture protection in buildings:

- SINTEF Building Research Series 421.132 Moisture in buildings. Theoretical basis for further information on moisture protection.
- SINTEF Building Research Series 474.511 Assessment of moisture safety. Checkpoints.
- SINTEF Building research series 474. 533 Building moisture. Dehydration and preventive measures.

M4.2 Moisture sensitive materials

The following materials are considered moisture sensitive and should, as a minimum, be considered when setting up the control plan. The list is not exhaustive.

- Insulation
- Plasterboard
- Wood panels
- Wooden structures

M4.3 Moisture measurements

SINTEF Building Research series and standards in Table Mat05-01 indicates which method and moisture level the documentation should contain.

Table Mat05-01: Description of method and moisture level to be used

Measures	Method/moisture level according to:
Drying of the building structure	SINTEF Building research series 474. 533 Building moisture. Drying and preventive measures
Moisture measurement and moisture level in concrete	NS 3511:2014 Measurement of the relative humidity (RF) of concrete If relevant: SINTEF Building Research Series 474.531 Measuring humidity in buildings
Moisture measurement and moisture level in wooden structures	NS 3512:2014 Measurement of moisture in wood If relevant: SINTEF Building Research Series 474.531 Measuring humidity in buildings
Where relevant	NS 3420-T:2019 +AC:2020 Description text for buildings, structures and installations – Part T: paint and indoor surfaces

M5 Construction under cover

For constructions with a cover system stated as having similar properties as a tent-based system, evidence must be provided proving that the system selected is at least as effective in terms of moisture protection measures. This means that moisture protection from rain and snow, both horizontally through external walls, and vertically through the roof, should be maintained throughout the construction process.

The measures that provide the same level of protection as a tent-based system need to be assessed by a responsible party in the project team and accepted by the assessor.

Evidence

Criteria	Design stage	Post-construction stage
1–2	A confirmation / obligation from the developer that there will be requirements for: - a risk analysis to be carried out by the end of step 2 and follow the methodology in NS 5814:2021 - documentation confirming preventive design measures for exposed areas/ building elements. Applies in those cases where the relevant parties are not selected. ----------------- OR Documentation showing the contractual obligations of the relevant parties: - To conduct a risk analysis by the end of step 2 and follow the methodology in NS 5814:2021 - Document confirming preventive design measures for exposed areas/building elements. ----------------- OR A risk analysis must be carried out by the end of step 2 and follow the methodology in NS 5814:2021. Revision number, date and involved persons shall be visible. AND Documentation showing preventive design measures for exposed areas/building elements	Updated risk analysis if changes made during step 2 affect the analysis. Revision number, date and involved persons shall be visible. AND The assessor inspection report and photographic evidence confirming the implementation of the preventive measures where accessible. Documentation of skills and experience of the qualified person.
3–5	A confirmation / obligation from the developer that there will be requirements for: - Documentation showing the relevant environmental factors for the assessment - Mapping of the building elements and parts of the development area that are exposed to material degradation because of environmental factors. - Documentation of measures with reference to recognised standards	As design stage with as-built data AND The assessor's inspection report and photographic evidence confirming: - the implementation of preventive measures, where possible. - convenient access to the roof and facade.

Criteria	Design stage	Post-construction stage
	or guidance, alternatively a professional's assessment of the robustness of the design - Documentation that the roof and façade design will prevent water damage and that these has convenient access for routine maintenance Applies in those cases where the relevant parts is not selected. ----------------- OR Documentation showing the contractual obligations of the relevant actors to: - Document the relevant environmental factors for the assessment - Map the building elements and parts of the development area that are exposed to material degradation because of environmental factors. - Documentation of measures with reference to recognised standards or guidelines, alternatively, a professional's assessment of the robustness of the design - Documentation that the roof and façade design will prevent water damage and that these offer convenient access for routine maintenance --------------- OR Documentation showing the relevant environmental factors for the assessment. AND Mapping of the building elements and parts of the development area that are exposed to material degradation because of environmental factors. AND Documentation of measures with reference to recognised standards or guidance. Alternatively, a professional's assessment of the robustness of the design. AND Documentation that the roof and façade design will prevent water damage and that these offer convenient access for routine maintenance..	

Criteria	Design stage	Post-construction stage
6–8	A confirmation / obligation from the developer that there will be requirements for: - Contractor's control plan for moisture control - Checklists for moisture protection adapted to the project - the contractor to plan for drying procedures and control measurements Applies in those cases where the relevant parts is not selected. --------------- OR Documentation showing the contractual obligations of the relevant actors to: - Create a control plan for moisture control - Create checklists for moisture protection adapted to the project - Create a plan for drying procedures and control measurements --------------- OR Confirmation must be submitted from the project manager that a control plan for the construction phase will be created according to the criteria. AND Checklists for moisture protection adapted to the project and documentation showing that the project team will comply with the checklists during design and construction AND Documentation showing drying procedures, control measures and performance requirements adapted to the assessment, as well as showing that the project team will comply with these during design and construction.	Contractor's control plan and documentation showing that it has been used actively during the construction stage. AND A copy of the completed checklists AND Documentation showing that drying procedures have been followed, measurements have been made at the correct time and that the performance requirements for drying have been met.
9	A confirmation / obligation from the developer that there will be requirements for the project to carry out the construction phase under protective cover. Applies in those cases where the relevant party is not selected. --------------- OR Documentation showing the contractual obligations of the relevant actors to complete the construction phase of the project under cover. ---------------	The assessor's inspection report and photographic evidence confirming that the building is constructed under cover. If the assessor was engaged later in the construction phase, the contractor's project report, documents and photographic evidence can be used to document compliance.

Criteria	Design stage	Post-construction stage
	OR Documentation showing how the project will complete the construction phase of the project under protective cover.	

Definitions

D1 Appropriate industry standards or guidelines for quality or durability

An established industry quality standard or guidance, certification or mark with testing procedures which demonstrate the quality and durability of the product or element. Examples of relevant standards for various element types are provided in the Methodology section.

D2 Durability

Ability of a building and its parts to perform its required function over a period of time and under the influence of degrading agents, without the need for undue maintenance, repair, replacement or refurbishment.

D3 Material degradation

The process whereby an action on an item causes deterioration to one or more properties. Note: Properties affected can be, for example, physical, mechanical or electrical.

D4 Environmental factors

These are natural, man-made or induced external and internal conditions that can influence performance and use of a building and its parts.

D5 Malicious damage

For BREEAM purposes this is damage caused by intentional or irresponsible actions by users of the building or the public.

BREEAM has not set specific examples, but the architect should use their professional judgment to define the vulnerable areas that need to be considered for criterion 2.d.

Additional information

None.

Mat 06 Material efficiency and reuse

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	Crit. 1	Crit. 1	Crit. 1	Crit. 1-3	Crit. 1-3

Aim

To promote reuse and avoid unnecessary materials use.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	See ref. 1.0	See ref. 1.0 See Appendix D	See ref. 1.0 See Appendix D

Assessment type specific	
1.0	Where, under the developer's ownership, no demolition will be undertaken to enable the assessed development, the mapping for component reuse credit is not applicable and therefore filtered out of the assessment

Building type specific notes

Building type specific	
None	

Assessment criteria

This issue is split into four parts:

- Mapping for component reuse and implementation (1 credit)
- Material efficiency (1 credit)
- Reuse of external building components (1 credit)
- Exemplary level criteria: FutureBuilt criteria set for circular buildings, point 2.3 reuse of building components

Mapping for component reuse and implementation – 1 credit

1. Complete a mapping for component reuse of any existing buildings, structures or hardstanding (see Definition) being considered for demolition. Mapping for component reuse should be carried out by a competent person (see Definitions) prior to disassembly or demolition works. See Methodology for minimum requirements for the content and scope of the mapping for component reuse.
2. A minimum of 10 of the recommendations in the mapping for component reuse report are implemented. This may be both internal and external recommendations.
3. Within at least five product groups, mapped in the existing building at level three or four in NS 3451:2022 – Table of building elements, parts 2–7, used building components are used (see Methodology) in the new building.

Material efficiency – 1 credit

4. Set targets for material efficiency (see Definitions), develop objectives and report on opportunities and implementation according to the stages in Table Mat06-01 (see Methodology).

Reuse of external building components

5. Within at least two product groups, at level three in NS 3451:2022 – Table of building elements, parts 2–7, used building components are used (see Methodology). Procurement of used building components must come from outside the project, external reuse (see Definitions).

Exemplary level criteria: FutureBuilt criteria set for circular buildings, point 2.3 reuse of building components – 1 credit

6. Show compliance with FutureBuilt criteria set for circular buildings, point 2.3 reuse of building components, version 2.0. dated 16.03.2020. See Methodology

Methodology

M1 Mapping for component reuse and implementation

It is important that the mapping for component reuse and the findings from the survey are available in time for them to form part of the decision basis and design in the project. The mapping for component reuse must, as a minimum, cover the following:

a. date of mapping and name of the person who carried out the survey
b. The amount and type of building components suitable for reuse with an assessment of design for disassembly.
c. Assessment of the remaining life of the suitable building components.
d. Assessment of documentation requirements, with product information (if available).
e. Assessment of ease of disassembly
f. Summary of the survey with internal and external recommendations for reuse.

It is recommended that the report also contains a market-oriented assessment and that the period between the completed reuse report and the start of renovation or demolition should be a minimum of three months in order to minimise the need for interim storage. It may also be useful to prepare a market placement plan.

The "Reuse mapping and ordering – how to do it" guide contains a proposal for a template for mapping reports for component reuse (Appendix 3). The guide also provides supplementary information about ordering, purpose of and processes related to reuse mapping. The guide can be downloaded from www.byggalliansen.no

Reuse mapping should be seen in connection with the development of a resource management plan (RMP) in the project in Wst 01 and it may be expedient for the mapping for reuse components to also show which building components are suitable for various forms of material recycling.

To ensure that the mapping for component reuse leads to reuse, it is important that immediately after receiving the reuse report, the customer assesses how the findings and recommendations in the report are to be taken further in the project process. The assessments should consider practical feasibility in light of costs, time frame and environmental impact.

To ensure further anchoring of responsibility for following up the recommendations in the report, the following is required:

- The responsibility for following up the recommendations must be dedicated to one person in the project
- It must be investigated what kind of skills are needed to ensure follow-up
- The recommendations must be anchored in a contract with the contractor

M1.1 Less than 10 recommendations

Where the results from the re-use mapping show that there are less than 10 recommendations for reuse, the mapping with all recommendations must be sent to NGBC as a technical query. Additionally, a confirmation from the person who has performed the mapping must be submitted to confirm that the mapping has been carried out in compliance with criteria 1 and methodology M1.

M1.2 Reuse of building components

A minimum of 20% of potentially reusable building components (explained in the reuse mapping report) for each selected product group must be reused into the new building. The project must select the relevant unit for the selected building components and the percentage must be calculated in accordance with area, volume, length or weight.

Calculation example: In order for the reuse of interior doors to be included as one of the five product groups, it must be documented that at least 20% of the total area of the product group “2442 doors” that are reusable is reused. If decks are to be included, it must be documented that at least 20% of the total area/weight of reusable “251 decks” has been reused.

For building components at the three- or four-digit level, the product groups are counted separately. For example, 20% reuse of windows and 20% reuse of doors will be counted as two of the five product groups,

In cases in which two or more different building components together make up 20% of a product group, they can be considered as one of the five product groups. As an example, the project can reuse plywood panels and diffusers, and count them as one of the five product groups if they collectively comprise more than 20% of the product group "246 interior surfaces and cladding".

M2 Material efficiency

Table Mat 06-01 describes how to optimise material efficiency by setting goals, preparing measures and ensuring that the measures are followed up in each step of the construction process. The table also shows how the method is to be documented.

Project-specific aims and targets shall be developed to ensure increased material efficiency. Examples of suitable material efficiency design measures can include:

a. Optimising area use, for example, sharing facilities
b. Increasing the utilisation factor of structural members
c. Designing to standard material dimensions to reduce off-cuts and waste on site
d. Removing redundant materials from the design
e. Using materials that can be recycled or reused (see Definitions) at the end of their service life
f. Making use of recycled or reclaimed materials
g. Designing for deconstruction and material reuse
h. Using pre-fabricated elements where appropriate to reduce material waste
i. Considering the use of an ‘exposed thermal mass’ design strategy to reduce finishes
j. Avoiding over-specification of predicted loads
k. Using lightweight structural design strategies
l. Making use of bespoke structural elements where this will reduce overall material use
m. 'Rationalisation' of structural elements
n. Optimising the foundation design for embodied environmental impact.

Table Mat06-01: Area and material efficiency strategy

Stages and action	
Step 2 Preparation and brief	
Objective	To set requirements for area and material efficiency that informs decisions throughout the design and construction of the project.
Participants	Client or client's agent with input from the design team if appointed.
Action	Assess the site, the likely scale of the project and the client's functional and aesthetic requirements to set material efficiency objectives for the project. Set out aims, objectives, targets, performance indicators, opportunities, constraints and responsibilities to guide are and material efficiency activities
Evidence	Dedicated report that sets out a clear framework to guide area and material efficiency activities throughout the design (step 2-4) and construction (step 5) of the project. The report should describe the aims, objectives, targets, performance indicators, opportunities, constraints and responsibilities for area and material efficiency.
Step 3 Concept Design	
Objective	Develop strategies to implement or action the materials efficiency requirements set under the Preparation and Brief stage.
Participants	The design team must include, as a minimum: Architect Structural Engineer Building Services Engineer
Action	Hold workshops with the project team to identify design opportunities to reduce or optimise area and materials use through design, specification, construction techniques, etc.
Evidence	Minutes of the workshops held. Documentation demonstrating how feedback from the workshop has been incorporated into the concept design of the project, for example: outline specification for materials selection, report on approximate predicted reductions in material quantities.
Step 4 Developed Design and Technical Design	
Objective	Develop design proposals based on area and material efficiency measures and strategies from the concept design.
Participants	All relevant members of the design team, contractors and potential suppliers.
Action	Incorporate area and material efficiency measures and strategies identified in the concept design into procurement and construction documents, as appropriate. Review performance against previous stages, identify deviations and specify mitigating actions.
Evidence	Report on deviations from previous stages and additional actions to be taken. Documentation demonstrating the incorporation of the outcomes from the concept stage and additional actions, for example: design drawings or specifications demonstrating the area and materials efficiency measures undertaken.
Step 5 Construction	
Objective	Implement area and material efficiency measures in construction.
Participants	Principal contractor, sub-contractor and suppliers.
Action	Implement area and material efficiency measures and strategies identified in previous stages in building construction and identify deviations. Identify further efficiencies as appropriate for this stage.
Evidence	Report on deviations from previous stages. Documented evidence of activity to further identify efficiencies at this stage, for example: meeting minutes, training events, waste reduction documentation, etc.
This table is based on the principles set out in parts 1 and 2 of the BS 8895 series of standards and provides examples of how material efficiency can be considered at each work stage (see Additional information).	

M3 Reuse of external building components

Each of the building components used must include at least 20% of the product group's area, volume, running metres or weight.

Calculation example: in order for the reuse of interior doors to be included as one of the two product groups, it must be documented that at least 20% of the total area of “2442 Doors” has been reused. If perforated decks are to be included, it must be documented that at least 20% of the total area/weight of “251 decks” has been reused.

For building components at the three- or four-digit level, the product groups are counted separately. For example, 20% reuse of windows and 20% reuse of doors will be counted as two product groups.

In cases in which two or more different building components together make up 20% of a product group, they can be considered as one of the two product groups. As an example, the project can reuse plywood panels and diffusers, and count it as one of the two product groups if they collectively comprise more than 20% of the product group "246 interior surfaces and cladding".

A reused building component that comprises multiple product groups can count for all these product groups if the building part constitutes at least 20% of the relevant building part as a whole. For example, a reused element exterior wall that makes up at least 20% of the total area of exterior walls could count as multiple product groups within the relevant building component Exterior walls (23).

See Methodology M.1 Mapping components for reuse and implementation for further information.

M4 FutureBuilt criteria set for circular buildings, point 2.3 reuse of building components

FutureBuilt's criteria set for circular buildings v. 2.0 dated 16.03.2020 are divided into five points that reflect the principles of good resource use in different phases of a building's lifetime. Criteria under point 2.3 reuse of building components must be fulfilled.
Requirements for goal achievement and documentation are stated under this section of the criteria set, which can be downloaded here: https://www.futurebuilt.no/FutureBuilt-kvalitetskriterier

Evidence

Criteria	Design stage	Post-construction stage
1	A confirmation / obligation from the developer that a mapping for component reuse will be conducted. Applies in those cases where the relevant party is not selected ------------ OR Documentation showing the contractual obligations of the relevant parties to conduct a mapping for component reuse. ----------- OR Mapping for component reuse report AND Documentation of skills and experience of the qualified person	Mapping for component reuse report Documentation of skills and experience of the qualified person
2-3	A confirmation / obligation from the developer that at least 10 of the recommendations in the report will be implemented and that reuse in accordance with the criteria and method will be	Documentation showing that at least 10 of the recommendations in the report have been implemented

	completed. Applies in those cases where the relevant party is not selected ----------- OR Documentation showing the contractual obligations of the relevant parties to implement at least 10 of the recommendations for reuse and ensure reuse of building components in accordance with the criteria and method. ------------ OR Documentation showing that at least 10 of the recommendations in the report will be implemented AND Documentation showing that 20% of the building components within five product groups will be reused.	Documentation showing that 20% of building components within five product groups are being reused The BREEAM-NOR Assessor Report with completed values.
4	A confirmation / obligation from the developer that the requirements for goals for material efficiency, measures and follow-up according to Table Mat 06-01 will be set. Applies in those cases where the relevant party is not selected ------------ OR Documentation showing the contractual obligations of the relevant parties to meet the requirements and goals for material efficiency, measures and follow-up according to Table Mat 06-01. ---------- OR Documentation showing the goals and measures for material efficiency for each stage that have been set.	See Table Mat06-01 for documentation from each work stage
5	A confirmation / obligation from the developer showing that requirements will be set for the use of external, used building components in accordance with the criteria and method. Applies in those cases where the relevant party is not selected ------------ OR Documentation showing the contractual obligations of the relevant parties to use external, used building components in accordance with the criteria and method ---------- OR Documentation showing the placement of and information about the used building components	As interim design stage with as-built documentation The BREEAM-NOR Assessor Report with completed values.

6	A confirmation / obligation from the developer that a requirement for compliance with the FutureBuilt criteria set will be made. Applies in those cases where the relevant party is not selected ------------ OR Documentation showing the contractual obligations of the relevant parties to show compliance with the FutureBuilt criteria set. ------------ OR Documentation showing compliance with the FutureBuilt criteria set.	As interim design stage with as-built documentation

Definitions

D1 External reuse
When a building component becomes the property of a new project, this is known as external reuse. This is when materials are sorted out in renovation or demolition projects, to be sold or given away to other construction projects for reuse. The building component is reused by the new project either for its original purpose or is given a new function.

D2 Hardstanding
Includes, for example, areas of paving stones, areas paved with asphalt, concrete, as well as gravel sites without vegetation. This could include car parks, access roads, pavements, delivery and service areas and sports arenas.

D3 Qualified person
A person who has relevant knowledge or experience of structures, materials or alternatives for reuse.

D4 Material efficiency
The process of designing a building to achieve its stated performance standards while reducing its embodied impact by reducing the quantity of materials required to do so. This includes using fewer materials, reusing existing demolition and strip-out materials and, where appropriate, procuring materials with higher levels of recycled content. It may also include the adoption of alternative means of design and construction that result in lower material consumption and lower wastage levels including off-site manufacturer or the use of pre-assembled service pods.

D5 Material recycling
Any process in which waste materials are used in the manufacture of non-waste substances or product. Material recycling includes biological treatment of organic waste. The use of waste for the production of energy or materials to be used as fuel or fillers is not considered as material recycling. Material recycling is often called *recycling*. The following are examples of material recycling:

Return of materials to the supplier via a "return system" which includes material recycling
Material recycling through an approved actor who has established processes for this.

D6 Reuse of components
New use of existing building components, including building elements that remains in the building. If a building part is dismantled and whole or parts of it are reused for a similar purpose for which it was originally designed, without

the need for significant processing, this can be called direct reuse. Used components can also be given new value for a different purpose than they were originally intended through processing and product development. This is often referred to as upcycling.

Direct reuse and upcycling can take place internally in the same building as the used components are from, or externally in other projects. Direct reuse and recirculation, internally and externally, are considered reuse of a building component in this context. The use of surplus materials from external projects is also considered reuse.

Additional information

T1 BS 8895 Designing for material efficiency in building projects

The standard outlines specific material efficiency processes, key tasks, team members and their responsibilities, and outputs specific to each work stage, along with supporting guidance and tools. This serves as a useful tool to assist the design team in developing and implementing material efficiency strategies for their developments.

The standard comprises the following three parts:

- Part 1: Code of practice for strategic definition and preparation and brief (published).
- Part 2: Code of practice for concept and developed design (published)
- Part 3: Code of practice for technical design (published)

Mat 07 Design for disassembly and adaptability

Number of available credits	Minimum standard				
3	P	G	VG	E	O
	-	-	-	Crit.2–6	Crit. 2–6

Aim

To avoid unnecessary material use, cost and disruption arising from the need for future adaptation works as a result of changing functional demands and to maximise the ability to reclaim and reuse materials in future renovation, disassembly or final demolition works.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	See 1.0 See Appendix D

Notes for fully fitted/shell and core	
1.0	The assessment of disassembly and functional adaptability only applies to the specified/assembled building components/installations. If there is a deviation from the minimum requirements for the assessment of disassembly and functional adaptability due to the building component/installation not being planned and installed, this must be clarified with the assessor before the assessment starts.

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into three parts:

- Resource inventory (1 credit)
- Design for disassembly and functional adaptability – recommendations (1 credit)
- Disassembly and functional adaptability – implementation (1 credit)

Resource inventory (1 credit)

1. A qualified person (see Definitions) assists the project with setting up a resource inventory list (see Methodology) with guidance to give the developer an overview of the facilitation of basic maintenance, future reuse and material recycling.

Design for disassembly and functional adaptability – recommendations (1 credit)

2. Conduct a study to explore the ease of disassembly and functional adaptation (see Definition and Methodology) by the end of Concept Design.
3. Develop recommendations or solutions based on the study (criterion 1 above) during Concept Design, that aim to enable and facilitate disassembly and functional adaptation (see Methodology).

Disassembly and functional adaptability – implementation (1 credit)

4. Criteria 2 and 3 must be achieved.

5. Provide an update, during Technical Design, on:
   a. Changes to the recommendations and solutions during the development of technical design
   b. How the recommendations or solutions proposed by Concept Design have been implemented. Omissions have been justified in writing.
6. Produce a building adaptability and disassembly guide to communicate the characteristics that allow functional adaptability and disassembly for prospective tenants.

Methodology

M1 Resource inventory

As a minimum, the resource inventory list shall include the construction products/components used in the greenhouse gas calculation, see Mat 01, criteria 1.

Each product/component will be described with the following information:

a) Classification in line with NS 3451:2022 Building component table
b) Location in the building
c) Estimated quantity and scope provided using a suitable unit of measurement (e.g. m^3, kg, metres, number)
d) Reusability (see Definitions) and suitability for material
e) Guidance regarding how functionality and quality can be maintained during maintenance, disassembly and final demolition.

The resource inventory list could be, for example, a spreadsheet or part of the building information model (BIM) and shall be form part of operations and maintenance (O&M) manuals.

Procedures for updating the resource inventory list during the operational and maintenance phase, repair, replacement and renovation shall be developed.

M2 Design for disassembly and functional adaptability

Solutions that facilitate changes and reuse are often limited or will incur additional costs if they occur late in the design process. It is therefore an advantage if the assessment or study of the building's adaptability and usability is carried out earlier than step 3.

M2.1 Functional adaptability strategy study

The study must consider the following, as a minimum:

- Planned functions and the potential adaption to the needs of future building occupants
- Superstructures
- Building envelope
- Core and local services
- Interior design
- Technical installations

The above must be considered with regard to the various principles of functional adaptability:

1. Versatility, the ability to accommodate different functions without affecting the building's structure (see Definitions)
2. Convertibility, the ability to accommodate substantial changes in user needs by making modifications without altering the building's structure (see Definitions)
3. Elasticity, designing to allow for either vertical or horizontal additions to the building's structure. (see Definitions)

Table Mat 07-01: Design measures allowing future adaptation

	Versatility	Convertibility	Elasticity
Planned functions and the potential adaption to the needs of future building occupants	Possibility for shared use, e.g. day/evening	Possibility to divide/ open room sections for different kinds of use	How is the building designed for the extensions in the event of functional changes?
Superstructures and floor height: - Constructive elements, e.g. frame, upper floors, load-bearing external walls - Foundations	A regular column layout and few or no load-bearing walls Equal floor height	Use of products or systems in which individual components are easy to adjust/move	Spacious floor heights that make it possible to change functions and technical solutions with regard to ventilation, etc. Adapted for extensions/ reuse through oversizing or the use of modular building/product systems
Building envelope: - External walls - Cladding - Ground - Roof	Optimal daylight conditions	Location of structural components within the floor space	Provision to add extensions or make modifications to increase the building's capacity and retain the cladding
Core and local services: - Toilet/kitchen cores - Stairs and lifts - Corridors	The building is planned so that these areas can preferably be fixed in the event of functional changes	Space to be able to upgrade, change or expand, for example, pipelines/and or electrical cables	Provision of infrastructure capacity to enable future expansion and adaptation
Interior design: - Finishes - Floors - Interior walls - Connections	General space solutions with regard to access, so that rooms can be used independently All type of rooms have optimal daylight conditions	Use of products or systems that can easily be replaced Layout in standardised grids Use of standardised material sizes Use of inherent finishes to allow replacement Floors are installed and finished before walls are installed	The use of standard and durable materials Efficient use of space to allow for any increase in occupancy
Technical installations: - Mechanical and electrical - Sanitary - Fire	A dense distribution network will provide opportunities for point extraction without major alterations or structural interventions	Use of products or systems in which individual components are easy to adjust, move or replace	Technical installations and guideways will be given good capacity to enable expansions and adaptions

This table is neither complete nor limited to the sample

M2.2 Ease of disassembly

The study must consider the following, as a minimum:

- Superstructures
- Building envelope
- Interior design
- Technical installations

The above must be considered with regard to the following, as a minimum:
1. Material selection
2. Exposed and reversible connections
3. Available information
4. Manufacturer agreement

Table Mat 07-02 shows the minimum measures for each strategic area and provides examples of considerationswhen designing for disassembly.

Table Mat 07-02: Minimum measures and examples of considerations when designing for disassembly

Strategic areas	Minimum measures and examples
Material selection	As a minimum, the following should be considered: - Avoidance of unnecessary toxic treatments and finishes (see Mat 02). Some finishes could contaminate the substrate in such a way that the components are no longer reusable or recyclable. This should be avoided unless finishes serve a specific purpose. - Materials should be used that require less frequent maintenance, repair or replacement and this should be considered in the context of the life span of the building. Other examples: - The number of different materials and components should be minimised - Homogenous materials should be chosen. - Standard types of connections, standard size materials and low complexity and modularity should be chosen.
Exposed and reversible connections	As a minimum, the following should be considered: - Exposed and reversible connections should be chosen to facilitate disassembly, e.g. screws and bolts. - The use of adhesives, sealants and poured and welded connections that are likely to damage components and prevent disassembly should be avoided. - Lime mortar should be used instead of cement mortar when using masonry - Constructive layers should be designed as independent systems and layers should be arranged according to the expected life span (see Definitions) of the components. Other examples: - The number of different connectors should be minimised and plans should be drawn up for the use of common tools. - Materials and building elements should be chosen that are durable based on warranties and the risk of being damaged during disassembly. - The availability of space between building elements should be considered when aiming to accommodate disassembly.
Available information	As a minimum, the following should be considered: - Reversible connections should be marked, available and exposed. - Materials and components assessed for disassembly should be marked. Other examples: - Material passports, information on products and materials, EPDs, maintenance advice, disassembly instructions as well as declarations as part of performance shall be prepared as part of the maintenance guidelines - The buildings geometry uis documented through open BIM, which can function as a digital twin to the building with associated and sufficient information.

Strategic areas	Minimum measures and examples
Producers' agreement	As a minimum, the following should be considered: - Leasing agreement with manufacturers instead of purchase Other examples: - readmission schemes with manufacturers. - Use of temporary structures when a short life span is expected

M2.3 Building adaptability and disassembly guide

The guide shall inform the owner(s) and user(s) about the principles and solutions in the building that ensure functional adaptability and ease of disassembly. See the new ISO 20887:2020 Sustainability in buildings and civil engineering works – Design for disassembly and adaptability – Principles, requirements and guidance for information on what the guide could include.

Evidence

Criteria	Design stage	Post-construction stage
1	A confirmation / obligation from the developer that a resource inventory list with guidelines will be created and that a qualified person will assist. Applies in those cases where the relevant party is not selected --------- OR Documentation showing the contractual obligations of the relevant parties to create a resource inventory list with guidelines and to receive assistance from a qualified person. ----------- OR Resource inventory list and guidelines. AND Documentation that assistance was received from a qualified person in the project	Resource inventory list and guide. AND Documentation of skills and experience of the qualified person. AND The BREEAM-NOR Assessor Report with completed values.
2-3	A confirmation / obligation from the developer that a disassembly and functional adaptability study will be conducted, with recommendations. Applies in those cases where the relevant party is not selected ----------- OR Documentation showing the contractual obligations of the relevant parties to conduct a disassembly and functional adaptability study with recommended measures and how to implement them ----------- OR	As interim design stage.

	Disassembly and functional adaptability study AND Documentation showing the recommended measures and how to implement them	
4-6	A confirmation / obligation from the developer that recommendations will be communicated in the project, and that a building adaptability and disassembly guide will be made. Applies in those cases where the relevant party is not selected ----------- OR Documentation showing the contractual obligations of the relevant parties to communicate the recommendations and adjust these, if necessary, as well as develop a building adaptability and disassembly guide ----------- OR Documentation showing how the recommendations are communicated in the project so that adjustments can be made when necessary. AND Building adaptability and disassembly guide	Documentation showing updated recommendations and which of these have been implemented Explanations as to why the recommendations have not been implemented Building adaptability and disassembly guide

The evidence required to demonstrate compliance will vary according to the relevant stage. Some examples are:
- Concept Design: reports outlining the activity relating to functional adaptability and disassembly – ideas discussed, analysis and decisions taken
- Concept and Developed Design stages: drawings or building information model (BIM).
- All stages: meeting notes, construction programme, responsibilities schedule indicating which parties have been consulted.

Definitions

D1 Elasticity

The potential for the building to be extended, horizontally or vertically. For example, opportunities for sectioning and extension.

D2 Functional adaptability

The ability of a building to be adapted for a change in operational requirements within the same building type or for use as a different building type. Accessibility, expandability, feasibility and versatility are different strategies for achieving functional and adaptable buildings. See separate definitions of these terms.

D3 Convertibility

The degree of adaptability, independent of superstructures, vertical cores and technical systems, of the internal physical space and external shell to accommodate changes in use. For example,provisionn for moving non-load-bearing wallsdrilling holes in upper floors or energy upgrades of cladding.

D4 Expected life span

An assessment of the material life span is based on the manufacturer's specified (technical) life of the product or on empirical references for replacement intervals. For reused products, the technical residual life must be considered in each case. This can be conducted by an adviser, or there may be a declaration of performance from a third-party sales link/seller stating the expected remaining life span. See also Mat01.

D5 Versatility

Versatility in the building will provide opportunities to change function without major interventions and costs and will depend on, for example, access to daylight, floor heights and communication principles, including versatile room solutions with regard to access so that all rooms can be accessed from hallway or distribution area. This will allow rooms to be used independently of each other.

D6 Qualified person

A qualified person must have relevant experience and expertise about the environmental qualities, reuse, material recycling or maintenance of building materials.

D7 Ease of disassembly

Ease of disassembly is facilitated by principles that allow the building or parts of the building to be disassembled at the end of its operational life, or to be renovated rather than demolished, with individual components being used for other purposes.

Additional information

The Health Technical Memorandum 07-07(208) includes guidance on the future of healthcare buildings.

Waste

Summary

This category encourages the sustainable management of construction and operational waste. By encouraging good design and construction practices that maintains a high degree of reuse, material recycling and sorting, issues in this section aim to reduce the waste arising from the construction and operation of the building.

Photo: Sintef Community

Category summary table

Issue	Credits	Aim
Wst 01 Construction waste management	5	Development of a resource management plan (RPM) that includes the design and management of construction waste, demolition waste and excavated masses. Minimize the waste amounts and maximize the potential of reusing, recycling and sorting of waste.
Wst 03a Operational waste Wst 03b Operational waste (residental only)	1 1	Provision of suitable space and facilities to allow for segregation and storage of operational recyclable waste volumes generated by the assessed building or unit, its occupants and activities.
Wst 04 Speculative finishes (offices and multiple dwellings only)	1	Specification of floor, ceiling and other relveant finishes only where agreed with the occupant or, for tenanted areas where the future occupant is unknown, installation in a show area only, to reduce wastage.

Wst 01 Construction site resource management

Number of credits available	Minimum standards				
	P	G	VG	E	O
5	Crit. 4 (minimum req.)	Crit. 4 (minimum req.)	Crit. 1-2 Crit. 4 (minimum req.)	Crit. 1-2 Crit. 4 (2 credits)	Crit. 1-2 Crit. 3 (1 credit) Crit. 4 (2 credits)

Aim

To reduce construction waste by encouraging reuse, recovery and best practice waste management practices.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	none	None See Appendix D	None See Appendix D

Notes for fully fitted/shell & core	
None	

Building type specific notes

Building type specific notes	
2.0	Extensions to existing buildings: If assessing a new extension to an existing building, the criteria only apply to the new extension.

Assessment criteria

This issue is split into four parts:
- Resource management plan (1 credit)
- Amount of construction waste (up to 2 credits)
- Waste sorting, reuse and recycling (up to 2 credits)
- Exemplary level criteria: Especially low amount of construction waste (1 credit)

Resource management plan – 1 credit

A compliant Resource Management Plan (RMP) should be prepared at the Concept Design stage (see methodology) that includes the design and management of construction waste (see Definitions), demolition waste and excavated masses. If there are existing structures on the site, the resource management plan must be aligned with the Mapping of component reuse report in issue Mat 06 Material efficiency and reuse. As a minimum, the resource management plan should include:

Projected solutions and methods that reduce the amount of construction waste

Targets for sorting construction waste and demolition waste if relevant, in accordance with criteria 4. The relevant waste groups should be described with specific downstream management plans. At least two of the following should be among the waste groups: EPS, XPS, glass wool, stone wool.

Targets for the amount of construction waste and demolition waste, if relevant, produced on site are set in kg of waste per m² (gross internal floor area).

d. Projected quantity extraction of excavated masses (m³) both contaminated and non-contaminated masses, and planned handling of these masses (see Methodology).

2 The project shall further detail the goals set in the resource management plan and ensure implementation as follows:

a. An explanation shall be provided as to how resource utilisation in the construction phase will be carried out.
b. The design/site management team shall nominate an individual responsible for implementing the criteria in the RMP. If relevant, transfer of information from the design team to the contractor must be ensured.
c. It must be ensured that procedures are in place for sorting, reusing and recycling (see definitions) construction waste into defined waste groups on site.
d. The amount of site construction waste created on site shall be measured and regularly reviewed with the relevant parts in the project to ensure that the targets set for waste amounts in the project are reached.

Amount of waste – Up to 2 credits

3 Meet or improve upon the benchmarks in Table Wst 01-01.1 for construction waste, excluding demolition and excavation waste. See Methodology.

Table Wst 01-01. Credits for total amount of waste from the construction site.

BREEAM credits	Amount of waste generated in kg/m² (gross internal floor area)
1	≤ 40
2	≤ 25
Exemplary level	≤ 19

Waste sorting, re-use and recycling of materials – Up to 2 credits

4 A percentage (by weight) of construction waste and demolition waste, if relevant, will be sorted into separate waste groups (according to the waste streams generated by the scope of the works) onsite and are ready for re-use or recycling of materials (see Definitions). Credits are awarded according to Table wst01-02.

Table Wst 01-02. Credits for percentage (per weight) of waste that is sorted and ready for reuse or recycling.

BREEAM credits	Percentage sorted	Percentage ready for re-use or recycling of materials
Minimum requirement – No credits	75%	-
1	85%	50%
2	90%	70%

Exemplary level criteria: Very low amounts of waste – 1 credit

5 To achieve an exemplary performance credit:

The amount of construction waste generated, excluding demolition and excavation waste, is less than or equal to the exemplary level requirement in Table Wst 01-01.

Methodology

M1 Resource Management Plan

Developing a resource management plan helps to manage resources and waste at a construction site. The aim of such a plan is to promote resource efficiency and prevent the illegal disposal of waste. Resource efficiency means limiting the amount of locally generated waste and ensuring that the project owner, engineering and main contractors assess the use, reuse and material recycling of materials and products both on and off the construction site.

The resource management plan shall include:

- Construction waste
- Demolition waste (if relevant).
- Excavation waste (if relevant)

The handling of construction and demolition waste divided into different waste fractions and quantities shall meet the requirements for waste planning in accordance with TEK17 (§9-6). Examination of natural and environmental conditions to map possible contaminants in the ground shall be carried out by the project owner cf. §9-3 in TEK17.

M1.1 Design out waste

Possible measures to reduce waste volumes at the construction site can be found in the guide "How to plan for less waste", which is available for download from the Green Building Council's website. The largest and most profitable measures to reduce waste volumes in a project are achieved during design and engineering phase. Several suggestions for measures that can be made during design phase to reduce the amount of waste can be found in issue Mat06 Material efficiency and reuse under M2 Material efficiency.

M1.2 Targets for sorting

See M3.2 building and demolition waste prepared for reuse and material recycling for information and examples. It is recommended that the project managers explore local solutions for reuse and material recycling. NS 9431:2011 "Classification of waste" provides an overview of the most important waste groups.

M1.3 Waste amount targets

Construction waste:
Calculations of probable waste streams for the project shall form the basis of the target. If the project does not have experience figures to set targets for construction waste quantity in the project, it is recommended to contact waste disposal or contractor companies that have experience figures in order to set as precise and realistic targets as possible. Targets for quantities of construction waste, hazardous waste and ordinary waste (see Definition) must be viewed in connection with criterion 3 in this issue.

Demolition waste:
Since demolition waste often constitutes the largest amount of tonnage in a development project, if existing structures on the site that are to be demolished, BREEAM-NOR wants to raise awareness of the amount of encountered demolition waste. In order to highlight the measures taken to reduce the amount of construction waste, the amount of demolition waste must be reported separately, but shall not be included in the assessment of waste volumes in criterion 3.

M1.4 Excavation waste

BREEAM-NOR wants to prevent the disposal of excavation waste if it is produced and promote reuse for high-grade purposes in the development area in order to reduce the volume of new materials produced or that are necessary in the supply chain (which, in turn, could constitute additional waste). By raising awareness of the amount of excavated waste and by planning waste handling, we will reduce transport needs (CO2 emissions and loads in the surrounding area), promote circular waste handling and reduce the need for landfill.

Excess soil and rock masses that arise in connection with development are regarded as industrial waste, cf. §27a, second subsection of the Pollution Control Act. Soil and stone masses from such activities, which should not be used at the same site at which they were excavated, will normally be regarded as industrial waste, unless it is certain that the masses will be exploited as building materials or fillers in another project.

The project shall plan and ensure that industrial waste is taken to an authorised waste facility or is recycled so that it either ceases to be waste or can be used to replace materials that would otherwise have been used.

See Norwegian Environment Agency guide M-1243 – Disposal of soil and stone that is not contaminated for further information.

The resource management plan shall contain projected quantities that are excavated and a plan for handling the various types of masses (cf. action plan if there are requirements from a local municipality). Actual quantities and handling must be documented and reported after execution.

M2 Amount of waste

The following types of waste should not be included as the total amount of waste from the construction site:

- Demolition waste
- Excavation waste
- Canteen waste
- Waste from the operation of buildings

If separate return schemes have been established with suppliers or manufactures for products that are considered waste, in addition to agreements with waste disposal centres, this information must also be included in the accounts of generated waste volumes.

BREEAM does not include demolition and excavation (D&E) waste in its resource efficiency benchmark, despite it often being the largest tonnage of waste on-site, because the amount of D&E waste produced is site dependent. Including D&E waste in an overall construction resource efficiency benchmark would:

1. Discourage sites with unavoidably large amounts of D&E waste from focusing on reducing waste arising from construction materials (which would have further knock-on environmental effects); and
2. Make compliance with the benchmark more straightforward for sites with little or no D&E waste. This would weaken the drivers for reducing construction waste resulting from the specification and use of new building materials.

M3 Waste sorting, re-use and recycling of materials

M3.1 Waste sorting

The sorted waste quantities are reported using forms 5178 or 5179 according to the Regulations on technical requirements for construction works (TEK 17). Note that demolition waste is included in the calculation of rate of sorting, but is excluded from the amount of waste.

To ensure that as many fractions as possible are sorted, it is important that this is planned in advance, during planning of the construction site and rig area. If space is limited, it is recommended that the project enter into dialogue with the waste contractor in order to identify solutions such as alternative collection containers, procedures and frequencies. Central sorting can be chosen in special situations if it is practically very difficult to sort construction waste at the construction site. If necessary, the assessor can apply for technical clarification in order for alternative solutions to be approved.

Waste sent to reuse should be included in the calculation of percentage sorted.

M3.2 Construction waste prepared for reuse and recycling of materials

Faculitating for material reuse and recycling means that the project has secured that the materials can be reused and recycled and that they have researched the possibilities with the waste contractors, recycling centres or other actors to reuse or recycle materials in their relevant wate streams. The intention is to handle waste at the site in such a way that it makes potential material reuse or recycling possible in the next link.

Preparation for re-use and recycling of materials means that the waste can be used for:
- Re-use for similar purposes (see Definitions).
- Recycling of materials for new products. Landfill within the construction area or on other sites within reasonable proximity. For the recovery of concrete and bricks, §14a of the Waste Regulations must be followed. Other materials that can be used must be approved by a relevant authority.

The wording “prepared for” indicates that the project should document that the waste has been prepared for reuse, not that it has actually been reused. Thus there are no criteria to document that the site waste is reused or recycled in the waste stream.

Table Wst 01-03 shows which types of waste are included in the calculation of waste prepared for re-use and recycling of materials.

Table Wst 01-03 Waste types that are included and not included in calculation of prepared for reuse and recycling of materials.

Included	Not included
Ordinary waste	Excavation waste such as soil and rocks
Ordinary demolition waste	Hazardous waste

The project must clearly document that the sorted waste meets the necessary quality criteria for being re-used or material recycled. Below are some examples of such quality criteria:
- A washbasin that is to be re-used must be complete with all parts intact so that it can easily be used in a new building.
- Wood for recycling of materials must meet the quality requirements of the operator who is to receive the wood. Such quality requirements may be that the wood is dry and clean, not surface treated, free of metal, glue, etc.
- The material must not contain prohibited substances according to REACH or the Priority List.

Some components will require testing or inspection by professionals in order to be re-used or recycled. For example, it may be necessary to test concrete for contamination in order for it to be used as landfill material.

The waste must be handled and stored in such a way that its quality is still maintained at the required level. For intermediate storage of materials for reuse, external storage facilities can be used.

Agreements with manufacturers and/or waste disposal companies on sorting for re-use, recycling of materials and use as landfill are accetable if it can be clearly documented that the contract partner includes this as an integral part of its business and can present sufficient documentation of processes, methods, storage conditions etc. that confirm that the waste will be handled as required by BREEAM-NOR.

The project must document that any potential waste recipients have processes and methods in place for re-use, recycling of materials or as use as landfill in reasonable proximity to the development area. If fractions are delivered for further processing, they must document the downstream solutions for the various fractions. The documentation must show which fractions are to be recycled so that the project can calculate the achieved percentage of waste prepared for reuse and recycling.

All preparation will depend on the planned waste stream solutions and contracts entered by each project.

The agreements handed in as part of the interim design stage documentation must how the waste is treated and handled by the waste contractor and that the handling/storing and preparation of the waste makes the waste stream solutions realistic.

Evidence

Criteria	Interim design stage	Final post-construction stage
1-2	A confirmation/commitment from the developer that a resource management plan (RMP) with objectives and measures in accordance with the criteria and method prepared by the end of stage 3 will be required. Applies to those cases in which the relevant party is not selected. ------------- OR Documentation showing the contractual obligations for the relevant parties to: - create an RMP with objectives and measures in accordance with the criteria and method by the end of stage 3 - deliver at the maximum quantities of waste and sorting percentage that have been set. - appoint a person who will ensure the implementation and follow up of measures set in the RMP. ------------- OR Resource management plan AND Documentation showing that an RMP has been prepared by the end of stage 3 AND Documentation showing that a person has been appointed to ensure the implementation and follow up of measures set in the RMP.	Resource management plan. If the targets are not met, an explanation must be provided as to why the targets were exceeded. AND Documentation showing that an RMP has been prepared by the end of stage 3 AND Documentation showing the amount of excavated masses, contaminated and non-contaminated masses taken out and handling of these AND Documentation showing that: - maximum waste quantities have been obtained for construction waste and, if relevant, demolition waste - sorting and recycling the percentage has been met, including, proof from the recipient of the quantities received The BREEAM-NOR Assessor Report with completed values.

3 and 5	Documentation showing the contractual obligations for the relevant parties to deliver at the maximum quantities of waste that have been set.	Documentation showing that maximum waste quantities have been obtained for construction waste and, if relevant, demolition waste, including, proof from the recipient of the quantities received The BREEAM-NOR Assessor Report with completed values.
4	Documentation showing the contractual obligations for the relevant parties to obtain the sorting and recycling percentage that have been set. Agreements with the recipient on excavated masses and waste that show possible solutions for reuse or downstream solutions for the different fractions	As per interim design stage. Documentation showing that the sorting and recycling percentage has been met, including, proof from the recipient of the quantities received A copy of forms 5178 or 5179. Construction waste in kg/m² (gross internal floor area) should be completed. The BREEAM-NOR Assessor Report with completed values.

Definitions

D1 Construction waste

BREEAM-NOR follows the definition in the Norwegian Regulations on technical requirements for construction works (TEK 17). Construction waste includes both hazardous and ordinary waste (see separate definitions), but does not include excavated masses from construction activities.

D2 Hazardous waste

Waste that contains substances that are hazardous to health and the environment and must be handled properly so that it does not create pollution or harm humans or animals. Hazardous waste is regulated by Chapter 11 of the Norwegian Waste Regulations.

D3 Ordinary waste

Any waste that is not considered hazardous waste, explosive waste, radioactive waste or infectious waste.

D4 Recycling of materials

Any form of recycling in which waste materials are used in the manufacture of non-waste substances or movable property. Recycling of materials includes biological treatment of organic waste. The use of waste for the production of energy or materials to be used as fuel or fillers is not considered as material recycling.

The following are examples of rmaterial recycling

1. Return of materials to the supplier via a "return system" that includes recycling of materials.

2. Recycling of materials through an approved company (or similar) that has established processes for such recycling.

D5 Re-use

Re-use of products or materials for their original purpose, without them having to be significantly processed. The following are examples of re-use:

1. Re-use of material on site for the same use or new uses.
2. Re-use of the material elsewhere than on site.
3. Disassembly of materials and building parts for potential re-use.

D6 Recycling

See recycling of materials

Additional information

None

Wst 03a Operational waste (non-residential and residental institutions only)

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	-	-	-	1 credit	1 credit

Aim

To encourage the recycling of operational waste through the provision of dedicated storage facilities and space.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	1–2	1–2
Assessment type specific notes	None	See refs. 1.0–1.1 See Appendix D	See refs. 1.0–1.1 See Appendix D

Notes for fully fitted/shell & core	
1.0	If the end occupier is not known, but the functions or areas of the assessed building suggest that large amounts of packaging or compostable waste are likely to be generated during the building's operation, e.g. it is a retail or industrial project or contains a large catering facility, then an appropriately sized space and services or infrastructure to accommodate the relevant facilities must be provided. The facilities themselves do not necessarily need to be provided or installed to demonstrate compliance.
1.1	End user/occupier known 1. As common criteria OR 2. The end user/occupier commits to providing a dedicated space for a compactor/baler and/or composting vessel installation (or storage space for compostable material) including: a. A suitable concrete standing for a future installation b. A three-phase power supply c. c. Good access for goods collection and vehicle manoeuvring

Building type specific notes

Building type specific notes	
2.0	**Small industrial units** Foran industrial building or development site comprising a number of smaller units, each with a floor area of ≤ 200m², shared facilities that meet the above criteria for the building or site as a whole are sufficient to achieve this credit.
2.1	**Multiple building assessments and buildings that form part of a wider estate.** Where the assessment applies to one or more buildings or units that are part of a wider estate or campus, the design team can choose to demonstrate compliance through the provision of dedicated centralised storage space and waste management facilities with the capacity to accommodate the recyclable waste material generated from all buildings and their activities.
2.2	**Shopping centres and retail parks** Shopping centres and retail parks must have adequate space to cater for each tenant and their potential recyclable waste volumes. Tenants that occupy a large proportion of the centre, i.e. 'flagship tenants', must have their own dedicated compliant facilities. For smaller non-flagship tenant units, compliant central or common facilities on site or dedicated spaces for individual units will meet the assessment criteria for this BREEAM issue.

2.3	**Multi-residential buildings**: Home composting information leaflet The leaflet must provide information on: - How composting works and why it is important - The materials that can be composted (e.g. raw vegetable peelings and fruit, shredded paper, tea bags, etc.) - Details of the operation and management plan for the communal composting scheme. Where a green or kitchen waste collection scheme is in operation, an information leaflet provided by the local authority is sufficient to meet the information leaflet criteria.
2.4	**Multi-residential buildings**: supported living facility Where it is not possible for safety reasons to locate recycling bins within a communal area accessible to residents (e.g. in cases where residents have mental health problems and free access to these facilities would pose a significant risk of self-harm or harm to others), it is acceptable to locate them in a dedicated non-obtrusive position accessible to staff only, but in close proximity to areas that generate recyclable waste material.
2.5	**Multi-residential:** waste storage shared by more than six bedrooms Where multi-residential buildings contain communal facilities shared by more than six bedrooms, the requirement for total waste storage can be increased on a pro-rata basis to demonstrate compliance. For instance, if the standard requirement is 30L for six bedrooms, this equates to 5L per bedroom. When assessing a flat with eight bedrooms, this requirement increases to 40L (8 x 5L). The minimum size of individual containers remains unchanged as per the criteria.
2.6	**Healthcare buildings** The types of waste that are sorted must comply with the relevant legal requirements, such as legislation related to infectious waste. The solutions must be weighed against medical or hygienic considerations that are relevant for the planned use of the building.
2.7	**Extensions to existing buildings:** Where there are facilities within the existing building, these can be used to assess compliance. The scope of these facilities must be adequate to cater for the total volume of predicted recyclable waste arising from the new and existing buildings.

Assessment criteria

This issue comprises one part:

- Operational waste – 1 credit

Operational waste - 1 credit

1. Provide a dedicated space or spaces for the segregation and storage of operational recyclable waste generated. The space and equipment (if installed as part of the building) must be:
    a. Clearly labelled, to aid segregation, storage and collection of the recyclable waste streams
    b. Accessible (see Methodology) to building occupants or facility operators for depositing materials and collection by waste management contractors
    c. Of a capacity appropriate to the building type, size, number of units (if relevant) and predicted volumes of waste that will arise from daily or weekly operational activities and occupancy rates
2. Where there is likely to be a consistent generation (in volume) of operational waste streams, e.g. large amounts of packaging and/or compostable waste generated by the building's use and operation, the following facilities are provided:
    a. Static waste compactor(s) or baler(s); situated in a service area or dedicated waste management space.
    b. Vessel(s) for composting suitable organic waste resulting from the building's daily operation and use OR adequate space(s) for storing segregated food waste and compostable organic material prior to collection and delivery to an alternative composting (or biogas) facility.
    c. A water outlet (for cleaning and hygiene purposes) adjacent to, or within the facility for storing/composting of organic waste if on site. .

Additionally for multi-residential buildings with self-contained dwellings or bedsits only

3 Three internal storage containers must be provided for each dwelling or bedsit with the following requirements:
   a. A minimum total capacity of 30 litres
   b. No individual container smaller than 7 litres
   c. All containers in a dedicated non-obstructive position
   d. Storage containers for recycling in addition to non-recyclable waste storage

4 Provide home composting facilities and a home composting information leaflet in the kitchen or communal ares for each self-contained dwelling or bedsit. If there is a food waste collection scheme, the information sheet from the local authorities is sufficient to satisfy the criterion.

Additionally for multi-residential buildings with individual bedrooms and communal facilities only

5 Meet criteria 3.a –c for self-contained dwellings or bedsits for every six bedrooms.

Methodology

M1: Dedicated storage space for recyclable waste

M1.1 Number of recyclable fractions

The area set aside must be used to sort and store at least six different types of recyclable fractions in accordance with local requirements for waste collection:

a. Paper
b. Cardboard
c. Plastic
d. Other packaging materials (not listed above)
e. Glass
f. Metal
g. Batteries
h. Wood
i. Fluorescent lamps
j. Plant oils
k. Mineral oils
l. Food waste
m. Electronic and electrical waste
n. Textiles
o. Toner cartridges and ink cartridges
p. Other recyclable waste that can be treated.

If two or more of these fractions are sorted in a common container, they can be counted as several fractions. For example, if glass and metal are sorted in one container it is counted as two fractions.

Individual recycling bins located at convenient locations throughout the building are necessary to maximise recycling rates. On their own, however, they are not sufficient to obtain this credit.

Food waste or organic waste can either be composted directly on site or stored to be sent to composting facilities, biogas production or other kinds of upgrading of organic waste. The aim is that food waste should be sorted and not to be treated as residual waste.

M1.2 Determining whether the dedicated space is compliant

The design team must demonstratethat the provision of waste management facilities for the assessed building is adequate given the building type, occupier (if known), operational function and likely waste streams and volumes to be generated. Guide for mapping waste streams, *Waste in operation – how to succeed with sustainable waste management*, can be found at Norwegian Green Building Councils website.

Where it is not possible to determine what kind of provision should be made, the following guide should be used for the provision of minimum storage space:

a. At least 3.5m² per 1000m² of net floor area for buildings < 5000m²
b. A minimum of 18m² for buildings ≥ 5000m²
c. An additional 2m²per 1000m²of net floor area where catering is provided (with an additional minimum of 10m² for buildings ≥ 5000m²).

The net floor area should be rounded up to the nearest 1000m².

The additional 2 m² per 1000 m² of waste storage area provided for catering is measured against the "net floor area where catering is provided" and NOT the floor area of the catering facility. Generally, a catering facility will serve all building users. If it can be demonstrated that this is not the case, for example, if part of the development is subject to a separate tenancy that is not served by the catering facility, the area calculation can be adjusted accordingly.

The additional operational waste storage requirement for developments that include catering is generally only applicable where a commercial kitchen is present. Where the design team can justify that there will be no significant waste streams from a modest facility, such as a small café that sells only drinks and pre-prepared snacks, the additional waste storage area identified in the default values does not need to be provided to meet compliance. If the project can document that an alternative solution can serve as a waste storage areaand ensure sorting of at least six different recyclable fractions, the project can disregard the area requirements above. This purpose can also be achieved using a combination of solutions.
Astorage area for recyclable materials must be in addition to areas and facilities provided for dealing with general waste and other waste management facilities, e.g. compactors, balers and composters.

Where the facilities are situated internally, entrance gate dimensions, manoeuvring and loading space must be designed to ensure ease of access for vehicles collecting recyclable materials. For sites that have limited space for static installations, compliance can be assessed on the basis of the provision of adequate space for a smaller portable compactor or baler.

Some companies now offer a fully automated underground system for the collection, sorting and transport of waste, allowing source separation of different types of waste from multiple locations, with enhanced hygiene, occupational health and safety standards. It also reduces waste transport by lorries, reducing nuisance and CO_2 emissions from fossil fuel consumption. These are accepted as a form of compliance as long as a management plan is in place, which can either be public (local authority) or private and that the requirements for separation are met.

M1.3 Accessible space

Typically, 'accessible' is defined in BREEAM-NOR as either inside a building or within 20m of a building's entrance. In some circumstances, depending on the size of the building, site restrictions or tenancy arrangements, it may not be possible for the facilities to be within 20m of a building's entrance. If the BREEAM-NOR Assessor considers it is not feasible for the facilities to be within 20m of a building's entrance, then the Assessor's judgement should be exercised to determine whether the facility is deemed to be 'accessible' to the building's occupants and goods collection.

Where the facilities are situated internally, entrance gate dimensions and manoeuvring and loading space and floor must be designed correctly to ensure ease of access for and withstand the use of vehicles collecting recyclable materials. See Additional information.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A confirmation/commitment from the developer that the provision and scope of dedicated facilities (on and off site) according to the criteria and method will be met. Applies to those cases in which the relevant party is not selected. ------------- OR Documentation showing the contractual obligations for the relevant parties to map probable waste streams with indicative quantities, and design and deliver waste facilities according to the criteria and method. ------------- OR Documentation showing the waste facilities described for the building, including placement of individual recycling bins. The number and type of recyclable fractions should be indicated in drawings. AND Documentation confirming likely building waste streams and indicative quantities.	As interim design stage. BREEAM-NOR Assessor's site inspection report and photographic evidence confirming compliant installation.

Definitions

D1: Waste compactor or baler

A machine that is designed to compress waste streams in order to improve storage and transport efficiency.

D2: Dedicated storage space for recyclable waste

The dedicated storage space must cater for the separation and storage of recyclable materials. If any local collection scheme requirements are more stringent, these should be used to demonstrate compliance.

D3 Flagship or anchor tenant

The largest and primary tenant within a retail development, typically department store type retailers.

Additional information

T1: Recyclable storage

The following can act as a guide when determining size and accessibility criteria for the recyclable storage space:

1. Compactor dimensions: about the size of one parking bay, 4.8 x 2.4m

2. Skip: the footprint of an 8 and 12 cubic yard skip measures 3.4m x 1.8m. Therefore allow a minimum of 2.0m width and 4.0m length or $8m^2$area for the storage and access of such containers
3. Wheeled bins: 360 litre = 0.86m x 0.62/660, L= 1.2m x 0.7m/1100, L = 1.28m x 0.98m
4. Roll-on-roll-off containers: allow a minimum of 6.1m x 2.4m
5. Vehicle access: the following are dimensions for lorry types that are typically used to collect waste. Therefore, minimum entrance gate dimensions should not be smaller than the following:
   a. Dustcart: medium capacity, length = 7.4m, height = 4m, width 3.1m
   b. Skip lorry: length = 7m, height = 3.35m, width 3.1m.

Consideration must also be given to any other types of vehicle requiring access to this area, e.g. lorries for roll-on roll-off containers.

Wst 03b Operational waste (residential only)

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	-	-	-	1 credit	1 credit

Aim
To recognise and encourage the provision of dedicated storage facilities for operational-related household waste streams and so help to avoid waste being sent to landfill or incineration.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	Not applicable	Not applicable
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/shell & core	
None	

Building type specific notes

Building type specific notes	
2.0	**Extensions to existing buildings** Where there are external facilities within the existing building, these can be used to assess compliance. The scope of these facilities must be adequate to cater for the total volume of predicted waste from the new and existing buildings.
2.1	**Multiple building assessments and buildings that form part of a wider estate.** Where the assessment applies to one or more buildings or units that are part of a wider estate or campus, the design team can choose to demonstrate compliance through the provision of dedicated centralised storage space and waste management facilities with the capacity to accommodate the recyclable waste material generated from all buildings and their activities.

Assessment criteria
This issue comprises one part:
- Sorting of waste (1 credit)

Sorting of waste – 1 credit
1 A practise is established to properly separate recyclable, non-recyclable, and non-compostable household waste (see Methodology). The practise must be in accordance with either alternative one or two, as described below:

Alternative 1: If waste is stored locally on the site before being collected, there must be sufficient space for waste storage at the site. The space must be:

a. Able to hold containers with a volume of either:
   i. The minimum volume recommended by the appropriate local authority OR
   ii. Where there are no recommendations from the local authority, 100L of volume for a single bedroom dwelling and a further 70L for each additional bedroom.
b. Located on a level hardstanding surface
c. Accessible to the occupants of the house or apartment block of flats.

Alternative 2: The waste is transported directly from the building to a central waste processing facility without intermediate storage, for example, via an automated vacuum collection system. The area for waste delivery must be accessible to the building's occupants and the system must meet the requirements regarding sorting etc. as described under Methodology.

2. Adequate internal space (including bins) must be allocated to the storage of recyclable household waste, as follows (see Methodology):
   a. There are at least three bins for the storage of recyclable household waste with the following capacity:
      i. Total capacity of at least 30L
   b. Each bin has a capacity of at least 7L
   c. Internal recycling bins should be located in a dedicated non-obstructive position. Free-standing recycling bins placed directly on the floor or in a cupboard are not compliant. The bins could be located in a kitchen (close to the non-recyclable waste bin) or located adjacent to the kitchen (i.e. within 10m), e.g. in a utility room or connected garage.
   d. One of the bins must be suitable for organic waste.
   e. The building's occupants must be given written information regarding waste separation according to the guidelines of the local waste collector (see Methodology).

Methodology

M1 Sorting of waste

M1.1 General

The dedicated requirements are default guidelines for situations in which it is not possible to demonstrate the required size for waste containers based on known waste streams. Compliance can be achieved provided that it is clearly demonstrated and evidenced that the waste facilities and dimension of waste storage provided are appropriate and customised according to the waste containers offered by the local waste collection service. Dimensions and design should meet the guidelines of the local waste collection service. The assessor should consider dimensions and facilities and that these meet the criteria based on the building type, occupancy and the likely waste volumes generated as a result of these.

SINTEF Building Research Design Guide 379.265 Consumer waste, Source separation, Collection and Fire safety provides an overview of regulations for the collection and transport of consumer waste, with emphasis on facilitation and solutions for the sorting and collection of household waste. The project can use the design guide as a basis for design, where relevant.

M1.2 External storage area for waste

Containers must be placed outside the apartment or living area and can be stored either outdoors or indoors, as long as they are accessible to the building's users.

Where an outdoor space is provided by the local authority or by the developer for storing non-recyclable and recyclable waste as part of the requirements from the local authority for small communities of dwellings, this can still be used to demonstrate compliance.

For the purpose of this issue, the space needs to be compatible with the range of recyclable collection provided by the local authority. Some companies offer a fully automated underground system for collecting, sorting and transporting waste (automated vacuum collection system). It enables central sorting of waste closer to the source from several locations, with improved hygiene, occupational health and safety standards. It also reduces the use of waste transport by trucks and reduces nuisance and CO_2 emissions from fossil fuel consumption. These are acceptable as a form of compliance as long as a management plan is in place, which can either be public (local authority) or private, and that the requirements for separation are met.

The distance from living area to waste containers will depend on the collection scheme in operation in the locality and should permit the easy transfer of recycled waste streams to the waste processing facility. As a baseline this should normally be taken as the recommended distance set out by local authority requirements.

OR

100m from one of the building's exits, where there are no other requirements.

M1.3 Internal storage for waste and information about sorting

A dedicated non-obstructive position is ideally in an easily accessible cupboard under a sink or any other cupboard in the kitchen, next to the storeroom or likely area for storing non-recyclable waste, where practical. Where a kitchen cupboard location is not possible, the bins can be located near to the kitchen, in a utility room or connected garage, for example.

An information leaflet about waste sorting must include the following information:

- Where different waste fractions are to be delivered, including information on where the nearest collection point is located (applies to both fractions that are collected locally and fractions that must be transported to central collection points)
- Sorting guide (information on how to sort correctly, and on what types of waste belong to individual waste fractions
- Pick-up frequency for different fractions (for fractions handled locally)

The information must be in writing and easily accessible, e.g. in the form of a laminated notice adjacent.to waste containers.

Evidence

Criteria	Interim design stage	Post-construction stage
All	A confirmation/commitment from the developer that requirements will be set for the size and location of the corresponding waste management areas (both internal containers and for external areas) and that a sorting guide will be prepared according to the criteria and method. Applies to those cases for which the relevant party is not selected. ------------- OR Documentation showing the contractual obligations for the relevant parties to: - submit calculations to justify the size of the space reserved for external waste storage - obtain information on the receipt of organic waste from local authorities/private organisations - prepare a specification for the central facility (if relevant) - document that there is a corresponding external area managed by the local authority - (if applicable) - prepare a sorting guide ---------------- OR Design drawings or equivalent showing the size and location of the corresponding waste management areas (both internal containers and external area) for the building. AND Documentation from local authority/private organisation for the reception of organic waste AND If relevant: specification of central facility. AND If relevant: Documentation that there is a corresponding external area managed by local authority	As design stage. AND As-built drawings and/or specifications (where applicable) AND Sorting guide AND The assessor’s inspection report with photographic evidence showing that requirements for the size of containers, availability and hard ground have been installed in accordance with the criteria and method.

Definitions

None

Additional information

None.

Wst 04 Speculative finishes (offices and multipled wellings only)

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	-	-	-	-	-

Aim

To encourage the specification and fitting of finishes selected by the building occupant and therefore avoid the unnecessary waste of materials.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	Not applicable
Assessment type specific notes	See ref. 1.0	See ref. 1.0 See Appendix D	None See Appendix D

Notes for fully fitted/shell & core	
1.0	**For offices**: Where the developer has not specified or installed any floor or ceiling finishes, the requirements can be deemed as met and the credit can be awarded.

Building type specific notes

Building type specific notes	
2.0	Where fully-fitted multiple residential units are developed exclusively for the rental market, compliance for this issue can be achieved where it is demonstrated that the tenancy agreement to be implemented stipulates that the tenant cannot replace the finishes.

Assessment criteria

This issue comprises one part:

- User involvement surface finishes – 1 credit

Speculative finishes – One credit

1 For tenanted office areas (where the future occupant is not known), prior to full fit-out works, carpets, other floor finishes and ceiling finishes have only been installed in a show area. See Methodology.

2 In an office building developed for specific occupants, these occupants must have selected (or agreed to) the specified floor and ceiling finishes.

3 For multiple dwellings (where the future occupants are not known), floor, kitchen and bathroom finishes (see Definitions) have only been installed in a show area. See Methodology.

4 In a residential building, future occupants must have selected (or agreed to) at least three of the specified floor, kitchen and bathroom finishes.

Methodology

M1: Show area in office buildings and multiple dwellings

Office building: either a floor plate or an individual office. However, to award this credit, the show area must be less than 25% of the net lettable floor area.

Residential buildings: A show home or apartment. Alternatives to show homes can also be used, for example, by giving residents the opportunity to visit a dealer/supplier in order to be able to compare the options offered.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A confirmation/commitment from the developer that future occupants will be involved in accordance with the criteria. Applies to those cases in which the relevant party is not selected. ----------------- OR Documentation showing the contractual obligations for the relevant parties to involve future occupants in decision making. ------------- OR Documentation that confirms future occupants' involvement, or that they will be involved, in choosing the building specifications.	Documentation that confirms future occupants' involvement in choosing the building specifications.

Definitions

D1: Residential kitchen and bathroom finishes

1 Kitchen units (cabinets and counter tops):
2 Kitchen appliances
3 Kitchen wall finishes
4 Bathroom suites (bath, shower, basin, WC)
5 Bathroom wall finishes

D2: Multiple dwelling

Multiple dwellings are any number of permanent residential buildings greater than one.

Additional information

None

Land use and ecology

Summary

This category encourages sustainable land use, habitat protection and creation, and improvement of long term biodiversity for the building's site and surrounding land. Issues in this section relate to the reuse of brownfield sites or those of low ecological value, mitigation and enhancement of ecology and long term biodiversity management.

Category summary table

Issue	Credits	Aim
LE 01 Site selection	2	To encourage the use of previously occupied and/or contaminated land and avoid land which has not been previously disturbed.
LE 02 Ecological risks and opportunities	2	To determine the existing ecological value associated with the site, including surrounding areas, and the risks and opportunities for ecological protection and enhancement as part of the project
LE 03 Managing impacts on ecology	3	To avoid, or limit as far as possible, negative ecological impacts associated with the site and surrounding areas resulting from the project.
LE 04 Ecological change and enhancement	4	To enhance ecological value of the area associated with the site in support of local, regional and national priorities. .
LE 05 Long term management and maintenance	2	To ensure ongoing monitoring, management and maintenance of the site and its habitats and ecological features in order to ensure that the intended outcomes are realised in the long term
LE 06 Climate adaptation	1	Existing natural climate impacts on the building must be reduced or eliminated. The future need to carry out works to adapt the building to take account of more extreme weather changes resulting from climate change and changing weather patterns must be minimised.

LE 07 Flooding and storm surge	2	To assess the risk of floods and storm surges and prevent damage to the building and development area both today and in the event of future climate change
LE 08 Local surface water management	3	Avoid, reduce and delay precipitation to public sewers and watercourses, thereby minimising the risk of impact due to flooding on and outside the development area, as well as pollution of watercourses and other environmental damage. This includes taking future climate changes into account.

LE 01 Site selection

Number of credits available	Minimum standards				
	P	G	VG	E	O
2	–	–	–	Crit. 2	Crit. 2

Aim

To encourage the use of previously occupied land and avoid land that has ecological qualities.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/shell & core	
None	

Building type specific notes

Building type specific notes	
2.0	**Playing fields** A playing field within the construction site can be considered as previously occupied land, provided an equivalent area of playing field is reinstated on land that has few ecological qualities (see definition in LE 02) within one year of completing the construction works.

Assessment criteria

This issue comprises of one part:

– Previously occupied land (two credits)

Previously occupied land – up to two credits

1. A percentage of the construction site (see Definitions) must be on an area of land which has previously been occupied by industrial, commercial or domestic buildings or fixed surface infrastructure. See Methodology and Definitions.

Table LE01-01 Percentage of the construction site on previously developed land

Percentage of the construction site on previously developed land	Credits
75%	1
95%	2

2. The site should not be defined as any of the following area types:
    a. Agricultural land or arable land as regulated in the Land Act.
    b. Areas that corresponds to the definition of forest as stipulated in national legislation used in the national greenhouse gas reporting in accordance with the FAO's definition of forest.

Methodology

M1 Previously occupied land

M1.1 Temporary works
Undeveloped areas of the site to be used for temporary works (e.g. temporary offices or parking, material or machinery storage) must be considered as a part of the construction site and therefore included in the calculations.

M1.2 Infill development
New buildings developed within the boundary of existing sites do not automatically comply with the reuse of land criteria. The land on which at least 75% or 95% of the new building will be sited must meet the definition of previously developed.

M1.3 Development on agricultural or arable land
The criterion is based on the EU taxonomy for sustainable finance, annex I. The taxonomy was launched in 2021 and not all parts of it is finished or have been given a final official interpretation in Norway. BREEAM-NOR has introduced the methodology below but will correct the methodology according to interpretations by relevant authorities. Changes in the methodology as a result of this will be published on www.byggalliansen.no.

The project shall investigate whether the site has been defined as agricultural area in the last 10 years before the land was converted to building development. This is independent of whether the process of developing the property was initiated by the current developer or by other parties.

Norwegian Institute of Bioeconomy Research (Nibio) has established map layers and value classes for agricultural land and arable land in collaboration with the Norwegian Public Roads Administration. See Verdiklasser for jordbruksareal og dyrkbar jord - Nibio. The assessment shall either document that according to this classification the site is not defined as agricultural area or arable land or is not defined as an area of «Medium value», «High value», or «Very high value». To find out how the site is classified, the assessment can use Nibio's map service "Kilden" with filtering on the three map layers under "Value classes for arable land", see Kilden - Arealinformasjon (nibio.no)

Please note that even if the site is not defined as agricultural area in local area plans or is marked as grey on Nibio's map service, it can still be an agricultural area. The site could for example have been converted to the Open Land class awaiting land conversion for construction. If it is less than 10 years since the site was classified as agricultural land, the site must still be considered agricultural and arable land and will not be approved. If the assessments are in doubt, local authorities should be contacted to clarify this. If the area is already developed, this problem is not relevant.

If the construction site is located on converted agricultural land, an approved zoning plan is not sufficient to show that the criterion is met. In such cases, the project must be able to present detailed documentation from the relevant authority stating the reasons for the conversion of the agricultural land. Reasons that can be accepted are:
- The area has been converted because it is of a size and shape that will not provide an acceptable operational solution, as described in the Land Act §1 and §12.
- The agricultural area is replaced by moving the soil and using it to establish a new agricultural land on a site that would not otherwise be suitable for agricultural cultivation. It must be confirmed by a competent person, such as a land consolidation adviser, that the new agricultural land will achieve the same value class as the original land.
- The area has been converted because it is adjacent to or contains elements that are subject to protection and conservation measures under the Biodiversity Act or the Cultural Heritage Act. An example could be that the area is adjacent to a nature reserve or situated next to a cultural heritage area where a visitor center or similar is to be built.

The lists above are based on the Land Act and details in Circular Note M-1/2013Conversion and division - Land Act, chapters 6.3 and 6.4
https://www.regjeringen.no/contentassets/3467107503334e26b980468ded9a96af/rundskriv-m-1-2013-omdisponering-og-deling--- revised-03-09-15.pdf

Please contact NGBC if you need further guidance on this criterion.

M1.4 Development on land defined as forest

The criterion is based on the EU taxonomy for sustainable finance, annex I. The taxonomy was launched in 2021 and not all parts of it is finished or have been given a final official interpretation in Norway. BREEAM-NOR has introduced the methodology below but will correct the methodology according to interpretations by relevant authorities. Changes in the methodology as a result of this will be published on www.byggalliansen.no.

The project must document that the site has not been classified as forest (see Definitions) in the municipal master plan before the land was converted to building development. This is independent of whether the process of developing the property was initiated by the current developer or by other parties.

If the forest on the site is part of a larger forest area that exceeds 0.5 hectares, the criterion will not be met, even if the size of the forest on the site itself does not exceed 0.5 hectares.

Please contact NGBC if you need further guidance on this criterion.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Documentation such as drawings, photos or similar confirming: - Type and duration of previous land use. - Area (m²) of previous land use. - Placement and footprint (m²) of the construction site	As-built documentation showing the placement and footprint of the development. Documentation, including photos of the placement of temporary works. Where alteration has occurred, the percentage must be recalculated using as- built documentation.
2	Documentation showing that the site fulfils the criteria.	As design stage.

Definitions

D1 Hardstanding

Includes, for example, areas of paving stones, areas paved with asphalt, concrete, as well as gravel sites without vegetation. This could include parking spaces, access roads, pavements, delivery and service areas and sports arenas.

D2 Arable land

The definition can be found on Nibio's web page Dyrkbar jord - Nibio .
Arable land is land that is not fully cultivated, but which from an agronomic perspective can be cultivated to fully cultivated land, and which meets the requirements for climate and soil quality for plant cultivation.

D3 Agricultural land

The definition can be found on Nibio's web page Jordbruksareal - Nibio.

Agricultural land is highly culturally influenced land, with permanent vegetation cover (meadow / pasture) or periodic vegetation cover (fields).

Agricultural land is divided into three types of land:

a. Fully cultivated land: Agricultural area that is cultivated to normal plowing depth,and can be used for arable crops or for meadows, and which can be renewed by plowing.
b. Surface cultivated land: Agricultural area that is mostly cleared and levelled at the surface, so that mechanical harvesting is possible.
c. Infield grazing: Agricultural area that can be used as grazing, but where mechanical harvesting is not possible. At least 50% of the area must be covered with cultivated grass or pasture-tolerant herbs.

D4 Forest

BREEAM-NOR uses the definition of the UN Food and Agriculture Organization (FAO):

Land spanning more than 0,5 hectares with trees higher than five meters and a canopy cover of more than 10 %, or trees able to reach those thresholds in situ. It does not include land that is predominantly under agricultural or urban land use, i8661en.pdf (fao.org).

D5 Previously occupied land

For the purposes of this issue, BREEAM-NOR defines previously occupied land as land that is or was occupied within the last 50 years by a permanent structure and any associated fixed surface infrastructure with hardstanding (see Definitions) The definition excludes:

1. Land in built-up areas such as parks, recreation grounds and allotments which, although they may feature paths, pavilions and other buildings, have not been previously occupied.
2. Land that was previously occupied but where the remains of permanent structures or fixed surface structures have blended into the landscape over time, to the extent that they can reasonably be considered as part of the natural surroundings.
3. Land with temporary gravel for parking.

D6 Construction site

Any land which is being developed (and therefore disturbed) for buildings, hardstanding, soft landscape, parking areas and site access. This includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hardstanding, site access and temporary storage will be located, it must be assumed that the construction site is the entire area affected by the construction activity.

Additional information

None.

LE 02 Ecological risks and opportunities

Number of credits available	Minimum standards				
2	P	G	VG	E	O
	–	–	Crit. 2–4	Crit. 2–4	Crit. 2–4

Aim

To determine the existing ecological value associated with the site, including surrounding areas, and the risks and opportunities for ecological protection and enhancement as part of the project.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/shell and core	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into four parts:

- Prerequisite – statutory obligations (no credits)
- Survey and evaluation (one credit)
- Determining the ecological possibilities (one credit)
- Exemplary level credit: Wider sustainability of the site (one credit)

Prerequisite: Statutory obligations – no credits

1. The client or contractor confirms compliance is monitored against all relevant national legislation relating to the ecology of the site.

Survey and evaluation – one credit

2. A Suitably Qualified Ecologist (see Definitions) carries out a survey and evaluation of biodiversity and eco system services (see Definitions and Methodology) for the extended construction (see Definitions) site early enough to influence site preparation works, layout and, where necessary, strategic planning decisions. This is typically carried out in step 2.
3. The ecologist's survey and evaluation determines the extended construction site's ecological baseline (see Definitions), including:
    a. Current and potential ecological qualities and condition of the site and related areas within the zone of influence.
    b. Direct and indirect risks to current ecological qualities of the assessment.
    c. Capacity and feasibility for enhancement of the site's ecological qualities and, where relevant, areas within the zone of influence.
4. Recommendations and data collected from the survey and evaluation are shared with the appropriate project team members to influence decisions made for activities during site preparation, design and construction works that can support ecological features (see Methodology and Definitions).

Determining the ecological possibilities – one credit

5. Survey and evaluation criteria 2–4 must be achieved.
6. The project team liaise and collaborate with representative stakeholders (see Methodology) early enough to influence key planning decisions, typically in step 3, to:
    a. Identify the optimal ecological possibilities for the extended construction site.
    b. Identify, appraise and select measures to meet the optimal ecological possibilities for the extended construction site (criterion 6.a), in line with the BREEAM-NOR mitigation hierarchy (see Table LE 02-01).

Table LE02-01 – the BREEAM-NOR mitigation hierarchy

Mitigation level	Ecological possibilities
1	Avoid and preserve (see Definitions)
2	Protect
3	Reduce or limit negative impact
4	Restore (see Definitions)
5	Compensate on or outside the construction site
6	Enhance (see Definitions) after a consideration of feasible possibilities on construction site, or where viable, off site

Exemplary level criteria: Wider sustainability of the construction site – one credit

7. Criterion 6 must be achieved.
8. Wider sustainability related activities and potential ecosystem service benefits (see Definitions) are considered as part of determining the optimal ecological possibilities for the construction site (criterion 6), including the areas outlined in the Methodology.
9. The credits for the assessment issues outlined below must be achieved:
    a. LE 08 Local handling of surface water – one credit for Measures for surface-based water management
    b. Pol 05 Reduction of noise pollution

Methodology

M1 Prerequisite: Statutory obligations

Prerequisite means that current legal requirements related to ecology and biological diversity (see Definitions) should be identified. Planning regulations for the construction site may provide information but are not sufficient on their own.

The following acts and regulations are relevant. The list is not exhaustive:

- The Biodiversity Act
- Site-specific protection regulations
- Regulations on protected habitat types in accordance with the Biodiversity Act
- Regulations on protected species
- Regulations on the protection of endangered species
- Regulations on invasive species

It must be investigated whether all or parts of the construction site or the zone of influence (see Definitions) are defined as an ecological functional area for protected species according to the Biodiversity Act. Local and regional public bodies, as well as ecological base maps in www.okologiskegrunnkart.artsdatabanken.no can be sources of information.

M1.1 Invasive species
The investigation should include a survey and, if necessary, approved removal of invasive species found on the construction site. www.okologiskegrunnkart.artsdatabanken.no can be a source of information.

M2 Survey and evaluation
site surveys shall be carried out at suitable times of the year when it is possible to determine the presence or evidence of the presence of different plant and animal species. site surveys during the winter season are only accepted if the ecologist confirms that such surveys are acceptable, for example, on sites that have no ecological qualities.

The SQE can use their discretion to confirm whether their survey has been conducted early enough to understand the ecological features that are present before works commence and to influence site clearance, preparation and layout, and whether it is necessary to change strategic planning decisions.

If the ecologist's site survey and/or report is completed at a later stage than required, the assessor would need to be satisfied that it was produced early enough for the recommendations to influence the design and leads to a positive outcome in terms of protection and enhancement of site ecology.

If preparatory work has been carried out by the previous owner, the SQE must use aerial photographs or similar sources.

The survey and evaluation approach used should be appropriate to the scope and scale of the project. As part of this, the SQE should use their robust professional judgement in line with established best practice such as the Norwegian Biodiversity Information Centre and the NiN methodology (see Definitions). Based on this, the ecologist should determine which aspects of M2.1 are relevant for the evaluation.

M2.1 Scope of the survey
The survey of ecological qualities must include the following:
1. Determining the zone of influence for the construction site including neighbouring land and habitats (see Definitions)
2. Current flora, fauna (including permanent and transient species), as well as current habitats such as wildflower meadows, blue-green elements, ponds, wetlands, watercourses, woodlands, shrubs and associated edge zones, trees that are visibly hollow with a chest height circumference of at least 198 cm and where the opening is larger than 5 cm, large amounts of dead wood, nesting sites, etc.
3. Any habitats in or on building structures where there could potentially be wildlife, such as protected birds or bats that may be exposed to risk as a result of construction activity. Including, but not limited to barns/ sheds, dilapidated, uninhabited or rarely used buildings, structures or rooms, older buildings (e.g. built before 1960) and underground structures.
4. Current habitat properties such as extent, ecological quality, connectivity and degree of fragmentation (see Definitions).
5. Recent and historic extended construction site conditions (see Definitions).
6. Existing management and maintenance situation.
7. Existing ecological initiatives within the zone of influence (see Definitions), e.g. creek recreation, tree planting, green roofs on existing buildings or the restoration/establishment of corridors.
8. Identification of and consultation with relevant stakeholders impacted or affected by the construction.
9. Local knowledge or sources of information.

Potential sources of information for the survey:
- The Norwegian Environment Agency's methodology NiN. www.nin.miljødirektoratet.no
- The Norwegian Environment Agency's handbook 13 – Survey of habitat types – evaluation of biological diversity handbok-13-080408_low.pdf (miljodirektoratet.no)
- The Norwegian Environment Agency's nature base www.miljodirektoratet.no/tjenester/naturbase/
- The Norwegian Environment Agency's methodology for environmental impact assessments www.miljodirektoratet.no/myndigheter/arealplanlegging/konsekvensutredninger/
- The Norwegian Biodiversity Information Centre www.artsbanken.no
- Ecological base maps www.okologiskegrunnkart.artsdatabanken.no

M2.2 Scope of the evaluation

The evaluation of ecological qualities includes:

1. Current ecological qualities and condition of the construction site and the zone of influence in terms of:
    a. Ecological features (see Definitions) including habitats, species, food sources and connectivity (see Definitions)
    b. Broader biodiversity and ecosystem services benefits or opportunities (see Definitions)
2. Direct and indirect risks to current ecological value (see Definitions), including:
    a. Sensitive areas and features on or near the construction site
    b. Direct risks including those from human activity (e.g. construction work), habitat fragmentation (see Definitions) and invasive species. The ecologist should make an assessment of the risk and the need for control measures for such species.
    c. Indirect risks including water, noise and light pollution
3. Capacity and feasibility to enhance the ecological qualities
4. Potential for habitat restoration and creation
5. Impact of the proposed design, construction works and operations on the construction site insofar as these have been determined at this stage.

M2.3 Sharing of recommendations with the project team

Criterion 4 promotes the sharing of information to encourage other members of the project team to adopt measures that support ecological value at an early stage of the outline design process (e.g. landscape architect, design team, constructors, specialist consultants). At an early stage, it is easier to meaningfully influence design and site activities, whilst minimising or avoiding impacts on cost.

Sharing of information could, for example, include recommendations from the ecologist relating to aspects such as: site layout that the design team should consider, features that landscape architects can incorporate in their design or timing considerations for activities on-site to avoid disruption and maximise opportunities.

M3 Determining ecological possibilities

The intention is to promote ongoing collaboration throughout the project, to avoid missing opportunities or risks for achieving optimal ecological possibilities.

To meet this criterion, the project team need to liaise with each other to agree what the optimal ecological possibilities are (criterion 6.a) and how they will be achieved (criterion 6.b). Project team members include, but are not limited to:

1. The client, owner, occupier
2. Design, construction, facilities team
3. Landscape architect
4. Architect and relevant consultants. For example, drainage engineer or geologist

Liaison needs to happen early in the project when determining the ecological possibilities and continue throughout the project whenever key decisions are being made that could impact the ecological possibilities. Evidence may vary in nature but needs to demonstrate how and when these liaison activities will be carried out.

Where relevant (see below), the project team should also consult with other stakeholders to determine appropriate options for the construction site in question. This may include:

- Relevant local government bodies and other relevant statutory organisations
- Local community groups, organisations or charities
- Local, regional and/or national biodiversity or protection focused organisations such as Sabima, biology groups, the Norwegian Society for the Conservation of Nature, WWF, etc.

The nature of this consultation will vary depending on the project's type and scale and the sensitivity of the ecological conditions of the extended construction site. For example, projects that are large or may impact sensitive areas will probably need formal input and consultation with all of these stakeholders.

Smaller-scale projects with minimal impact may not need to formally engage with them if they incorporate decisions that comply with or exceed local and national policy on biodiversity from the stakeholders listed (e.g. relevant government White Papers, county plans, municipal plans, municipal strategy and action plans for biodiversity, blue-green structures and outdoor life). The SQE can advise on what is appropriate and what justifications are needed as part of the evidence.

M3.1 Coordinator

The activities are likely to be coordinated by someone who has an overview of the project, its members and specialist contractors. They also need to have the authority to issue instructions to deliver measures aimed at achieving ecological possibilities. As such, they would normally be a central project team member.

M3.2 Optimal ecological possibilities

For criterion 6.a, the project team, in discussion with relevant stakeholders, need to determine the optimal ecological possibilities for the project and set appropriate targets to achieve these. These targets should aim to achieve the maximum ecological benefit that is feasible when considering other limitations for the assessment.

For example, they are likely to include overall plans for protection and enhancement and any specific targets for the level of ecological change, e.g. biodiversity net gain (BNG) (see Definitions) or any specific ecological features that will be adopted (e.g. types and quantity of habitat created or enhanced).

As part of determining the optimal ecological possibilities, the project team must consider the following aspects where they are appropriate to the nature and scale of the project, in line with the SQE's recommendations (see Definitions):

1. Ecological value and benefits offered (before, during and after project completion).
2. Biodiversity and ecosystem services benefits offered (before, during and after project completion).
3. Local microclimatic conditions.
4. Habitat features, including extent, ecological quality, connectivity and fragmentation (see Definitions)
5. Opportunities to enhance the value of existing habitats and increase biodiversity, or if this is not possible, to restore or create new, more valuable habitats.
6. Opportunities to align and integrate with existing ecological features and initiatives in the zone of influence, e.g. blue-green corridors.
7. The viability of meeting the mitigation hierarchy (criterion 6.b) and capacity and feasibility of enhancement.

M3.4 Identifying and agreeing measures

For criterion 6.b, the project team and relevant stakeholders must identify and agree on measures for achieving the construction site's optimal ecological possibilities (criterion 6.a), with consideration of the following:

1. Ecological, biodiversity and ecosystem services benefits (see Definitions), accounting for:
   a. Local priorities.
   b. Long-term viability of the possibility or option.
   c. Alignment with the construction site's function, amenity and value.
2. Practicality, including consideration of:
   a. Timing and duration of implementing and realising the possibility and associated options.
   b. Outline up-front and ongoing management and maintenance costs.
   c. Long-term management and maintenance implications.
   d. Opportunities and barriers arising from management or procurement structures.
   e. Availability of appropriate skills, budgets and other resources at all stages.

M3.5 Mitigation level Avoid and preserve
See Definitions for an explanation of the term.

In some special cases, ecological functions can be moved on the construction site and thus meet the measure level "Avoid and preserve" This is only acceptable if the qualified ecologist has accepted the measure and confirms that the ecological quality, including long-term qualities, can remain unchanged after the move. The effects of changes in ground conditions, light and climatic conditions should be considered.

M3.6 Mitigation level Restoration
See Definitions for an explanation of the term Restoration.

This mitigation level can sometimes overlap with the mitigation levels of Compensate and Enhance. Both levels are used to compensate for loss, either as a result of the construction project or a previous loss.

The difference can be described as follows:

If a car park is removed where there otherwise would have been a meadow and is replaced by a new meadow with expected developments towards similar habitats and structures regarding what exists naturally in the area, this constitutes restoration.

If bird boxes are set up to replace trees that have been removed, this constitutes compensation. For example, for the loss of two bird nests in each tree, eight bird boxes will have to be installed to compensate for this particular ecological function.

M3.7 Mitigation level Compensation
See Definitions for an explanation of the term Compensation.

Compensation can take place either on or outside the development area in line with the following hierarchy:
1. in the development area
2. in areas adjacent to the development area
3. outside the development area (offsetting) as a last resort

M3.8 Approval and further development of measures
Measures are only acceptable if the SQE confirms that they are sufficient for meeting the optimal ecological possibilities agreed in criterion 6 and are feasible given the nature of the construction site, including the above considerations.

These planned measures must be added to and refined in LE 03, LE 04 and LE 05 as part of the activities that are recognised within these issues, summarised below.

M3.9 Collaboration throughout the project
Criteria relating to ‘Collaboration throughout the project’ are referred to throughout LE 03, LE 04 and LE 05. These criteria encourage planning and activities throughout the project to be informed by collaboration between the relevant stakeholders and collected information, to benefit ecology as much as possible (see each issue for the specific criteria requirements for collaboration throughout the project.)

M4 Exemplary level criteria: Wider site sustainability

The following opportunities for integrating ecology with wider site sustainability-related activities and ecosystem service benefits should be considered as a minimum and where relevant (see Definitions):

1. Landscape (see Definitions):
   a. Landscape design
   b. Heritage and local landscape qualities
   c. Blue-green infrastructure and blue-green factors (see Definitions)
2. Health and well-being:
   a. Water quality measures
   b. Noise mitigation measures
   c. Air quality control measures
   d. Light pollution control measures
3. Resilience:
   a. Climate change mitigation
   b. Flood risk management
   c. Climate-sensitive urban design such as measures to avoid the heat island effect, thermal mass, shading, biotic cooling, etc.)
4. Infrastructure:
   a. Maximising the benefits of blue-green infrastructure and optimising alignment with existing infrastructure on the construction site and in the zone of influence.
5. Community and end user involvement:
   a. Life cycle costing and service life planning (where targeted under Man 02 Life cycle cost and service life planning).

For helpful information on the benefits and examples of wider sustainability benefits that can be considered, see BREEAM Briefing Paper 'Greening the Built Environment' available here: https://www.breeam.com/engage/research-and-development/ecology/

Evidence

Criteria	Design stage	Post-construction stage
1	Documentation from the client or main contractor including: – an overview of relevant legislation – how it affects the project – a commitment to ensure compliance.	As-design stage
2-8	A confirmation / obligation from the developer that a requirement will be made to perform a survey, evaluation and that ecological possibilities will be determined. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to perform a survey and evaluation and determine the ecological possibilities. -------------- OR Documentation that shows the competence and experience of the Suitably Qualified Ecologist. Documentation that the assessment has performed a survey and evaluation to determine the site's ecological baseline.	Documentation that shows the competence and experience of the Suitably Qualified Ecologist Documentation that the assessment has performed a survey and evaluation to determine the site's ecological baseline. Documentation showing that the result is shared with relevant members of the project team. Documentation showing the ecological possibilities and measures, and the process that the assessment has followed.

Criteria	Design stage	Post-construction stage
	Documentation showing that the result have been shared with relevant members of the project team. Documentation showing the ecological possibilities and measures, and the process the assessment has followed.	
9	Completed pre-assessment estimator tool showing the project plans to achieve credits in the relevant issues.	A BREEAM-NOR assessor report confirming that credits for the relevant issues have been awarded.

Definitions

D1 The Norwegian Biodiversity Information Centre

The Norwegian Biodiversity Information Centre is a national information bank and an agency under the Ministry of Climate and Environment that works for biodiversity with its main objective to spread updated and easily accessible information about species and habitat types. Through the acquisition, organisation and communication of knowledge, this is the largest public source of information about biodiversity in Norway.

D2 Biodiversity

All the variations of life forms that exist on earth, in the soil, oceans or other aquatic ecosystems and the ecological complexities of which they are a part. This includes diversity within species (genetic diversity), at species level and at ecosystem level. Biodiversity is equivalent to the term biological diversity.

D3 Blue-green factor

Blue-green factor (BGF) is a calculation method for quantifying vegetation and water elements. It will help to stimulate the incorporation of vegetation elements and solutions for open surface water management early in the planning of a construction project. The use of a blue-green factor contributes to the use of nature-based solutions that can provide a healthier environment, more biological diversity and more robust surface water management. The conservation of vegetation, and particularly trees and their root zone, are key to this.

D4 Blue-green infrastructure

Multifunctional urban and rural areas that can form a network or be independent, and that can provide local communities with a wide range of benefits, both environmentally and in terms of quality of life. This includes both "green" and "blue" (aquatic environment) functions in natural and man-made environments. Examples are parks, open areas, sports fields, forest areas, wetlands, grasslands, rivers and canals, plots, private gardens and green roofs and facades.

D5 Enhancement in the mitigation hierarchy

Improved management of ecological functions or facilitation of new ecological functions, leading to net biodiversity improvement (NBF). This is not related to handling negative impact and is a measure that complements what is required to reduce, restore or compensate for impact.

D6 Fragmentation

Habitat fragmentation is the formation of barriers that divide the habitats of animals, plants or other organisms. Habitat fragmentation means that the opportunities of species for movement and for utilising nearby areas are reduced. This can lead to a loss of biological diversity.

D7 Habitat

Habitat is the habitat or habitat that a particular plant or animal species prefers. This is affected by physical and chemical conditions, as well as interactions with other species. Examples of different habitats can be water ponds, flood plains, rocky beaches and sandy beaches by the sea.

D8 Zone of influence

The area(s) in which ecological features may be affected by biophysical changes caused by a proposed project and associated activities. For example, this can include areas of land, flight paths or water bodies that are impacted by the construction site being assessed.

These areas can be adjacent to the construction site or can be areas that are impacted by the construction site although not physically linked. For example, wildlife populations can be isolated as a result of barriers in migration routes and changes in waterways can affect areas that are downstream of the development area.

Species and habitats in areas within the zone of influence might be negatively affected by changes on an assessed construction site but these changes may also provide opportunities to maximise the benefits of enhancement activities within the zone of influence.

D9 Preparation of the construction site

Preparatory work before the actual construction work begins. This includes all types of surfaces and groundwork, including the removal of walls, hedges, ditches, trees, other plants and ecosystem services from the construction site. It may also include the removal of illegally dumped waste or materials.

D10 Compensation in the mitigation hierarchy

Measures taken to make up for the loss of, or permanent damage to, ecological features despite mitigation measures being put in place to avoid, protect, reduce or restore as a result of negative impact. Compensation can be a replacement habitat or improvements to existing habitats similar in terms of biological features and ecological functions to those habitats that were lost or damaged. Compensation can be provided either within or outside the construction site.

The purpose of this measure is to avoid the net loss of natural values in the development area. Ecological compensation is the last resort to counteract the negative impact of construction activity after doing what is possible in the mitigation hierarchy to avoid negative impact on ecological qualities. Compensation can include ensuring ecological quality in new areas or creating new valuable habitats to replace those habitats that were destroyed.

D11 Connectivity

Areas or habitats that facilitate the movement of species between and across areas.

D12 Suitably Qualified Ecologist (SQE)

An individual achieving both of the following qualities can be considered to be 'suitably qualified' to carry out a BREEAM-NOR survey:

1. Holds a degree on a bachelor or master's level or has an equivalent qualification in ecology or an ecology-related subject.
2. Is a practising ecologist, with a minimum of three years' relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment, including: acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures.

An education in an ecology-related subject must comprise at least 60% ecology. The following education can be considered relevant:

- Education in biology, such as ecology, biology, zoology, botany and marine and freshwater biology. Nature management

– Environmental science

D13 Landscape
An area, as perceived by people, whose visual features and character is of an environmental, social and economic value, usually as a result of the action and interaction of natural and human factors, e.g. aesthetic, heritage, scenic, cultural and leisure benefits.

D14 Biodiversity Net Gain (BNG)
Biodiversity Net Gain (BNG) is an approach to development that leaves biodiversity in a better state than before. Where a development has an impact on biodiversity, it encourages developers to provide an increase in appropriate natural habitats and ecological features over and above what is being affected in such a way that the current loss of biodiversity through development will be halted and ecological networks restored.
The British institutes CIEEM, CIRIA & IEMA provide guidance that helps to achieve the principles of net gain by implementing processes throughout the project. This guidance may also contribute to meeting BREEAM criteria where followed and is available as a useful resource.

D15 NiN – Nature in Norway
NiN is a system for describing and mapping habitat types that cover all nature in Norway, both common and unusual. The system is owned by the Norwegian Biodiversity Information Centre. www.artsdatabanken.no/NiN.

D16 Restoration in the mitigation hierarchy
This involves initiating functions and processes that create, safeguard and contribute to a habitat on the construction site as a replacement for lost ecological qualities. See an example of restoration under M3.6.

D17 Avoid and preserve in the mitigation hierarchy
The prevention of impacts occurring as a result of the project, thereby preserving ecological qualities in their original condition before developing the site. This includes predictions about potentially negative environmental effects (e.g. project decisions about site location, design or timing of works).

D18 Extended construction site
An extended construction site is defined as any area that is being developed (and therefore disturbed) by buildings, hardstanding, landscaping, parking areas and site access, **plus a 3 m boundary around these areas**. It also includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hardstanding, site access and temporary storage will be located, it must be assumed that the construction site is the entire area affected by construction activity.

D19 Ecological features
Examples of ecological features include habitat, ecosystems and species.

D20 Ecological quality
In BREEAM-NOR, ecological quality constitutes more than areas of rare, protected or endangered nature. Ecological quality represents the importance, value or usefulness of a species, habitat or ecosystem to the construction site. It includes its impact on other species and habitats, as well as other environmental, social, cultural and economic value that can be delivered from species and habitats and their interactions (ecosystem services) specific to a geographical frame of reference.

D21 Ecological condition

Status and development of functions, structure and productivity in the habitats of a habitat type in the light of current influencing factors.

Good ecological condition means that the ecosystems do not deviate significantly from intact ecosystems, i.e. that important ecological functions, structure and productivity are safeguarded.
In an ecosystem with good ecological condition, human impact has not led to significant changes in food chains and nutrient cycles.

D22 Ecological baseline

The ecological baseline is the ecological qualities of the extended construction site before preparation and construction. It is used to compare performance after construction, to determine whether it is the same or has significantly changed. LE 04 describes a method for calculating changes in biodiversity for a site.

D23 Ecosystem

An ecosystem is a dynamic complex of plant, animal, and micro-organism communities, and the non-living environment interacting as a functional unit. Ecosystems vary enormously in size: a temporary pool of water in a tree hollow and an ocean basin can both be ecosystems.

D24 Ecosystem services

Ecosystem services are the direct and indirect benefits people obtain from ecosystems. The term includes both physical and non-physical services from nature. The services are divided into:

- Supply services such as food and water supply
- Regulating services such as regulation of floods, droughts, land erosion and diseases
- Supporting services such as soil formation and nutrient cycle
- Experience and knowledge services, such as tourism, cultural social services such as health and wellness, recreation, as well as spiritual, religious and other non-material benefits

Additional information

T1 Assessment routes

While many projects will require input from a suitability qualified ecologist to determine the best approach, the varied nature and scope of development sites means that some may not warrant this level of specialist input. BREEAM’s goal is to promote the consideration of ecological value and its resulting benefits on all sites. This is to increase the chance of positive benefits for the environment and for those who will occupy, interact with or otherwise be affected by the project. BREEAM has therefore developed assessment criteria that recognise meaningful actions taken involving levels of expertise that are appropriate to the specific project risks and the life cycle stage under assessment.

LE 03 Managing impacts on ecology

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	–	–	–	–	–

Aim

To avoid, or limit as far as possible, negative ecological impacts associated with the site and surrounding areas resulting from the project.

Assessment scope

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific notes	
None	

Specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into three parts:

- Prerequisite: Ecological risks and opportunities (no credits)
- Planning and measures on-site (1 credit)
- Managing negative impacts (up to 2 credits)

Note: Whilst doing different things, LE 03 and LE 04 are linked and scoring maximum credits in LE 03 is likely to make it easier to score credits in LE 04. For more information, please see Additional information.

Prerequisite: Ecological risks and opportunities – no credits

1. Criteria 2–6 in LE 02 must have been achieved.

Planning and measures on-site – 1 credit

2. Further planning to avoid and manage negative ecological impacts on-site must be carried out early enough to influence the design as well as site preparation planning (typically step 3) (see Methodology).

3. On-site measures for managing negative ecological impacts during site preparation and construction must be implemented in practice (e.g. mitigation measures to protect existing ecological features) (see Methodology).

4. Criteria 2–3 must be based on input from the project team in collaboration with representative stakeholders and data collated as part of the 'Determining ecological possibilities' in LE 02 Ecological risks and opportunities (see Methodology).

Managing negative impacts – up to 2 credits

5. Criteria 2–4 must have been achieved.

6. Negative impacts from site preparation and construction works must have been managed according to the mitigation hierarchy, in line with the SQE's recommendations (see Methodology) and, either:
   a. two credits: No net loss of (see Definitions) ecological qualities has occurred. The methodology in Appendix E and the BREEAM-NOR LE calculator shall be used to calculate the net loss.

   OR where criterion 6a is not possible:

   b. 1 credit: The loss of ecological value has been minimised (Minimising Loss)

Methodology

M1 Planning and measures on-site

The approach to managing negative impacts from site preparation and construction works should be appropriate to the scope and scale of the project. This may mean that some of the points listed in the Methodology section are not applicable to the project. Where this is the case, justifications should be given for the parts that have been excluded.

M1.1 Roles, responsibilities and planning

For criterion 2, further planning needs to be carried out for activities during site clearance and construction. This builds on the measures agreed for delivering optimal ecological possibilities in LE 02 Ecological risks and opportunities, and is likely to include plans for the following:

1. Determining responsibilities, relationships and management required for implementing measures, including clear ownership of each task.
2. Allocating roles and defining areas of responsibilities for adapting the plans and for measures, as well as for incorporating these in the project's progress plan.
3. Allocating resources to deliver these measures (including financial, time, technical and skills)
4. Implementing procedures for monitoring progress against these plans and collecting feedback to enable continual improvement
5. Aligning with related activities and processes
6. Implementing effective handover and collaboration where responsibility is transferred and shared, including transition to long-term management and maintenance arrangements.

The following should be considered to determine timescales for implementing on-site measures (where relevant):

1. Which roles and responsibilities apply
2. Ecological seasonality
3. Alignment with existing and planned activities and processes
4. Project phasing, including existing planned activities and processes on or near the site, or in the wider local area

M1.2 Contractual requirements

Contractual requirements should focus on:
1. Reducing and managing potential knock-on impacts of works (e.g. pollution and disturbance)
2. Contractual and other handover project milestones, long-term management, maintenance and monitoring requirements, as well as outline costs.

For criterion 2, further planning is likely to be coordinated by a central project team member (see 'Coordinator' in LE 02 Methodology), with input from an SQE based on their professional judgement about what they think is appropriate given the ecological features of the site.

M1.3 On-site measures

For criterion 3, on-site measures need to be carried out in line with: the SQE's recommendations (for the comprehensive route only), the measures agreed for achieving optimal ecological outcomes (LE 02) and in a technically robust, practical, feasible and cost-efficient way. See M1.4 and M1.5 for further information on best practice measures and approaches.

M1.4 Guidance on best practice

If the following elements identified as an ecological quality are present on the site and are retained, they must be protected as specified below:
1. Trees of significant ecological quality must be protected by barriers. The barriers should prevent construction work from being carried out in the area between the barrier and the tree trunk. The minimum distance between the tree trunk and the barriers must be either equal to the length of the branches or one half of the height of the tree, of which the largest distance must be chosen. Trees must be protected from direct impact and from severance or asphyxiation of the roots.
   The project should use one of the following guides as a basis for securing trees:
   - The Norwegian Public Roads Administration's guide – Hb 271 Vegetation in the road and street environment Chapter 5
   - Byggforsk series 513.710 Securing existing trees on construction sites
2. Coastal developments, watercourses, wetland areas, freshwater areas and areas with known groundwater wells should be protected by cut-off ditches and drainage of the site to prevent run-off and limit the risk of pollution, silting or erosion.
3. Masses containing invasive species must be handled by an approved agent and follow the principles in the report "Handling materials with invasive plant species and secure composting of plant waste with invasive plant species" published by the Norwegian Environment Agency. www.miljodirektoratet.no/globalassets/publikasjoner/m982/.pdf.
4. The project should take measures to ensure that invasive species are not allowed to establish themselves during the construction period before planting, as far as possible. For example, through routines to avoid exposed ground or uncovered mounds, regular weeding, etc.
5. Construction during the breeding season must be avoided. If it is unavoidable, the project should ensure that measures are in place to reduce any negative impact as much as possible.
6. Other ecological elements and natural areas that require protection must either be protected by barriers or when remote from site works or storage areas, be protected by a ban on construction work in the vicinity.

The list above refers to a number of guidelines and reports that should be used as a basis for best practice. If the ecologist, using their qualified judgment, believes that it is more appropriate to use other publicly available reports or guidelines published by recognised professional bodies, this is acceptable but should be justified.

M1.5 Documentation of measures in the construction phase

When measures are implemented during the construction phase, the contractor must ensure that there is relevant documentation in the form of photos, specifications, etc. to document that the mitigation hierarchy has been fulfilled. This includes (if relevant):

a. Photographic evidence that trees, areas etc. that should be avoided or protected are adequately protected during the construction phase, for example, when excavating or driving activities takes place nearby

b. Documentation of measures to restore and compensate should show that:
   i. necessary soil depths are established for compensatory measures

ii. the soil used meets the relevant requirements for nutrient content, is free of invasive species, etc.
iii. the seeds, plants and other elements used meet the quality requirements for origin, indigenousness, climate zone hardiness, etc.
iv. the substrate is adapted to the plants. For example, using the correct drainage and slope
v. the planting time is adapted to the growing season so that the plants will have time to develop roots before the winter.

M1.6 Collaboration throughout the project

For criterion 4, collaboration is required as part of the ‘Collaboration throughout the project’ requirements in LE 02. For the purposes of this issue, SQE recommendations produced as part of the survey and evaluation criteria in LE 02 should be shared with the project team to inform decisions relating to the site preparation, design or construction works.

As part of this, the project team is expected to liaise and collaborate with relevant stakeholders during site preparation and construction, to support optimisation of the ecological outcome for the site. This should happen at appropriate times according to the SQEs.

This builds on the liaison and collaboration carried out as part of LE 02’s ‘Determining ecological outcomes’ criteria. For example, this could possibly include disseminating information to sub-contractors to help them maintain mitigation measures on site or involve local nature conservation groups.

M2 Managing negative impacts

M2.1 The mitigation hierarchy in BREEAM-NOR

For criterion 6, the following hierarchy must be followed when managing the negative impacts of the site preparation and construction works. The criteria will only be deemed to be met if an SQE confirms that the mitigation hierarchy has been followed.

1. Avoidance of negative impacts and preservation of habitats and features of ecological quality on site.
2. If it is not possible to avoid or protect from negative impacts, habitats and features of ecological value must be protected from damage in accordance with best practice guidelines during development works.
3. If it is not possible to achieve 1 or 2 above, negative impacts must be reduced, limited or controlled as far as possible.
4. Where it is not possible to avoid/preserve, protect, limit or control the negative impacts on features of ecological quality on site, restoration or compensation must have taken place to ensure the existing ecological qualities are maintained during and after the project.

Further guidance on applying the mitigation hierarchy is given in relation to achieving the principles of biodiversity net gain, which BREEAM’s ecology issues support. (CIEEM, CIRIA, IEMA). See Definitions under LE 02.

Evidence

Criteria	Design stage	Post-construction stage
1	Documentation showing that the assessment will achieve criteria 2–6 in LE 02.	The assessor's report confirming that criteria 2–6 in LE 02 has been achieved.
2-6	A confirmation / obligation from the developer that a requirement will be made to plan and implement measures to avoid and reduce negative impacts according to the mitigation hierarchy. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to plan and implement measures to avoid and reduce negative impacts according to the mitigation hierarchy -------------- OR Documentation of plans and measures to avoid and reduce negative impacts according to the mitigation hierarchy If criterion 6a is fulfilled: Completed LE calculator in line with the methodology in Appendix E, showing that no net loss will be achieved.	Documentation including photographic evidence, showing that measures to avoid and reduce negative impacts according to the mitigation hierarchy have been implemented. If criterion 6a is fulfilled: Updated BREEAM-NOR LE calculator, showing that no net loss will be achieved.

Definitions

D1 Handover

For the purposes of the ecology-related issues in this category, handover refers to any point in the life cycle of a site or development where ecological or landscape-related responsibilities are handed over from one organisation, group or individual to another. This will include information or documentation deemed to be crucial to the successful attainment of the ecological aims and objectives. Handover strategies should be designed to support effective communication, monitoring and transition throughout the project's life cycle.

D2 No net loss of biodiversity

No net loss of biodiversity means that the negative impacts on biodiversity caused by a construction project are balanced or outweighed by measures taken in line with the hierarchy set out in this issue. There has been no overall loss of ecological value on the site as a result of activities to avoid, protect, reduce, limit, control or compensate for impacts in line with the hierarchy set out in the assessment criteria in this issue. Where statutory designated protected sites or species, or, irreplaceable habitats or legally protected nature types and species have been impacted, the project has ensured that all statutory requirements are met and are agreed with the relevant statutory bodies as necessary.

No nett loss of biodiversity is a policy goal in several countries. See additional definitions in LE 02.

Additional information

T1 Differences between LE 03 and LE 04

LE 03 recognises projects that follow good practice processes and follow the mitigation hierarchy to limit negative impacts from the project as far as possible.

LE 04 builds on the activities in LE 03 by recognising projects that follow good processes to enhance ecological value in line with the mitigation hierarchy (on site, as far as possible). It also recognises the overall change in ecological value as a result of the project by using BREEAM's calculator tool to quantify 'biodiversity units' before and after the development (based on the British Defra metric).

This approach avoids the unnecessary loss or impact of existing on-site habitats before the assessment is recognised for creating a habitat or enhancing a habitat. It is better to avoid having to compensate for negative ecological impacts in the first place due to the unnecessary time and resources associated with habitat creation or enhancement. This also reduces the risk of ecological benefits not being fully met in practice.

The good practice approaches recognised in LE 03 and LE 04 provide a way of complementing the principles of biodiversity net gain. See the definition of NBF in LE 02.

LE 04 Ecological change and enhancement

Number of credits available	Minimum standards				
	P	G	VG	E	O
Up to 4	–	–	–	–	Crit 1-2 Crit. 3–4

Aim

To enhance ecological value of the area associated with the site in support of local, regional and national priorities.

Fully fitted/ shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into four parts:

- Prerequisite: Managing negative impacts on ecology (no credits)
- Ecological enhancement (one credit)
- Calculation of changes in biodiversity (up to three credits)
- Exemplary level credit: Significant net gain of biodiversity (one credit)

Prerequisite: Managing negative impacts on ecology – no credits

1. A minimum of one credit in criterion 6 in LE 03 has been achieved.
2. The client or contractor confirms compliance has been monitored against all relevant national legislation relating to the ecology of the site (see Methodology).

Ecological enhancement – 1 credit

3. Measures have been implemented to enhance the ecological qualities. The measures must be based on input from the project team and an SQE in collaboration with representative stakeholders and data collated as part of the 'Determining ecological possibilities' in LE 02 (see Methodology). Measures must be implemented in the following order:
   a. On site, and where this is not feasible:
   b. Off site within the zone of influence.
4. Data collated are analysed and where potentially valuable, provided to the local environmental authorities. This includes information on, for example, endangered organisms, invasive organisms and valuable nature types.

Calculation of changes in biodiversity –3 credits

5. Three credits will be awarded when, as a result of the project, the change in the ecological value of the construction site, achieves a net gain according to the Reward Scale table E-07 in Appendix E. This must be calculated as described in Appendix E.

Exemplary Level criteria: Significant net gain of biodiversity - 1 credit

6. To achieve one exemplary performance, credit one of the following is achieved:
   a. The change in ecological value calculated under criterion 5 above confirms that significant net gain has been achieved as set out in Table E-07 in Appendix E.
   b. FutureBuilt's criteria set for biodiversity dated 23.10.2020 is achieved. See www.futurebuilt.no for details.

Methodology

M1 Managing negative impacts on ecology

The prerequisite in criterion 2 should confirm that the legal requirements identified in LE 02 are still met, including the handling of any invasive organisms to prevent spread.

M2 Ecological enhancement

The ecologist's report must clearly identify the enhancement measures that have been implemented, and justify how they meaningfully enhance the site's ecological quality.

This criterion intends to recognise enhancement measures that have been carried out in line with good practice recommended by an SQE, which build on the mitigation measures taken in LE 03. The enhancement measures also supports meeting good practice principles of biodiversity net gain (BNG) before quantifying the change in ecological value in criteria 5 and 6 in this issue. See definition of BNG in LE 02.

M2.1 Guidance on possible measures

The measures to be implemented will vary with the site. Examples of possible measures are given below. These can be used if a qualified ecologist confirms that they are relevant to the development area and the area of influence. The list is for guidance purposes only intended as a suggestion and is not exhaustive:

- Continuous green structures that are as large as possible should be established, with relevant multi-layered vegetation and requirements for a diverse composition of species.
- The green structure should be planned in such a way that green corridors and “pockets” are created between which animals can move, particularly in large open areas such as parking spaces or similar.
- Green roofs should be established in the form of biotope roofs (own habitats) and/or extensive green roofs or roof gardens with a minimum requirement for vegetated areas and guidelines for the composition of plant species
- Plants should be chosen that grow wild in nearby areas, preferably with a local seed source that is suitable to local climatic conditions. The seeds may be produced in the Nordic countries or have a Nordic source.
- Plants should be chosen that have value for birds and pollinating insects, such as flowers with pollen/ nectar, fruit and berries, and that ensure flowering throughout the season.
- It should be ensured that animals can remain in the area by establishing hiding places and "residences" such as leaf and twig mounds, vegetation that is not managed, bird boxes, bat boxes, squirrel boxes, insect hotels, dead wood, sunny areas with fine-grained sand, etc.
- Water elements should be created, preferably by utilising surface water as a resource, such as ponds, rain beds, streams or wetlands.
- Management of the green structure should be planned so that there is less disruption to wildlife, for example, flower meadows should be prioritised over lawns or plant hedges, trees and shrubs that can grow freely.
- To the extent appropriate, a green structure should be established that is as natural as possible, i.e. wild-growing species, plants in multiple layers should be used and vegetation should be allowed to develop

itself. Dead wood twigs/leaves etc. should be left and stone/gravel or sand areas, etc. should be included.

- Soil and stone from the site should be reused instead of adding new soil with a different composition such as commercial soil, peat, etc.
- Topsoil must be taken care of as this will contain a seed bank from existing areas of vegetation. This can be used for natural revegetation on the site, possibly in combination with new plants if appropriate where this topsoil does not contain invasive species or is contaminated.

M2.2 Guidance on best practice

When choosing plants, the ecologist should only describe plants that have been ecologically risk assessed. This is to ensure that invasive species are not used. If the species has not been risk assessed, the ecologist shall use their professional judgment to assess the risk.

When improvement measures are implemented in the construction phase, the contractor should ensure that there is relevant documentation in the form of photos, specifications, etc. to document that the conditions for the improvement to be long term, are present. This includes (if applicable):

a. Excavating and operating machinery near the roots of trees to be preserved
b. Photo documentation that the necessary soil depths have been established
c. Documentation that the soil used meets the requirements for nutrient content, is free of invasive species etc.
d. Documentation that shows that the seeds, plants and other elements used meet the quality requirements for origin, indigenousness, climate zone hardiness, etc.
e. The substrate has been adapted to the plants. For example, with the correct drainage and slope
f. The planting time has been adapted to the growing season so that the plants have time to develop roots before the winter.

M2.3. Collaboration throughout the project

For criterion 4, collaboration between relevant stakeholders referred to in LE 02 should be used to inform decisions relating to the ecological enhancement measures taken. For example, where appointed, guidance from the landscape architect or SQE regarding long-term maintenance requirements should be considered as part of decisions made for habitat creation and enhancement. A landscape architect or ecologist should be involved in the process, particularly during review of drawings and on-site inspections.

M3 Calculation of change in biodiversity

Criteria 5 and 6 are based on the outputs from the LE calculator when following BREEAM-NOR's Methodology for calculating biodiversity changes as set out in Appendix EIt quantifies a development's impact by calculating and comparing ecological values as 'biodiversity units' (ecological qualities) before and after the development. These units are determined by quantifying habitat value using the following factors throughout the assessed project's life cycle:

- type
- distinctiveness
- condition
- area or length

The percentage change of the units is used to determine the reward scale – see Table E-07 in Appendix E. This recognises Biodiversity Net Gain (BNG). Further background information can be found in Appendix E). The LE-calculator is filled out by the SQE.

Evidence

Criteria	Design phase	Post-construction phase
1	Documentation showing that the assessment will achieve criterion 6 in LE 03.	The assessor's report confirming that criterion 6 in LE 03 has been achieved.
2	Confirmation from the client or main contractor with an updated overview of relevant legislation showing how it affects the project, and that the project undertakes to ensure compliance.	Confirmation from the client or main contractor showing that the assessment has complied with all relevant legislation.
3-6	A confirmation/obligation from the developer that a requirement will be made to enhance ecological qualities and to collate and, if relevant, forward the relevant data. Applies to those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to enhance ecological qualities and to collate and, if relevant, forward the relevant data. -------------- OR Documentation of plans and specification of planned measures to enhance ecological qualities and to collate and, if relevant, forward the relevant data. Criterion 5 and 6 only: Completed BREEAM-NOR LE calculator in line with the methodology in Appendix E.	Documentation including photo evidence showing that measures to enhance ecological qualities have been implemented, and that relevant data have been collated and, if relevant, forwarded. Documentation showing that the ecologist has approved the plant selection. Assessor's inspection report and photo evidence confirming that the measures have been carried out as described Criterion 5 and 6 only: Updated BREEAM-NOR LE calculator. The BREEAM-NOR Assessor Report with completed values.

Definitions

See definitions within LE 02.

Additional information

None.

LE 05 Long term ecological management and maintenance

Number of credits available	Minimum standards				
	P	G	VG	E	O
2	–	–	–	–	–

Aim

To ensure ongoing monitoring, management and maintenance of the site and its habitats and ecological features in order to ensure that the intended outcomes are realised in the long term.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Assessment type specific notes	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue is split into three parts:

- Prerequisite: Statutory obligations, planning and site implementation (no credits)
- Management and maintenance throughout the project (one credit)
- Landscape and ecology management plan (one credit)

Prerequisite – Statutory obligations, planning and site implementation – no credits

1. Criterion 6 in LE 03 and criterion 3 and 4 in LE 04 must have been achieved.

2. The client or contractor must have confirmed that compliance is being monitored against all relevant national, EU and international standards relating to the ecology of the site.

Management and maintenance throughout the project – 1 credit

3. Measures must be implemented to manage and maintain ecology throughout the project. These measures must be based on input from the project team in collaboration with representative stakeholders and data collated as part of the 'Determining ecological outcomes' in LE 02 (see Methodology). This includes monitoring and evaluating the effectiveness and success of the measures implemented in LE 03 and LE 04. The project team must measure and consider the effect of the measures for LE 03 and LE 04 to ensure they are implemented (see Methodology).

4. A section on Ecology and Biodiversity must be included as part of the FDV (management operation and maintenance documents) and tenant or building owner/user information supplied, to inform the owner or occupant of local ecological features, values, and biodiversity on or near the site (see Methodology). This should include detailed management and maintenance plans as required by landscape and asset managers, as well as relevant parts of the handover information for occupiers written in a format that encourages understanding and supportive behaviours.

Landscape and ecology management plan – 1 credit

5. A Landscape and Ecology Management Plan, or equivalent, must be developed covering the full lifespan of the project.
   a. Actions and responsibilities of relevant individuals prior to handover
   b. The ecological value and condition of the site at handover and how this is expected to develop and change over time.
   c. Identification of opportunities for ongoing alignment with activities beyond the development project that support the aims of BREEAM's Strategic Ecology Framework
   d. Identification and guidance to trigger appropriate remedial actions to address unforeseen impacts.
   e. Clearly defined and allocated roles and responsibilities for delivering the management plan.

6. The developer or the building users must commit to using the landscape and management plan and update this to support and maintain the site in accordance with the plan's ecological qualities.

Methodology

M1 Legal requirements, planning and implementation on the site

For criterion 3, management throughout the project should include the following:

- Monitoring and reporting of outcomes and successes from the project. The list is not exhaustive.
  a. Excavating and operating machinery near the roots of trees to be protected.
  b. Photographic evidence that the necessary soil depths have been established.
  c. Documentation that the soil meets the requirements for nutrient content, is free of alien species etc.
  d. Documentation that shows that seeds, plants and other elements meet the quality requirements for origin, location and hardiness that suits the climate zone, etc.
  e. The substrate must be adapted to the plants. For example, proper drainage and slope
  f. Planting time must be adapted to the growing season so that the plants have time to develop roots before winter.
- Arrangements for the ongoing management of landscape and habitat connected to the project (on and, where relevant, off site)
- Maintaining the ecological value of the site and its relationship or connection to its zone of influence
- Maintaining the site in line with any sustainability linked activities, e.g. wider sustainability benefits (LE 02 Ecological risks and opportunities).

M1.1 Collaboration and data

For criterion 3, collaboration between the relevant stakeholders referred to in LE 02 (Collaboration throughout the project) should be used to inform decisions relating to the management and maintenance measures taken throughout the project.

M2 Management and maintenance throughout the project

For criterion 4, the handover information should include the following content, as appropriate:

1. Details of the ecological value within the site boundary (e.g. public and private gardens, green roofs edge zones and corridors), common areas (e.g. communal garden), and the surrounding area (e.g. public recreational space).
2. The benefits of the ecological value to the occupants and the broader community.
3. Guidance on how the occupants can make the most of the local ecology and contribute to its management, (e.g. planting ecologically appropriate species in their property), as well as things that

should be avoided (e.g. disrupting wildlife corridors, planting invasive species or allowing them to colonise and spread)

4. Relevant measures should be highlighted that can enhance value within the property that is owned or occupied to help ensure its ongoing management and maintenance.
5. Contact details must be provided for those parties responsible for the management and maintenance of the local ecology and sources of local information on biodiversity and ecological management, including management companies and local wildlife trusts.

M3 Landscape and ecology management plan

Biological communities are constantly changing and require positive action to maintain their conservation value. The preparation and implementation of a bespoke management plan provides a convenient means of achieving this. In order to provide clarity and certainty over what is being provided, and to enable adequate resources to be identified and allocated, plans for the long-term management of habitats, species and other biodiversity features should include the following. The list is not exhaustive, but must be considered specifically for the development area:

a. Description and evaluation of features to be managed.
b. Ecological trends and constraints on site that could influence management.
c. Aims and objectives of management.
d. Appropriate management options for achieving the aims and objectives.
e. Description of management activities. This could include plans and procedures for:
   - management of borders
   - management of new or improved habitats both during and after the establishing period
   - retention and protection of trees
   - management of bird boxes or other animal biotopes
   - management of water courses and wetland
   - securing any habitats of principal importance or habitat types in the area
   - regular mapping and measures to avoid invasive species
   - mass handling to avoiding the spread of alien organisms
f. Preparation of a work schedule (including an annual work plan capable of being rolled forward over a five-year period).
g. Body or organisation personnel responsible for implementation of the plan.
h. Monitoring and remedial measures to be implemented if the development area does not maintain the ecological qualities.
i. Funding resources and mechanisms to ensure sustainable long-term delivery of the proposed management.

NOTE: Regulatory planning conditions and other public plans may contain proposals for long-term management.

M3.1 Coordination with other operational and management tasks

Wherever possible, management of biodiversity features should be coordinated with other site management requirements, particularly the management of landscape features where there is often considerable overlap of aims, objectives and necessary management actions. This may be achieved through the preparation of an integrated landscape and ecological management plan.

M3.2 Level of detail

The level of detail required for any given site should be whatever is necessary to ensure the effective management of the biodiversity features that are present. The approach to management planning should remain flexible so that time, money and energy are not expended on the implementation of non-essential or inappropriate management works.

For some large and complex sites containing a variety of biodiversity and landscape features, a comprehensive management plan covering a broad range of management works should be prepared.
However, on smaller sites, the preparation and implementation of full-scale management might be beyond the resources available or simply be unnecessary. In such circumstances, an outline management document may be prepared.

M3.3 Monitoring and reporting biodiversity outcomes

Monitoring should be undertaken to:

a. ensure compliance with planning conditions/obligations and/or regulations regarding any protected species imposed by statutory bodies.
b. establish the success and effectiveness of measures undertaken to avoid, mitigate, restore, or compensate for impacts and/or to achieve biodiversity enhancement.

Where monitoring identifies non-compliance with planning conditions or regulatory requirements, the management plan describes procedures and responsibility. This should be used where appropriate by the relevant decision-maker to rectify non-compliance and implement preventive measures to ensure that this does not happen again.

Evidence

Criteria	Design stage	Post-construction stage
1	Documentation showing that the assessment will achieve criterion 6 in LE 03 and criterion 3 and 4 in LE 04.	The assessor's report confirming that criterion 6 in LE 03 and criterion 3 and 4 in LE 04 has been achieved.
2	Confirmation from the developer or main contractor that compliance is being monitored against all relevant national, EU and international standards relating to the ecology of the site.	Confirmation from the client or main contractor showing that the assessment has complied with all relevant legislation.
3-4	A confirmation/ obligation from the developer that a requirement will be made to manage and maintain ecology throughout the project and include this in the FDV documentation and tenant/building owner information. Applies to those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to manage and maintain ecology throughout the project and include this is in the FDV documentation and tenant/ building owner information. -------------- OR 1. Documentation of plans and specifications to manage and maintain ecology throughout the project. 2. Documentation showing how this has been included in the FDV documentation and tenant/ building owner information.	Documentation including photographic evidence showing that measures to manage and maintain ecology throughout the project have been implemented. FDV documentation and tenant/building owner/user information showing that ecology has been implemented.
5-6	1. A confirmation/ obligation from the developer that a requirement will be made to develop a Landscape and Ecology Management Plan, or equivalent. 2. A confirmation/ obligation from the developer and/ or building users to use and update this during operation. Applies to those cases where the relevant party is not selected. --------------	Documentation showing the Landscape and Ecology Management Plan, or equivalent. A confirmation/ obligation from the developer to use and updated this during operation.

Criteria	Design stage	Post-construction stage
	OR 1. Documentation showing the contractual obligations of the relevant parties to develop a Landscape and Ecology Management Plan, or equivalent. 2. A confirmation/ obligation from the developer and/ or building users to use and update this during operation. -------------- OR 1. Documentation showing the outline or draft Landscape and Ecology Management Plan, or equivalent. 2. A confirmation/ obligation from the developer and/ or building users to use and update this during operation.	

Definitions

Refer to definitions within LE 02.

Additional information

None.

LE 06 Climate adaptation

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	–	–	–	Crit. 1–6	Crit. 1–6

Aim

Existing natural climate impacts on the building must be reduced or eliminated. The future need to carry out works to adapt the building to take account of more extreme weather changes resulting from climate change and changing weather patterns must be minimised.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	1–6
Assessment type specific notes	None	None	None

Notes for fully fitted/shell & core	
None	

Building type specific notes

Building type specific notes	
None	

Assessment criteria

This issue consists of two parts

- Risk assessment (one credit)
- Exemplary level: Comprehensive response to climate change (one credit)

Risk assessment – 1 credit

1. A climate adaptation strategy appraisal must be conducted via a risk assessment. A systematic risk assessment (see Definitions) must be carried out before or during project step 2 and according to the principles in NS 5814: 2021 Requirements for risk assessments (See Methodology). The risk assessment must identify how the building and the site are affected by current and future weather and nature conditions over its projected life cycle. The assessment must include technical systems and renewable energy solutions, as well as the robustness of load-bearing systems and facades (see Methodology and Definitions).
2. The risk assessment should include:
   - Step 1: Definition of a framework for the risk assessment
   - Step 2: The identification of hazards and adverse events (see Definitions)
   - Step 3: An assessment of vulnerability, probability and consequences (see Definitions)
   - Step 4: A risk assessment, including an assessment of the achievement of safety objectives/evaluation criteria (see Definitions)
3. Specific recommendations or solutions should be developed in the project to mitigate the impacts identified in the assessment. This must be conducted before or during project step 2 and implemented in the relevant specification, planning and contract documents. Where relevant, the measures should be nature-based designs. See Definitions and Methodology.

4. An update should be provided during project step 4 demonstrating how the recommendations or solutions proposed in project step 2 have been implemented in the design, where practical and cost effective. Any omissions must have been justified by the project team and approved in writing by the assessor.
5. An update after completion must be provided that shows how the recommendations or solutions have been implemented, where practical and cost-effective. Any omissions must have been justified by the project team and approved in writing by the assessor.
6. For solutions and measures that require follow-up in the operational phase in order to function as intended, it must be documented that the building's owners and/or operating personnel have received training, and that procedures and responsibilities are clearly described in the building's FDV documentation.

Exemplary level credit – Broader response to climate change – 1 credit

The following criteria must be achieved in order to demonstrate a holistic approach being used in the design and construction to mitigate against the impacts of current and future climate in the whole life cycle of the building.

7. To achieve an exemplary level credit:
    a. Criteria 1 to 6 must be met.
    b. The criteria must be met or the credits of the assessment issue achieved, as specified in Table LE 06-01 below.

Table LE 06-01 Criterion 7 requirements

Issue	Requirements	Link to the LE 06 issue
Hea 03 Thermal comfort	Criterion 5–8	Prevent increased risk of overheating.
Ene 01 Reduction of energy use and carbon emissions	A minimum of six credits, including achievement of criterion 1–4 Passive design.	Maximise energy efficiency to tackle likely energy demand and minimise resultant carbon emissions.
Wat 01 Water consumption	A minimum of three credits	Minimise water demand during periods of drought.
Mat 05 Designing for durability and resilience	Criteria 3-5	Avoid increased risks of deterioration and higher maintenance demands.
LE 07 Flooding and storm surge	A minimum of one credit	Avoid flood risk affecting the site and other areas.
LE 08 Local surface water handling	Two credits	Avoid surface water run-off affecting the site and other areas.

Methodology

M1 Timing of the risk assessment

If the risk assessment is carried out late in the process, this could reduce the assessment to a paper exercise, with minimal value to the project. The project step requirement is there because it provides advantages to conduct such an assessment early in the project process.

In special cases, it may be acceptable for a risk assessment to be carried out at a slightly later stage, but no later than early in step 4, provided the project can document that the strategy has still influenced the planned results, i.e. that the late assessment has not in any way been detrimental to the results, and that it has still provided clear benefits for the project.

Other criteria in the issue must be met in order for the credit to be awarded.

M2 Risk assessment

The risk assessment must be carried out according to the process steps given in NS 5814: 2021 Requirements for risk assessments. The degree of detail must be adapted to the assessment but must, as a minimum, follow the process steps described below.

The risk assessment must be carried out as a qualitative assessment. This means that the project team must use the available sources described in M4 and its best judgment to analyse the risk.

The risk assessment should be updated if the risk conclusions and recommendations in the assessments are no longer robust or valid due to changes. For example, this could refer to significant changes in the prerequisites and conditions for the project, new knowledge about risk factors, changes in the regulations or several minor changes that together constitute a significant change.

M3 Step 1: Definition of framework for the risk assessment

At the start of the risk assessment, the project group should define:

- Aims, requirements and delimitations
- Qualities that need protecting (e.g. critical functions, objects and infrastructure)
- Safety objectives and evaluation criteria (see M3.2)
- Object and system description
- Methodology

M3.1 Responsible individual and meetings

An individual must be nominated to coordinate the necessary work and be responsible for documenting the assessment. For example, this could be a BREEAM-NOR AP if appointed or an advisor with expertise in risk assessment.
If the development area has many known risks or is otherwise complex, the use of experts for risk assessment should be considered.

The project plan should schedule sufficient time to carry out the risk assessment. Project team members who are to participate in the assessment should be defined. One possible method may be to set aside time in one or more project meetings to carry out the assessment.

The number of people involved should be adapted to the size and complexity of the project. When identifying hazards and adverse events in step 2 of criterion 2, people from different disciplines and/or agencies who are well acquainted with the project or have experience from similar projects should participate. This is to ensure that all potential hazards and adverse events related to the project are identified.

M3.2 Establish safety objectives and risk evaluation criteria

Safety objectives and risk evaluation criteria must be established before the risk assessment begins. This could be performance targets, functional requirements, technical requirements or requirements to optimise solutions. The risk assessment should discuss and consider the extent to which the safety objectives have been achieved.

An example of an overall safety goal could be: "The building should be robust with regard to external climate impacts today, and the next 60 years".

M4 Step 2: Identification of hazards and adverse events

Hazards and adverse events (see Definitions) must be identified by mapping hazards. Documentation and information should be procured from relevant bodies, building owners, users and other sources in order to identify and understand the expected impacts of current and future extreme weather events and climate change on the building. Relevant bodies include, but are not limited to, the following:

a. Local authorities
b. Statutory bodies, e.g. The Norwegian Energy Regulatory Authority (NVE), Norwegian Directorate for Civil Protection (DSB), the Norwegian Environment Agency, etc.
c. Technical bodies, e.g. Norwegian Water (NV), SINTEF, Climate 2050, etc.

Hazards and adverse events that could result from current and future impact must be identified. Emission scenarios corresponding to RCP 8.5 should be used when analysing the risk of hazards and adverse events caused by climate change. See www.klimaservicesenter.no.

As a minimum, all elements in Table LE 06-02 below should be considered (if relevant). The table is based on the EU taxonomy requirement on climate adaptation – Appendix A.

Table LE 06-02 impacts to be assessed

	Temperature	Wind	Water	Solid mass
Chronic	Changing temperature (air, fresh water, marine water)	Changing wind patterns	Changing precipitation patterns and types, incl. rain, snow, hail and ice	Coastal erosion
	Heat stress		Precipitation or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave/frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood and storm surge, surface water run-off and ground water flood	Subsidence
			Glacier lake outburst	

The following sources are relevant for identifying hazards and adverse events:
- Regulations on technical requirements for construction works (TEK 17) with guidance
- Map of risk areas for landslides, landslides, quick clay, floods, etc. https://temakart.nve.no/ and https://atlas.nve.no.
- Technical basis for climate adaptation (see Definitions) in Norway www.klimaservicesenter.no.
- Data on risk and vulnerability caused by natural events www.dsb.no/kunnskapsbanken

M5 Step 3: Assessment of vulnerability, probability and consequence

See definitions for a description of the terms vulnerability, probability and consequence.

Emission scenarios corresponding to RCP 8.5 should be used during risk assessment for adverse events caused by climate change. See www.klimaservicesenter.no for details.

M5.1 Assess vulnerability

An assessment must be conducted regarding the vulnerability of the site to the risk of identified hazards and adverse events occurring and having undesirable consequences. Weaknesses and dependencies that give the event the opportunity to develop should be considered, as well as barriers (see Definitions) that could change the course of events, and their suitability and effectiveness.

For example, an adjacent building could provide protection from heat and wind. The degree to which it protects the site should be considered (suitability). If it has been planned that the adjacent building will be demolished within 10 years, it will contribute less to risk reduction (effectiveness).

The following resources for climate emission scenarios and impacts are available:

- Climate in Norway 2100. Background material for NOU Climate adaptation. www.klimaservicesenter.no/kss/rapporter/kin2100
- Climate profiles for Norwegian counties at www.klimaservicesenter.no

M5.2 Assess probability

The probability should be assessed based on how likely it is that the adverse event will occur. The assessment can be qualitative.

The project is not required to obtain statistics or other figures to determine risk at a quantitative level unless specifically stated in the methodology. However, if figures and specific data are available, it is recommended that these are used as they usually result in a more reliable assessment. The assessment is based on the best available information at the time of assessment and is not intended to be an estimate of what will actually occur, regardless of whether the probability is stated in qualitative or quantitative terms.

Probability can be divided into low, medium and high, or more detailed, if appropriate. What is to be included in the categories low, medium and high should be defined for the project and be adapted to the purpose of the survey. See example of categories of probability in Table LE 06-03.

Table LE 06-03 Categories of probability

Probability	Criteria
Low	a. The incident is unknown or occurs very rarely for these types of development areas or buildings OR b. Professional judgment indicates that the probability is low, but that it cannot be ruled out
Medium	a. The incident is known to have occurred in the last X years in these types of development areas or buildings OR b. Professional judgment and precautionary considerations dictate that it is correct to take into account that the event may occur during the life cycle of the site OR c. There is considerable uncertainty (see Definitions) as to whether the event is likely to occur or not
High	a. The incident is known to occur often in this geographical area, for this type of building, in the building sector, etc. OR b. There is great uncertainty as to whether the event has a high or medium probability

M5.3 Assess consequences

The consequences of any incident must be assessed for the defined qualities (M3). For example, consistency can be divided into low, medium and high, or in more detail if appropriate. What is included in the categories low, medium and high should be defined for the project and be adapted to the purpose of the survey. The type of construction can affect the consequences of the incident.

Hazards and adverse events and their consequences should be divided into three matrices with the following categories:

a. Consequences for health and safety (humans)
b. Consequence for the building and site during the whole life cycle
   i. Structural stability
   ii. Structural robustness
   iii. Weatherproofing and detailing
   iv. Material durability (see Definitions)
c. Consequence for financial conditions, for example, building contents and business continuity

Example of categories of consequences can be found in Table LE 06-04.

Table LE 06-04 Categories of consequence

Consequence	Health and safety	The building/site	Financial conditions
Low	Non-serious or short-term health damage	No or minor impact	Financial loss less than X
Medium	Serious short-term health damage or less serious long-term health damage	Will cause impact. OR Consequences are uncertain	Financial loss between X and Y
High	Death or high probability of serious and long-term health damage	Major consequences	Financial loss greater than Y

Examples of financial consequences as a result of hazards and adverse events may be that all or parts of the building or the site:

- Experience increased costs for repairs, conversions or renovation earlier than the service life would indicate.
- Loss of rental income because the building cannot be leased for shorter or longer periods or because it is less attractive to tenants or users.

If possible, one or more financial factors adapted to the project should be determined for the low/medium/high impact categories. This could be costs, occupancy rate, income, value loss, etc. The consequences of financial loss should be assessed for the whole life cycle.

M5.4 Describe uncertainty

The strengths and weaknesses of the knowledge base should be assessed for all parts of the risk assessment. The knowledge base must be described together with the results of the risk assessment. Any weaknesses in the knowledge base must be specified in the description of risk and taken into account in the recommendations and decisions related to risk management. In practice, this means answering the following question: Are we sure that the level of risk is correct?

For example, the uncertainty will be low for the event "strong wind" if this is a known weather phenomenon in the area where the building is located and is supported by the wind rose for the area.

To reduce uncertainty, the project can use previously recorded events and statistics. These can be used to gain an impression of what can be expected in terms of hazards, adverse events, frequency and possible consequences. Note that even if an event has not previously occurred, it may still occur in the future.

M5.5 Describe the risk

The results of the assessment must be presented so that they can be evaluated in accordance with established safety objectives and evaluation criteria (M3.2). It should be clear that risk is a complex and detailed subject. Risk can be described by stating the probability of hazards and adverse events and the consequences they may have, how vulnerability affects probability and consequences, and what contributes to uncertainty. Trends that may change the risk situation in the future may be included in the description.

One way of describing risk is to enter all identified hazards and undesirable events into a risk matrix, see Figure LE 06-01 below. The colours describe the level of risk. Table LE 06-05 explains what the different risk levels mean.

Probability		Consequence		
		Low	Medium	High
	High			
	Medium			
	Low			

Figure LE 06-01 Example of a risk matrix

Table LE 06-05 Description of the various risk levels

Level	Description	Risk-reducing measures
Green	**Acceptable risk** Low risk to health and safety of users, visitors, neighbours or others located in the vicinity of the site. There is minimal risk of extensive damage to the building and the site. The existing preventive or risk-reducing measures are sufficient.	Risk-reducing measures can be considered if they have a significant risk-reducing effect in relation to costs.
Yellow	**Acceptable risk, measures are assessed according to ALARP** (see Definitions) Medium or uncertain risk to the health and safety of users, visitors, neighbours, or others located in the vicinity of the site. There is a medium or uncertain risk of damage to the building and the site that may influence the use of the building. This means that risk-reducing measures should be considered. Measures must be assessed according to the ALARP method (As Low As Reasonably Practicable).	Risk-reducing measures in accordance with the ALARP principle are being considered.
Red	**Unacceptable risk** High risk to the health and safety of users, visitors, neighbours or others who are in the vicinity of the site. High risk of such extensive damage to the building and the site that it can no longer be used as intended. For risk in the red area in the risk matrix, risk-reducing measures must be implemented and the risk reduced to an acceptable level.	Risk-reduction measures must be implemented.

M6 Step 4: Risk evaluation

M6.1 Evaluate the achievement of safety objectives

The extent to which established safety objectives have been achieved must be assessed and described by comparing the results of the assessment of vulnerability, probability and consequence (M5) with the evaluation criteria for risk defined in M3.2. The evaluation should decide what the assessment results say about risk. The evaluation should provide to the following questions:

- To what extent is there a correspondence between the assessed risk and the safety objectives?
- Which solution involves the lowest risk if there are alternative solutions?
- Is the risk sufficiently elucidated to assess whether the safety objectives have been achieved?
- Which conditions of the site contribute most to risk?

M6.2 Provide risk management recommendations

Recommendations must be provided on how the project team should follow up the risk assessment based on the evaluation in M6.1. Any risk-reducing measures should be related to identified risk factors in the assessment, so that the expected risk-reducing effect can be assessed. A distinction between probability-reducing and impact-reduction measures can help explain the effect.

In summary, measures can:

a. Eliminate the probability of the incident occurring
b. Eliminate the consequences of the incident
c. Reduce the probability of the incident occurring
d. Reduce the consequence of the incident

The measures may be related to:

a. People, for example, competence
b. Technical solutions
c. Organisational solutions, such as procedures

The recommended measures should not negatively impact climate adaptation measures or the resilience of other buildings, people, natural qualities, cultural heritage, or other economic activities. The measures must be in line with other local, sectoral, regional or national adaptation strategies and plans.

The measures should, as far as possible, be based on nature-based solutions and the use of blue or green infrastructure (see Definitions). Nature-based solutions are preferred because they are often more robust and require less maintenance. They often have positive side effects, i.e. recreation or conservation of biodiversity. Nature-based measures can also help solve other climate challenges. For example, protection or planting of vegetation may be important for water management, thus reducing the risk associated with floods and droughts.

The following resources for best practice design guidance are available:

- NVE's safety manual. Digital guide for protective measures against floods and landslides www.nve.no/sikringshandboka/
- Regulations on technical requirements for construction works (TEK 17)
- Climate-adapted building – instructions for procurement in the planning and construction process. Klima 2050 Klimatilpasset bygning. Anvisning for anskaffelse i plan- og byggeprosessen SINTEF Bokhandel
- Climate change adaptation measures for buildings – a scoping review, MDPI
- Nature-based solutions for climate adaptation – The Norwegian Environment Agency: m830.pdf (miljodirektoratet.no)
- Technical handbook on nature-based solutions, UNALAB. unalab-technical-handbook-nature-based-solutions2020-02-17.pdf
- The BRE report 'Potential implications of climate change in the built environment', discusses climate change adaptation strategies, including some for structural resilience. Potential implications of climate change in the built environment : BREbookshop.com

Evidence

Criterion	Design stage	Post-construction stage
1-2	Documentation showing that a risk assessment has been prepared during step 2, according to the criteria and methodology.	Documentation of the assessment as in the design phase. If more than five years have passed since the assessment was carried out, or the project has changed significantly, it must be documented that the risk situation for the development area has not changed.
3	Documentation showing that - specific recommendations and solutions have been identified before the end of step 2 - the solutions have been included in relevant project documents to ensure implementation	As in the design phase.

Criterion	Design stage	Post-construction stage
4	A confirmation/from the developer that a requirement to implement the solutions will be made and that this will be completed by the end of step 4. Applies to those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to implement the solutions and that this will be completed by the end of step 4. -------------- OR Documentation showing how the solutions have been implemented in the design and that this has been completed by the end of step 4.	As in the design phase. Updated risk assessment if the conditions have changed.
5	Documentation showing that the contractor is obliged to implement the projected solutions during the construction phase.	Documentation showing that the projected solutions have been implemented as planned. Updated risk assessment if the conditions have changed.
6	A confirmation/ obligation from the developer that there is a requirement to plan and perform training and establish procedures and responsibilities in accordance with the criteria and methodology. Applies to those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to plan and perform training and establish procedures and responsibilities in accordance with the criteria and methodology. -------------- OR Documentation showing plans for training and procedures and responsibilities in accordance with the criteria and methodology.	Documentation showing that procedures and responsibilities have been established in accordance with the criteria and methodology. Documentation showing planned or completed training of owner and / or operating personnel.
7	A completed pre-assessment calculation or equivalent documentation that shows an obligation to achieve credits in the respective issues.	Assessor's report showing that the project has achieved credits in the respective issues.

Definitions

D1 Definitions, general reference

BREEAM-NOR uses the NVE's definitions for run-off surface water management. See definitions in the NVE's glossary www.nve.no/begrepsliste
Risk assessment: further definitions can be found in NS 5814: 2021

D2 ALARP principle

The ALARP principle stands for "As Low As Reasonably Practicable" and means that all necessary risk-reducing measures must be implemented unless they have disproportionately high costs or disadvantages.

D3 Barriers

Measures intended to influence the course of events so that the event does not occur or have adverse consequences. Examples can be robust materials or the building's location in relation to natural conditions.

D4 Green and blue infrastructure

A strategically planned network of natural and semi-natural areas with other environmental functions designed and managed to deliver a wide range of ecosystem services. The infrastructure contains green areas or blue in terms of aquatic ecosystems and other physical properties in terrestrial (including coastal) and marine areas. On land, green infrastructure is for example present in rural and urban environments.

For example, can vegetation and green roofs reduce the risk of flooding and reduce the rise in temperature (urban heat islands). Trees and shrubs can dampen the effect of wind and prevent erosion.

D5 Structural and fabric resilience

BREEAM-NOR defines this as the ability of a structure to withstand the present and future burden of weather, increased pressure or hazards associated with climate change.

D6 Hazard or adverse event

A hazard or adverse event that has the potential to cause harm. It may be an accidental or malicious action, insufficient strength or resistance, or excessive deviation from intended limits.

D7 Durability

The ability to withstand wear, pressure or damage.

D8 Climate adaptation

Climate adaptation means understanding the consequences of climate change and implementing measures to prevent or reduce damage and take advantage of the opportunities that the changes may entail.

D9 Consequence

Consequence is the loss of value as a result of an undesirable event. Consequence is the effect the undesirable event may have on the site. Several categories can be considered. The most common are health and safety, material values and finances. Consequence can be expressed using words such as "High", or a numerical value.

D10 Nature-based solutions

Solutions that are inspired by and in collaboration with nature, cost efficient and that also provide environmental, social and economic benefits and contribute to increased resilience. Through locally adapted, resource-efficient and systemic interventions, such solutions bring increasingly more diverse nature and natural features and processes into cities, landscapes and seascapes. Examples of such solutions include the following:

i. solutions that use or restore existing habitats and ecosystems
ii. solutions based on the use of nature (semi-natural solutions)
iii. solutions often categorised as blue-green infrastructure, and which may to a greater extent involve "nature-mimicking" solutions, such as the construction of surface water ponds, ditches, etc.

D11 Natural impacts

Natural processes or phenomena that occur in the biosphere or crust that may constitute a damaging event.

D12 Risk

Risk is uncertainty related to whether an adverse event will occur and what the consequences might be.

D13 Resilience

The ability of a building, structural system or material to withstand an accidental or exceptional loading or other incident without experiencing an undue degree of damage or decrease in performance, such that progressive collapse, loss of performance or disproportionate degree of damage occurs.

D14 Probability

Probability is used as a measure of how likely it is that an event will occur, within a period of time, given the available knowledge base. Probability can be expressed in words such as "low, medium or high", or a numerical value/frequency, such as "Less than once every 10 years".

D15 Systematic risk assessment

A structured approach to help professionals identify, evaluate and manage risk, where the reduction of the risks identified is integral to the process. It includes:

- Identifying hazards
- Eliminating hazards, as far as reasonably practicable
- Reducing the risks from each hazard, as far as reasonably practicable
- Developing the building design to be robust.

D16 Uncertainty

Uncertainty relates to whether the assessment of a hazard or adverse event is robust enough based on the knowledge base on which the risk assessment is based.

D17 Safety objectives

Safety objectives are set targets for safeguarding qualities. If the safety objectives are general, they should be operationalised using measurable evaluation criteria.

D18 Vulnerability

The site’s inability to handle hazards and adverse events or permanent stresses, as well as maintain or resume its function afterwards. A building can be vulnerable to both an adverse event that may occur and to the negative consequences of the adverse event. Resilience is the opposite of vulnerability.

Additional information

Table LE06-06 below is an example of a climate change adaptation strategy appraisal for a selection of building elements and climate change impacts. This example does not constitute a complete appraisal, but illustrates some of the content that should be included in the appraisal.

Table LE06-06 Example of risk assessment

	Example 1	**Example 2**
Hazard or adverse event	Increased solar radiation	Storm and strong winds
Assessment of vulnerability		
Vulnerability	Building materials may have a shorter life span as a result of increased solar radiation.	Aluminium roofing sheets and fittings can be damaged in storms and strong winds
Assessment of probability		
Building element affected	External cladding	Roof boards and aluminium fittings
Building element service life	10 years	20 years
Probability of hazard or adverse event	High	Low
Description of probability	The site is open and the building has little shielding from solar radiation. Geographically, the site is located in an characterised by many sunny days. No climate scenarios are available.	The building is shielded from storm in an inland location
Assessment of consequence		
Consequence for health and safety	Low	Low
Consequence for the building and site	High	Medium
Consequence for financial elements	Medium	Medium
Description of consequences	The service life of the external cladding can be greatly reduced as a result of strong solar radiation. Will entail high costs to replace the facade and will increase resource use and the CO2 emissions.	Acute damage. Roofing boards may be replaced before their service life has expired. Will probably not apply to the entire roof, but some parts.
Risk description and evaluation		
Highest evaluated risk	High	Medium
Risk description	High probability of increased solar radiation and high consequences for building/ development area mean high risk. Measures must be taken to reduce the risk	A low probability that the building will be affected by storms and strong wind, combined with low or medium consequences, mean medium risk. Measures should be considered in accordance with the ALARP principle.
Assessment uncertainty	Low uncertainty. Well-known situation	Low uncertainty. Well-known situation
Risk-reducing measures	UV-proof external cladding should be chosen.	Measures should be considered to protect roofing sheets from storms or strong winds

LE 07 Flooding and storm surge

Number of credits available	Minimum standards				
	P	G	VG	E	O
2	–	–	–	–	–

Aim

To assess the risk of floods and storm surges and prevent damage to the building and development area both today and in the event of future climate change.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/ shell & core	
None	

Building type specific note

Building type specific notes	
None	

Assessment criteria

This issue is split into two parts:

- Prerequisite: Flood risk assessment (no credit)
- Resilience against flood and storm surge (up to two credits)

Prerequisite: Flood risk assessment (no credit)

1. A flood risk assessment (see Methodology and Definitions) specific to the site has been carried by the end of step 2 showing the development area's risk of floods and storm surge events (see Definitions). The assessment prepared by a qualified hydrology consultant (see Definitions) and in accordance with the methodology in NS 5814: 2021. See LE 06 for details. The assessment takes into account all current and future sources of flooding (see Definitions). See Methodology.

Resilience against flood and storm surge – up to two credits

2. Credits are awarded according to the probability of flooding or storm surge in table LE07-01. See Methodology.

Table LE07-01 Awarded credits in relation to risk and probability of flood or storm surge

Credits	Probability	Annual probability of flooding or storm surge
2	Low	≤1:1000
1	Medium/High	>1:1000

3. Where a site-specific flood risk assessment confirms that the development is situated in a flood zone that is defined as having a medium or high annual probability of flooding (1 credit in table LE07-01), one of the following should be achieved in order to increase the robustness and safety of the development:

a. The ground level of the building and access to both the building and the site must be 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 (see Methodology)

OR

b. The final design of the building and the wider site must reflect the recommendations of an qualified hydrology consultant.

Methodology

M1 Flood risk assessment

The flood risk assessment must detail the risk of flooding from the following sources:

1. Fluvial (rivers)
2. Tidal (sea)
3. Reservoirs, canals and other artificial sources.

Emission scenarios following RCP 8.5 according to the county-specific climate profile and the guide on sea level rise and storm surge should be used, see www.klimaservicesenter.no. Note that flood risk from surface water, drainage pipes and groundwater is assessed in LE 08 Surface water management.

The following sources of information can be used during the flood risk assessment:

- Regulations on technical requirements for construction works (TEK) with guidance
- Flood zone map: www.temakart.nve.no/link/?link=flomsone
- Flood events: www.flomhendelser.no
- NVE's caution map: https://temakart.nve.no/tema/flomaktsomhet
- The municipality's caution map
- Emission projections for flood risk: www.klimaservicesenter.no.
- NVE's guides for mapping flood risk in smaller watercourses
    - http://publikasjoner.nve.no/rapport/2015/rapport2015_97.pdf
    - http://publikasjoner.nve.no/veileder/2015/veileder2015_03.pdf

No credits can be awarded where the assessed development has proceeded against the recommendations of a statutory body on the basis that the flooding implications are too great (this includes a recommendation given by a statutory body even where such a recommendation cannot be, or is not, statutorily enforced).
Where a local authority (or other statutory body) has set more rigorous criteria than those above, these must be met in order to achieve the relevant credits.

For smaller sites, e.g. less than 1 ha (10,000 m²), the level of detail required in an acceptable flood risk assessment will depend on the size of the site and the arrangement of buildings on that site. For a small site with a relatively simple arrangement of buildings, this might consist of a brief report. For larger sites with a higher density of buildings, a more detailed assessment would be appropriate.

For small simple sites (2000 m² and less), an acceptable flood risk assessment could comprise a brief report carried out by the contractor's engineer confirming the risk of flooding from all sources of flooding, including information obtained from the water company or sewerage undertaker, other relevant statutory authorities, site investigation and local knowledge.

M1.1 Timing of flood risk analysis

If the flood risk analysis is carried out late in the process, this can reduce the analysis to a paper exercise, with minimal value to the project. The step requirement is there because it provides advantages to conduct such an analysis early in the project process.

In special cases, it may be acceptable for a risk assessment to be carried out at a slightly later stage, but no later than early in step 4, provided the project can document that the strategy has still influenced the planned results, i.e. that the late assessment has not in any way been detrimental to the results, and that it has still provided clear benefits for the project.

M2 Resilience against flood and storm surge

M2.1 Existing flood defences

Many landscape feature defences are owned by third parties which, due to their location, act as a flood defence by default, e.g. motorways, railway embankments, walls, etc. It can be assumed that such embankments will remain in place for the lifetime of the development unless the assessor or project team have reason to believe otherwise. For walls, assurances must be sought that the wall is likely to remain for the design life of the building.

In an area protected by existing flood defences (see Definitions), the appropriate number of flood risk credits can be awarded where the defences reduce the risk accordingly.

The following conditions must be met:

1. The development is not located in an area where new flood defences must be, or have been, constructed to minimise the risk of flooding to the site and its locality purely for the purpose of the development or its wider master plan.
2. The relevant agency (see Definitions) confirms that, as a result of such defences, the risk of a flood event occurring is reduced to low or medium risk. If firm confirmation is not provided, then the credit cannot be awarded.

A statutory body's local or regional office may be able to provide more information on existing defences in the area in which the assessed development is located.

M2.2 600 mm threshold

It is acceptable that for buildings located in medium and high probability for flood or storm surge, areas of the car park and site access may be allowed to flood and therefore fall below the 600 mm threshold. In such cases the credit is still achievable provided safe access to the site and the ground floor of the building can be maintained (i.e. they are 600 mm above the design flood level with a probability of $\leq$1:1000) 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 or infrastructure immediately adjacent to the site fall below the 600 mm 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 that access to it meets 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 a zone with a medium or high probability of flood or storm surge, any areas used to store sensitive, historical, hazardous, valuable or perishable materials, e.g. radioactive materials, microbiological facilities, server rooms, libraries, etc., must be located above the 600 mm threshold.

Evidence

Criteria	Design stage	Post Construction stage
1	Documentation showing that a flood risk analysis has been prepared according to the criteria and methodology. Documentation of skills and experience of the qualified hydrology consultant.	Documentation of the risk analysis as in the design phase. If more than five years have passed since the assessment was carried out, or the project has changed significantly, it must be documented that the risk situation for the site has not changed.
2	Flood risk analysis prepared for criterion 1 showing flood risk for the development area. If relevant: correspondence from a relevant public body confirming that existing flood	Documentation of the risk analysis as in the design phase. If more than five years has passed since the assessment was carried out, or the project has

	defences reduce the annual probability of flooding.	changed significantly, it must be documented that the risk situation for the site has not changed.
3	A confirmation / obligation from the developer that requirements will be made for the building to be designed in accordance with the criterion or recommendations of a qualified hydrology consultant. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to design the building in accordance with the criterion or the recommendations of a qualified hydrology consultant. -------------- OR Documentation showing that the building is designed according to the criterion or recommendations of a qualified hydrology consultant. If relevant: correspondence from a relevant public body confirming that existing flood defences reduce the annual probability of flooding.	As-built documentation showing that the building has been constructed according to the criterion or recommendations of an qualified hydrology consultant.

Definitions

D1 Definitions, general reference

BREEAM-NOR uses NVE's definitions. See definitions on NVEs glossary www.nve.no/begrepsliste

D2 Design flood event

A historical or notional flood event for a given annual flood probability, where the consequences for the development area have been investigated and damage mitigation measures, if any, have been planned.

D3 Design flood level

The maximum estimated water level during the design flood event (see Definitions). The design flood level for a site can be determined through either known historical data or modelled for the specific site.

D4 Flood event

A flooding incident characterised by its peak level or flow, or by its level or flow hydrograph.

D5 Flood storage

The temporary storage of river flow in ponds, basins and reservoirs during a flood event.

D6 Flood risk

The combination of the flood probability and the magnitude of the potential consequences of the flood event.

D7 Flood risk assessment

A study to assess the risk of a site flooding, and to assess the impact of any changes or development on the site on flood risk to the site and elsewhere.

D8 Flood defences

Flood defences do not completely remove the risk of flooding, although they do reduce it. Building in areas where flood defences are present (and appropriately designed to withstand a certain magnitude of flooding) is therefore preferable to building in medium/high risk areas without defences. However, for the purpose of this issue, it is still preferable to build in areas of low risk than encourage development of new flood defences in areas with a higher risk of flooding purely for the sake of new development.

D9 Sources of flooding and storm surge

1. Streams and rivers: Flooding that can take place from flows that are not contained within a channel due to high levels of precipitation in the catchment.
2. Coastal or estuarine: Flooding that can occur from the sea due to a particularly high tide or surge, or a combination of both.
3. Infrastructure failure in canals, flood storage, reservoirs, etc.

D10 Qualified hydrology consultant

A hydrologist or engineer with at least two years' experience of performing flood risk assessments and designing flood protection measures. Complex calculations and design of protection measures must be carried out by consultants with expert knowledge.

D11 Appropriate statutory body

This refers to the statutory organisation, legal organisation or entity whose duty it is to carry out the planning approval function for the project.

D12 Flood probability

The estimated probability of a flood of a given magnitude occurring or being exceeded in any specified time period. For example, a 100-year flood has a 1% chance of occurring in any given year.

D13 Storm surge

When the effect of the weather on the water level in the sea is particularly great, this is called storm surge. Storm surges are usually caused by low air pressure and strong winds that push the water towards the coast. If a storm surge coincides with a spring tide, this can result in particularly high water levels. During a spring tide, the tide is higher because of the gravitational pull of the moon and sun, which occurs around the new and full moon.

Additional information

None.

LE 08 Local surface water management

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	–	–	–	–	–

Aim

Avoid, reduce and delay precipitation to public sewers and watercourses, thereby minimising the risk of impact due to flooding on and outside the development area, as well as pollution of watercourses and other environmental damage. This includes taking future climate changes into account.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/ shell & core	
None	

Building type specific

Building type specific notes	
None	

Assessment criteria

This issue is split into five parts:

- Prerequisite: Risk assessment and the "three step strategy" – (0 credits)
- Handling of 5 mm precipitation – (1 credit)
- Maximum run-off – (1 credit)
- Measures for surface-based water management – (1 credit)
- Exemplary level credit: Wider approach for surface water management (1 credit)

Prerequisite: Risk assessment and the “three step strategy” – no credits

1. A risk assessment for water run-off (see Definitions) has been carried out by the end of step 2, specifically for the site and according to the methodology in NS 5814:2021. See LE 06 for details. The assessment is prepared by a qualified consultant (see Definitions) and take into account current and future risks from surface water run-off, drainage pipes and ground water (see Methodology)
2. Handling of surface water run-off is in line with the results of the risk assessment in criterion 1 and follow the principles of the three-step strategy (see Definitions).
3. The site is designed so that extreme precipitation is handled through safe and well-developed drainage and flood paths. Flood paths do not increase the risk of damage and flooding in and outside the development site (step 3 the three-step strategy).

Handling of 5 mm precipitation – 1 credit

4. There are no discharges from the site for precipitation up to 5 mm. The water is handled by surface-based solutions and infiltration on the site according to step 1 of the three-step strategy (see Methodology and Definitions).
5. A comprehensive and updated plan for surface water run-off management on the site will be made available to the facilities manager (and/or building occupants, if relevant).

Maximum run-off – 1 credit

6. Drainage design measures are specified in line with the risk assessment in criterion 1. This is to ensure that the post-development maximum run-off volume (see Definitions) is no greater for the developed property than for the property's natural run-off without any development (step 2 in the three-step strategy). This must be calculated for a precipitation event with a 20-year recurrence interval and duration of 60 minutes from the property to watercourses (see Definitions) and/or public drainage systems. The calculation must include increased run-off as a result of future climate change. See Methodology.
7. A comprehensive and updated plan for surface water run-off management on the site will be made available to the facilities management (and/or building occupiers, if relevant).

Measures for surface-based water management – 1 credit

8. One credit can be awarded if at least two of the measures below are carried out:
   a. Only surface-based Sustainable Drainage Systems (SuDS) (see Definitions) are used for retention and storage on the site.
   b. A closed watercourse within the site is reopened for a minimum length of 15 m and 50% of the total length of the watercourse on the site.
   c. At least 70% of the construction site, has permeable and/or vegetated surfaces (see Methodology)
   d. At least 70% of the roof area is constructed as a green or blue-green roof (see Methodology and Definitions).
   e. Achieved a blue-green factor of 0.7 for dense urban area, 0.8 for an open urban area and 0.9 for other areas.
9. A comprehensive and updated plan for surface water run-off management on the construction site will be made available to the facilities management (and/or building occupiers, if relevant).

Exemplary level credit: Wider approach for surface water management – 1 credit

10. Criterion 4–7 must be achieved.
11. At least one of the following measures for a wider approach to run-off water management must be implemented:
    a. The amount of run-off water from the site is regulated by a surface water system based on "smart data" infrastructure, using digital weather data/satellite data. See Methodology.
    b. The site's need for retention and infiltration is handled by a solution that also has a significant ecological and/or social function. See Methodology.
    c. The solution for surface water run-off management is part of an irrigation system for commercial cultivation or food production that ensures at least a 50% reduction in the need for irrigation from a public water supply. See Methodology
    d. The FutureBuilt criteria for climate-adapted and sustainable stormwater management (dated 23.10.2020) have been met (for details, see [www.futurebuilt.no)](http://www.futurebuilt.no)
12. A comprehensive and updated plan for surface water run-off management on the site will be made available to the facilities management (and/or building occupiers, if relevant).

Methodology

M1 special conditions on the site

Three credits can be awarded without specifying any further attenuation measures if the site discharges run-off directly to either the sea, foreshore or tidal estuary and this is reviewed and the solution is approved in writing by the relevant local authorities. The run-off from the site must be discharged directly into the recipient if credits are to be awarded by default. Typically, this would mean that drainage pipes would only carry run-off from the site and that they would not need to cross land owned by others before reaching the recipient.

M1.1 Sites with multiple buildings

Where the assessed building is part of a larger development of buildings, there are a number of options for assessment of the surface water run-off credits:

1. The individual building and its associated hardstanding areas can be assessed independently where the run-off is being dealt with on a building-by-building basis (i.e. each building has its own dedicated sub-catchment (See Definitions) that serves only that building).
2. When assessing the run-off from a number of buildings (including domestic and non-domestic buildings), the assessment must take into account the drainage from the local sub-catchment that serves all those dwellings or buildings. Note that proportioning cannot be used to calculate the percentage of run-off discharging into the local sub-catchment resulting from the assessed building only.
3. The whole development can be assessed for compliance.

Whichever approach is adopted to demonstrate compliance, it must be consistent when completing both the rate of run-off and volume of run-off calculations.

M2 Prerequisite: Risk assessment and the three-step strategy

M2.1 Risk assessment

A qualified consultant (see Definitions) should perform a survey of the area before calculations and carry out the risk assessment. The methodology in NS 5814:2021 should be used.

The mapping and risk assessment should include run-off water where and if it may affect:

1. Overload and flooding from drainage or surface water systems
2. Groundwater levels, including fluctuation of groundwater as a result of storm surges and flood events from relevant watercourses.
3. Landslide and erosion in or downstream of the development area (special consideration should be made for areas with quick clay).

The following sources of information should be used (if relevant) to map the situation pre-development and calculate the possibilities for local surface water run-off management:

- Guide for handling surface water in land use plans, NVE. www.nve.no
- Historical aerial photos of closed streams or historic drainage solutions
- Local surface water guides or Water and Sewage (WS) standards
- Local water, sewer and drainage maps
- Local plans and risk assessment related to surface water run-off and climate risk
- Mapping of groundwater level, or measurement of groundwater level
- IVF curves (Intensity-Duration-Frequency) with precipitation data for the relevant recurrence interval https://klimaservicesenter.no/ivf?locale=nb
- The Norwegian Environment Agency's map of ground contamination www.grunnforurensning.miljodirektoratet.no
- NGU's maps of loose materials and infiltration ability as well as groundwater level www.ngu.no/emne/kartinnsyn
- Norwegian Water report 162-2008. Guide to climate-adapted surface water management. www.norskvann.no

- Norwegian Water project report Open flood paths in built-up areas. A 204 Åpne flomveger i bebygde områder (kun digital) | Norsk Vanns Kompetanseweb (va-kompetanse.no)
- The case files in local agricultural offices for information on old stream closures during development in previously leveled areas.

The locally applicable IVF curve and emission scenario RCP 8.5 should be used for the calculation of future precipitation. See www.kllimaservicesenter.no.

M2.2 Timing of the surface water run-off assessment

If the surface water run-off assessment is carried out late in the process, this can reduce the assessment to a paper exercise, with minimal value to the project. The step requirement is there because it provides advantages to conduct such an assessment early in the project process.

In special cases, it may be acceptable for a risk assessment to be carried out at a slightly later stage, but no later than early in step 4, provided the project can document that the strategy has still influenced the planned results, i.e. that the late assessment has not in any way been detrimental to the results, and that it has still provided clear benefits for the project.

M2.3 Flood paths

Flood paths shall be mapped using digital terrain models (DTM). Where local authorities have made flood path maps or flood risk maps available, these can be used. A flood path map is used to identify potential risk areas for the current situation, as well as being a guide to visualise possible solutions. Where such maps are not available, flood paths shall be mapped using digital tools.

Where local flood paths have a high load with a potential risk of damage to the site or downstream property, the hydraulic capacity of the flood path should be documented by calculations.

M 2.4 The three-step strategy

The three-step strategy is an approach to managing surface water (Lindholm et al., 2008) recommended by Norwegian Water. The strategy is based on three steps:
Step 1: Run-off from small amounts of precipitation is captured, cleaned, evaporated and infiltrated locally.
Step 2: Run-off from major rain is retained locally with a controlled outlet to a drainage system or watercourse.
Step 3: Run-off from extreme rain ensures safe drainage on the surface via flood paths.

M3 Handling of 5 mm precipitation

M3.1 No discharge from the site for precipitation up to 5 mm

Infiltration to ensure adequate water quality in a recipient and a hydrological water balance for the development area must be in line with the recommendations for surface water management according to the three-step strategy by Norwegian Water (see Definition)

In step 1, vegetation should be used locally in interaction with infiltration, transpiration and evaporation, so that the water's natural hydrological cycle is maintained, and nature's ability to self-purify is utilised. BREEAM-NOR requires that precipitation of 5 mm with a duration of 60 minutes is retained and infiltrated without discharge of run-off water from the site.

Green and blue-green roofs (see Definitions) can be used to meet the 5 mm criterion for rain falling on a roof surface given that any surface water from other hard surfaces (see Definitions) in the development area is handled according to the 5 mm criterion.

Where the local ground conditions do not provide sufficient infiltration or have contaminated masses, complete retention of the first 5 mm of precipitation may be impossible to achieve. In such cases, a qualified professional must design a run-off system that ensures adequate purification of the surface water from all hard surfaces and areas of motorised traffic. Discharge via a rain bed as described in the fact sheet "Rain beds for local flood mitigation" (Oslo Municipality, January 2016, version 1.1) can be an example of an approved solution.

If the project can document that the surface water is not polluted and goes to a robust recipient with no downstream impact on flooding, this can be permitted via a technical query.

M3.2 Calculation of run-off volumes

The assessment should use a locally applicable IVF curve and emission scenario RCP 8.5 for calculation of post-development run-off. See www.kllimaservicesenter.no

Infiltration capacity must be documented with an approved infiltration test using a double-ring infiltrometer or MPD infiltrometer. If a MPD infiltrometer is used, a correction factor of 0.6 used in accordance with "Measurement of infiltration from the surface for use of open SuDS in practice" Solheim/French/Braskerud, Water 03-2017. Solheim-1.pdf (vannforeningen.no)

Retention reservoirs shall be dimensioned according to the relevant method as described in VA sheet no. 69. Blad-69_05.02.16.pdf (va-blad.no)

It must be documented that the lowest level of the infiltration zone is at least 0.5 meters above the highest groundwater level.

Recognised software should be used when using hydrological and hydraulic simulation models, as well as combined models that take into account both piped flow and surface run-off.

Manual calculation methodology (rational formula) can be used for development sites with a time of concentration of less than 15 minutes or areas smaller than 20 hectares, according to NVE Guide 7-2015: Veileder (nve.no). The use of digital simulation models is required if the time of concentration is higher than 15 minutes or the area is over 20 hectares. Alternatively, the total area of the site can be divided into several sub areas: each sub area with a size below these limits. The relevant calculations, dimensioning criteria and calculated dimensioning capacity should be highlighted in the documentation. For manual calculations using the rational formula, the values for the run-off factor shown in Table LE 08-01 should be used.

Table LE 08-01 Overview of run-off factors when calculating post-development run-off:

Category	Type of surface	Step 1 (5 mm)	Step 2 (20 year)
Impermeable surfaces	Asphalt, roof and other impermeable surfaces	0.85	0.95
Permeable surfaces	Grass, gravel and permeable surfaces	0.20	0.60
Undeveloped areas	Meadows, shrubs, areas of sparse woodland	0.10	0.50
Forest	Forest with natural ground vegetation, (not park-like structures with grass between trees).	0.00	0.20

M3.3 Roads and impermeable surfaces

Where roads are built that will be managed privately, i.e. not owned/managed by a public authority, including roads for developments with a mixture of buildings, all the new impermeable surfaces must be included in calculations. Where buildings are built beside existing highways or where adoptable highways are built, the impermeable area of the highway does not need to be included in the calculations.

M3.4 Retention outside the development site

Retention storage basins outside the site that contribute to all or part of the required retention capacity can be included in the calculation for the development site area. It must be guaranteed that the measure outside of the site and reservoir capacity (volume) are dedicated to the development and will be available for at least 10 years after completion.

M4 Maximum run-off

The purpose of the three-step strategy is to imitate nature's way of moving water. The post-development run-off should therefore be compared with a situation that is similar to a natural run-off pattern on the site. This is not necessarily the same as the situation pre-development.

For calculation of maximum run-off, the calculation methodology described in M3.2 to M3.4 should be used. Run-off factors for Step 2 – (20 years) in Table LE0 8-01 should be used when calculating post-development run-off.

For the calculation of run-off for a property without development, an average run-off factor of ≤ 0.50 shall be used for the entire area of the development, regardless of the current area categories. The run-off must be calculated without any allowance for climate change. Areas comprising watercourses are excluded from the run-off calculations.

M5 Measures for surface-based surface water management

M5.1 Open surface-based run-off water solutions (SuDS)

Table LE08-02 describes open surface-based run-off water solutions approved in BREEAM-NOR.

Table LE08-02 Open local surface water disposal (LOD) with examples of technical design

Category	Example of technical design
Local SuDS techniques Infiltration and retention close to the source	- Infiltration on vegetated surfaces - Permeable surfaces - Infiltration in rock fills - Accumulation of surface water on surfaces prepared for flooding - Storage of water on roof areas (blue roof) - Green roofs (see Definition). See M5.4 for details. - Ponds with retained storage capacity - Wetlands - Delayed retention
Retained run-off	- Recesses - Channels - Streams/ditches
Total retention	- Dams - Wetland areas - Ponds/lakes

Surface-based run-off water solutions should be planned in line with best practice based on Norwegian Water Report no. 162/2008 "Guidance for climate-adapted surface water management" and the City of Oslo's fact sheet series on blue-green solutions: [Blågrønn faktor - Veiledning for tiltak i blågrønn faktor.pdf (oslo.kommune.no)]

Supplementary infiltration zones with drainage from surface-based surface water solutions may be permitted if they are situated under hard surfaces. However, this is only if a robust operation and maintenance option is established for the infiltration installation at the same time. As a minimum, it should contain a drainage system and inspection sump with flushing options.

M5.2 Opening closed watercourses

Rivers and streams are part of the natural surface water run-off system and flood paths. Restoration of existing closed rivers and streams is a simple and robust solution for returning run-off water to the natural watercourses. Restoration also leads to better water quality and reduces the infiltration and inflow of non-sewer water into the sewer system.

The length of the watercourse being restored should be at least 15 metres and comprise a minimum 50% of the length of the existing closed watercourse on the site (measured as the length of the pipe/culvert). See Figure LE 08-01 for an example of such a solution.

The opened watercourse shall be dimensioned and erosion proofed for floodwater flow and constructed with natural and site-adapted streambed substrate and riparian vegetation.

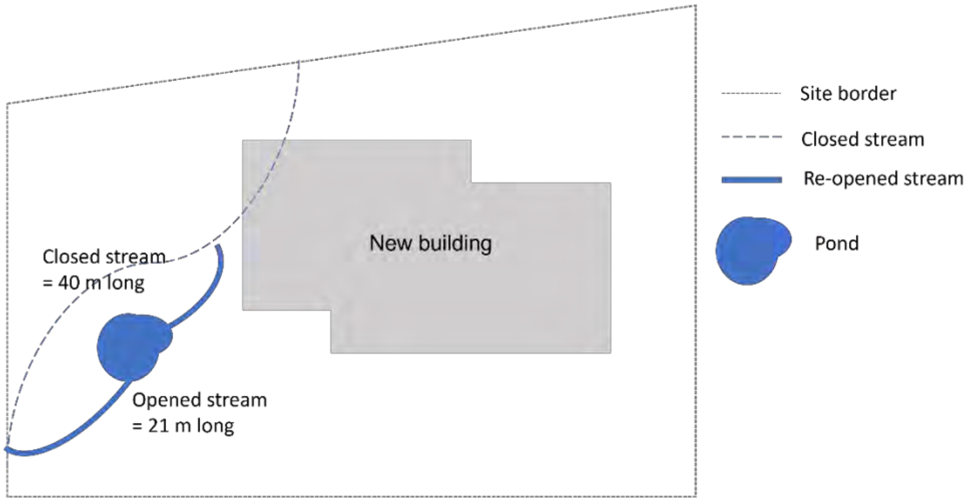


Figure LE08-01 Example of the restoration of a watercourse

M5.3 Permeable surfaces on 70% of the site area

amount of permeable surface because it is an efficient and cost-saving solution for run-off water challenges. In addition to reducing pollution from surfaces, such surfaces effectively retain surface water without leaving ponds. Such ponds can reduce the efficient usage of the site or damage surfaces.

Percentage of permeable surfaces is calculated as the m^2 of the total site area.

Paving stones should have minimum 5 mm wide drainage joints. A maintenance plan should be included for cleaning and replacing joint material to ensure that the draining function is maintained over time. Drainage pavements with paving stones or gravel pavements are constructed based on the Norwegian Public Roads Administration's handbook N200. [N200 Vegbygging | Statens vegvesen].

Drainage asphalt is not approved as a permeable surface in BREEAM-NOR.

The following are considered as permeable surfaces. The list is not exhaustive:

- Vegetation
- Green roofs
- Permeable paving stones or mixed paving stones and grass joints.
- Gravel areas
- Streams and swamps

M5.4 At least 70% of the roof area is constructed as a green or blue-green roof

BREEAM-NOR rewards an extensive area of green and blue-green roofs because it contributes to the retention and absorption of surface water run-off from the site. Blue-green roofs can also ensure a significant delay in run-off in the event of extreme precipitation.

BREEAM NOR sets requirements for a minimum thickness of 50 mm soil layer for green roofs.
The percentage is calculated as the m^2 of green roof of the total roof area.

For blue-green roofs, BREEAM-NOR requires a minimum storage capacity of 25 l per m^2 roof area. In addition, the green roof must make up 35% of the total area of the roof.

M5.5 Blue-green factor achieved

The blue-green factor promotes and contributes to functional, climate-adapted outdoor spaces with vegetation and open water.

The blue-green factor is calculated in accordance with Norwegian Standard NS 3845: 2020 Blue-green factor – Calculation method and weighting factors.

Dense and open city: Where local authorities have defined areas for dense and open urban areas, these shall be applied. Where these area categories are not defined, only the categories "Open City" and "Other Areas" shall be used. The area categories are based on the official municipal Master Plan or Action Plan. Open City corresponds to the Municipal Master Plan area category Central Areas and also includes any adjacent areas categorised as Business areas and Retail areas. Other Area categories are defined as “other areas”. The definition of the terms are described in the Government Dictionary of area types in municipal Master Plans, see Bokmål-nynorsk ordliste for arealformål, underformål og hensynssoner - regjeringen.no for details. Judgement should be used when deciding which category the site belongs to. Where the area categories in the municipal Master Plan deviate significantly from the dictionary referred to above, area categories with similar purposes shall be used.

M6 Exemplary level credit: Wider approach for surface water management

M6.1 Run-off water management system with "smart data" solution

Such systems should include the automatic regulation of run-off quantity from the site based on real-time weather data with smart data forecasting, warnings of heavy rainfall, etc. It should be documented that the system is connected to a weather forecast system in real time so that it provides optimised utilisation of the retention capacity in the run-off water management system and delayed run-off from the area when high precipitation is expected, etc.

M6.2 Ecological and social function

The credit can be awarded if the development site area's run-off water management solutions also contains a function that contributes to ecological and/or social qualities on the site or in the adjacent area. Examples of ecological and social functions can be areas created to enhance biodiversity, playgrounds and sports facilities that also function as flood paths/areas for extreme precipitation, social areas and meeting places with rain beds, open water surfaces, etc.

The amount of water retained and/or infiltrated in these facilities must correspond to at least 50% of the development area's total retained surface water run-off volume in accordance with the calculations in criterion 6.

As an additional function to increase the ecological quality using plants, the facility should be vegetated with at least 20 species per 10 m^2. It should be documented that the species have considerable value for biodiversity. This may include naturally occurring species, species for food cultivation and purely ornamental plants. The plants should be adapted to the site’s local climatic conditions. The soil on which the plants is grown must satisfy the plants' requirements in relation to soil depth, structure, etc. Regulations on invasive species should be followed when establishing new plant areas.

An additional function which increases social quality/function should fulfil the municipality's local norms for outdoor space. Where there is no outdoor area norm, "Outdoor area norms – Norms for public playing and outdoor social areas for the construction of dwellings in Oslo" should be used.

M6.3 Run-off water for farming and food production

The purpose is to encourage local utilisation of run-off water, reduce the use of purified drinking water for irrigation and contribute to a circular water balance in the area. Since this is an innovation credit, the farming or food production should be of a commercial nature, and rainwater harvesting in the development area should have a volume that contributes to a significant reduction in the need for artificial irrigation.

Commercial farming can be farms, nurseries, etc. Credits cannot be awarded for irrigation of green areas on the site or smaller vegetable gardens for canteens, etc. However, credits can be awarded for production managed by non-commercial organisations, such as horticulture schools or other non-profit organisations.

The production must take place on or in the immediate vicinity of the site. There is no distance requirement in BREEAM-NOR, but the water must be able to be transported from the development area to the cultivation area by means of a piped system, not by a vehicle or similar.

Documentation of a reduced need for irrigation using purified drinking water must be based on the volume of water used for irrigation in a normal year. This can be documented using water consumption for irrigation over the last 5–10 years or by using standard water consumption for irrigation depending on the type of farming/production.

Evidence

Criterion	Design stage	Post-construction stage
1–3	Documentation showing that a risk assessment for surface water run-off has been prepared in accordance with the criteria and methodology Documentation that shows the competence and experience of the qualified consultant. Documentation showing that a risk assessment is used when designing surface water management. Documentation showing that safe and well-developed drain and flood paths have been planned.	Documentation of the risk assessment as in the design phase. If more than five years has passed since the assessment was carried out, it must be documented that the risk situation for the site has not changed. Documentation showing that safe and well-developed drain and flood roads have been established.
4, 6, 8 and 10	Documentation showing the project strategy to handle 5 mm of precipitation locally on the site. A confirmation / obligation from the developer that a requirement will be made to design appropriate solutions. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations of the relevant parties to design appropriate solutions. -------------- OR	Documentation showing the implemented solutions including calculations and measurements. Assessor's inspection report with photographic documentation showing that the designed solutions are installed, (where it is possible to inspect). The BREEAM-NOR Assessor Report with completed values.

	Documentation of the projected location and/or specifications for appropriate solutions.	
5, 7, 9 and 11	Documentation of a plan for surface water run-off management and a confirmation from the developer that this will be made available to the facilities management (and/or building occupiers, if relevant).	Documentation showing that the plan has been made available to the facilities management (and/or building occupiers, if relevant). The BREEAM-NOR Assessor Report with completed values.

Definitions

D1 Definitions, general reference

BREEAM-NOR uses NVE's definitions for run-off surface water management. See definitions on NVEs glossary www.nve.no/begrepsliste

D2 Run-off

Usually rain- and snow melt water,but can also be groundwater or overspill from sewers or other sources.

D3 Run-off volume

The volume of run-off that is generated by precipitation occurring on the site. This is typically measured in litres/ seconds.

D4 Treatment of run-off water

Improving the quality of water by physical, chemical or biological means.

D5 Green and blue-green roofs

Green roofs include various forms of plants and variable substrate thickness. Typical vegetation can be sedum, moss, herbs and grass on thin growth substrate (extensive roofs) and possibly flowers, small shrubs and trees on thicker growth substrate (extensive roofs).

A blue-green roof is a combination of a green roof and a retention reservoir with regulated run-off from the roof surface. Blue-green roofs aim to increase both the volume of water stored and control the amount of water released.

D6 Hard surfaces

These include roofs, car parks, access roads, pavements, delivery and service yards and external hard landscaping. Footpaths less than 1.5m wide that have free drainage to soft landscaped areas on both sides may be excluded.

D7 Infiltration

The passage of water into a permeable surface, such as vegetated areas, soil, permeable paving, infiltrable masses such as sand, gravel, stone, etc.

D8 Qualified consultant – Run-off water management

A hydrologist or engineer with at least two years' experience of calculating run-off water and designing run-off water management systems (SuDS).

D9 Surface water run-off

Surface water run-off in this issue refers to:

1. Surface water: Net rainfall that falls on a surface (on or outside the plot) that acts as a run-off, which has not penetrated into the ground or entered into a drainage system.
2. Sewers and surface water systems: Water from combined, foul or surface water sewers that are temporarily overloaded due to excessive rainfall or blockage.
3. Groundwater: Where the groundwater level rises to such a height that flooding occurs. This is most common in low-lying areas underlain by permeable rock (aquifers), usually during extended periods of wet weather.

D10 Run-off water management

Local handling, safe drainage and possible treatment of surface water run-off. The purpose is to ensure safety and avoid damage to health, the environment and infrastructure, and if possible, use surface water run-off as a resource.

D11 The three-step strategy

The three-step strategy is an approach to managing surface water (Lindholm et al., 2008) recommended by Norwegian Water. The strategy is based on three steps:
Step 1: Run-off from small amounts of precipitation is captured, cleaned, evaporated and infiltrated locally.
Step 2: Run-off from major rain is retained locally with a controlled outlet to a drainage system or watercourse.
Step 3: Run-off from extreme rain ensures safe drainage on the surface via flood paths.

D12 Sub-catchment

A catchment is an area where all surface water flow to a point on a drainage or watercourse. A catchment can be divided into sub-catchments.

D13 Watercourses and sewers

Watercourses are defined as all stagnant or running surface water with year-round water flow, including associated beds and widths up to the highest normal flood water level. Although a watercourse might in some stretches flow underground or under glaciers, it is considered in its entirety as a watercourse. Watercourses without year-round water flow are also considered watercourses if they clearly differ from their surroundings.

The terms *watercourses* and *sewers* include rivers, streams, ditches, drains, culverts, dykes, sluices, sewers and passages through which water flows.

D14 Open sustainable urban drainage systems (SuDS)

Surface water from local areas is infiltrated or retained in an open system as close as possible to the starting point. This can, for example, be infiltration systems or retention ponds. See M5.1 for details.

Additional information

None

Pollution

Summary

This category deals with the prevention and control of pollution as a result of the building's location and use. The themes in the category are about reducing the building's impact on surrounding communities and environments from light pollution, noise and emissions to air.

Category summary table

Issue	Credits	Aim
Pol 01 Impact of refrigerants	4	To reduce the level of greenhouse gas emissions arising from the leakage of refrigerants from building systems
Pol 02 Local air quality	2	Contribute to the reduction of local air pollution through heating and hot water installations with low emissions
Pol 04 Reduction of night time pollution	1	To ensure that external lighting is concentrated in the appropriate areas and that upward lighting is minimised, thereby reducing unnecessary light pollution, energy consumption and nuisance to neighbouring properties.
Pol 05 Reduction of noise pollution	1	To reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise- sensitive buildings

Pol 01 Impact of refrigerants

Number of credits available	Minimum standards				
	P	G	VG	E	O
3	–	–	–	–	–

Aim

To reduce the level of greenhouse gas emissions arising from the leakage of refrigerants from building systems.

Fully fitted/ shell and core

	Fully fitted	Shell and core	Shell only
Applicable Assessment criteria	All	All	Not applicable
Assessment type specific notes	None	See ref 1.0 See Appendix D	None See Appendix D

Notes for fully fitted/ shell and core	
1.0	If the building is designed to avoid the need for refrigerant containing building services, to the extent that no refrigerant use will be specified for the fit-out, the available credits can be awarded by default.

Building type specific

Building type specific notes	
None	

Assessment criteria

This issue is split into three parts:

- No refrigerants in the building (3 credits)
- Impact of refrigerants (up to 2 credits)
- Leak detection (1 credit)

No refrigerant use - 3 credits

1. No refrigerant use within the installed plant or systems or any off-site systems it is connected to.

OR alternatively, where the building uses refrigerants:

Prerequisite – Impact of refrigerants – no credits

2. All systems with electric compressors comply with the requirements of NS-EN 378:2016series for Refrigerating systems and heat pumps part 1 – 3:2016 or ISO 5149:2014

Impact of refrigerant – up to 2 credits

2 credits

3. The direct effect life cycle CO_2 equivalent emissions, DELC (see Definitions) should be ≤100 CO_2-eq/kW. For systems that provide cooling and heating, the worst performing output based on the lower kW cooling output and kW heating output is used to complete the calculation. To calculate the DELC, refer to the relevant definitions in Methodology.

OR

4. All refrigerants used have a global warming potential (GWP) ≤10 (see Definitions).

OR

1 credit

5. Systems using refrigerants have a DELC of ≤1000kgCO_2-eq/kW cooling and heating capacity.

Leak detection – 1 credit

6. All systems are hermetically sealed (see Definitions) or only use environmentally benign refrigerants, see Additional information.

OR

7. Where the systems are not hermetically sealed:
   a) The systems have:
      i. A permanent automated refrigerant leak detection system (see Methodology), that is robust, has been tested (see Definitions), and is capable of continuously monitoring for leaks.

      OR

      ii. An in-built automated diagnostic procedure for detecting leakage has been enabled.
   b) In the event of a leak, the system must be capable of automatically responding and managing the remaining refrigerant charge (see Definitions) in order to limit loss of refrigerant (see Methodology).

Methodology

M1 Impact of refrigerants

M1.1 Scope of this issue

The criteria in this issue apply to all building technical installations in the building, regardless of the system's refrigerant charge (kg).

These installations include, but are not limited to:

- Comfort cooling or space heating (including assessment of refrigerants in heat pumps)
- Cold storage, including commercial refrigerators / refrigerated counters / freezers, but excluding small appliances (See Definitions)
- Process-based cooling of for example servers and IT equipment

M1.2 Calculation of DELC CO2e and the BREEAM Pol 01 calculator

The BREEAM Pol 01 calculator is used to determine the number of credits achieved.

The direct effect life cycle CO_2-eq emissions (DELC) per kW of cooling and heating capacity are calculated using the following equation:

$$\frac{[\textbf{Refrigerant loss operational+refrigerant loss system retirement}]\ \textbf{x}\ GWP}{\textbf{Cooling Capacity (kW)}}$$

Where:

Refrigerant loss operational: (Ref_{charge} x $Sys_{op\text{-}life}$ x (L1 + L2 + S1 + S2))/100
Refrigerant loss system retirement = Ref_{charge} x (1 - (Ref_{RecEff}/100))

Project-specific values must be obtained from the project engineer and /or the system manufacturer. Where this is not available, the default values in Table Pol 01-01 can be used.

Table Pol01-01 Calculation of DELC description of the factors in the formulas

Ref_{charge}: Refrigerant charge (kg)	The information must be sourced from the design team's mechanical and electrical engineer or system manufacturer
$Sys_{op\text{-}life}$: System operational lifetime (years)	See Table Pol01-03
Ref_{RecEff}: Refrigerant recovery efficiency factor (%)	95%
L1: Annual leakage rate (units: % Refrigerant charge)	See Table Pol 01-02
L2: Annual purge release factor (% Refrigerant charge)	0,5 (if the system does not require an annual purge, zero should be used).
S1: Annual service release (% Refrigerant charge)	0,25 (this applies where the system requires opening up to carry out the annual service. For systems which do not require opening up, there will be no associated annual release of refrigerant. Thus a default of zero should be used).
S2: Probability factor for catastrophic failure (% refrigerant charge loss/year)	1 (based on a failure rate of 1 in 100 systems).
GWP: global warming potential of refrigerant	The information must be sourced from the design team's mechanical and electrical engineer or system manufacturer:
Cooling and heating capacity (kW).	

When manufacturers provide figures used in the DELC calculation, these figures must be supported by published data, or such data must be readily available from the manufacturer. BREEAM-NOR assessors must obtain this supporting evidence. The DELC calculation is a measure of the risk and severity of potential system leaks. The figures used must represent this for all installed systems, i.e. across the expected range of maintenance and use.

Table Pol01-02 Default values for DELC calculation when manufacturer's figures are not available

System type	Annual leakage rate (% of charge per year)
Cold storage and display systems	
Integral cabinets	3%
Split or condensing units	18%
Centralised	19%
Air-conditioning systems	
Unitary split	15%
Small-scale chillers	10%
Medium or large chillers	5%
Heat pumps	6%
Note: These figures are based on those reported in LOT 6 for air-conditioning units and also Table 2 of the Market Transformation Programmes Briefing Note for Commercial Refrigeration no. 36, 'Direct Emission of Refrigerant Gases' (version 1.2). The figures are based on the average of the leakage rates from the four separate studies reported in Table 2 (where a range is reported, the higher value was used).	

Table Pol01-03 Default system operational design life values

System type	Default system operational design life values (years)
Small or medium capacity chillers	15
Large capacity chillers	20
Unitary split	15
Variable Refrigerant Flow (VRF) system	15
All other systems	10
Note: These figures are based on those reported in LOT 6 for air-conditioning units and the British Refrigeration Association's (BRA) Guideline Methods of Calculating TEWI (Total Equivalent Warming Impact) (2006). The following should be considered when determining whether the system specified is defined as small, medium or large: - Large capacity chiller: centrifugal compressor - Medium capacity chiller: scroll or screw compressor - Small capacity chiller: scroll compressor.	

M1.3 Specification of multiple systems

Where more than one air-conditioning or refrigeration system is installed in the building, the assessor must source the relevant technical data for each system and enter it into the Pol 01 calculator. The calculator will then determine the weighted average DELC for the building.

M1.4 District heating and cooling systems

When a district heating or district cooling system serves the assessed building, the building will have an environmental impact due to the use of refrigerants, albeit in this case indirectly. Therefore, the district heating or district cooling system must be assessed against the BREEAM criteria for refrigerants.

The maximum number of points can be awarded for this issue where connection to a district heating or district cooling system is something that the developer does not control but is required by a local authority or other statutory unit.
Where such a connection is not required and the developer can choose to connect, regardless of encouragement or incentives from the local authority, the district heating or district cooling system must be assessed against the BREEAM criteria for Pol 01 when awarding points.

The following can be used as a basis for the assessment of the obligation to connect:

- Outside areas with an obligation to connect, district heating is voluntary / not mandatory.
- In areas with an obligation to connect where an exemption for connection has been granted, district heating is regarded as voluntary/not mandatory.
- In areas with an obligation to connect where an exemption has been applied for, but not granted, district heating is regarded as mandatory.
- In areas with a connection obligation where no exemption has been applied for, district heating is regarded as mandatory.

Where the refrigerants in a district heating or district cooling system are not to be assessed against the criteria, any other refrigerants in the building will have to be assessed if they are covered by methodology M1.

M2 Leak detection

The refrigerant leak detection criteria (see Definitions) are applicable where any type of non-solid refrigerant is present, i.e. even if the refrigerant meets BREEAM's DELC CO_2-eq benchmarks. Exceptions to this are systems that use natural and environmentally benign refrigerants, air or water (e.g. lithium bromide or water absorption chillers) and installations of small multiple hermetically sealed systems. These types of system or refrigerants will achieve the leak detection credit by default. See criterion 6.

Evidence

Criteria	Design stage	Post-construction stage
1	Documentation showing the absence of refrigerants in the building.	As design stage.
2-5	A confirmation / obligation from the developer that a requirement will be made for the systems and refrigerants in the building to be in accordance with the criteria and methodology. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for relevant parties to design and install systems and refrigerants in the building. -------------- OR A copy of the completed Pol 01 Calculator. Documentation (including the manufacturer's product information) that supports the data used in the Pol 01 calculator and shows that the location and / or specifications for the systems and refrigerants in the building will fulfill the requirements.	A copy of the completed Pol 01 Calculator. Documentation (including the manufacturer's product information) that supports the data used in the Pol 01 calculator and showsthe location and / or specifications for the systems and refrigerants in the building. The BREEAM-NOR Assessor Report with completed values.
6-7	A confirmation / obligation from the developer that a requirement will be made for the systems to be hermetically sealed or fitted with a leak detection system in accordance with the criteria and methodology. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for relevant parties to design and install systems that are hermetically sealed or fitted with a leak detection system.. -------------- OR Documentation (including the manufacturer's product information) that systems will be hermetically sealed or fitted with a leak detection system.	Documentation (including the manufacturer's product information) that systems are hermetically sealed or fitted with a leak detection system.

Definitions

D1 Automatic isolation and containment of refrigerant
An example of a system that would meet criterion 7b could be one that initiates an automated shut down and pump down of the refrigerant into a separate storage tank.

D2 Limiting loss of refrigerant in the event of a leak
BREEAM-NOR has not set specific requirements or methods regarding the most appropriate way of limiting refrigerant loss. This will differ depending on the system type. Example methods are pump down, isolation or system shut-down, etc.

D3 Direct effect life cycle (DELC) carbon dioxide equivalent
A measure of the effect on global warming arising from emissions of refrigerant from the equipment to the atmosphere over its lifetime (units: $kgCO_2$-eq). The calculation involves estimating the total refrigerant release over the period of operation and subsequent conversion to an equivalent mass of carbon dioxide. Should the system use multiple refrigerants (e.g. a primary refrigerant and a secondary coolant) or a cascade system, individual calculations are made for all refrigerants that contribute to the direct effect. See for a description of how DELC is calculated.

D4 Refrigerant leak detection
An automated permanently installed multi-point sensing system, designed to continuously monitor the atmosphere in the vicinity of refrigeration equipment. In the event of detection, it will raise an alarm. The system may be aspirated or have multiple-sensor heads linked to a central alarm unit or building management system (BMS). Various sensor types are available including infra-red, semi-conductor or electro-chemical.

D5 Global warming potential (GWP)
GWP is defined as the potential for global warming of a chemical relative to 1 unit of carbon dioxide, the primary greenhouse gas. In determining the GWP of the refrigerant, the Intergovernmental Panel on Climate Change methodology using a 100-year integrated time horizon should be applied

D6 Hermetically sealed systems
Hermetically sealed plant (as defined in the F Gas regulations) https://www.miljodirektoratet.no/ansvarsomrader/klima/f-gasser/. The regulations' definition of hermetically sealed plant only allows systems to have a tested leakage rate of less than 3 grams per year. This results in the risk of a large refrigerant leak due to system failure being minimised.

D7 Refrigerant
There are three main types of refrigerant:
1. Hydrogenated fluorocarbon refrigerants (HFCs) are made up of hydrogen, fluorine, and carbon. These do not use a chlorine atom (which is used in most refrigerants), which means they are one of the least harmful to the earth's ozone layer.
2. Hydrogenated chlorofluorocarbon refrigerants (HCFCs) are made up of hydrogen, chlorine, fluorine and carbon. These refrigerants contain minimal amounts of chlorine; they are not as detrimental to the environment as some other refrigerants.
3. Chlorofluorocarbon refrigerants (CFCs) contain chlorine, fluorine, and carbon. These refrigerants have high amounts of chlorine and are known to be the most hazardous to the ozone layer.

The use of CFCs and HCFCs as refrigerants has been addressed under the Montreal Protocol. Phase-out programmes have been agreed resulting in these substances no longer being used as refrigerants in all new installations and most existing situations. The industry's favoured replacements are currently HFCs, which are often potent contributors to global warming. Hydrocarbons and ammonia-based refrigerants have low or zero GWP. These are now widely available and are valid alternatives to HFCs in all buildings, provided health and safety issues are fully addressed. The United Nations Environment Programme (UNEP) hosts a HCFC help centre that provides information about the management and phase-out of HCFCs and alternatives to HCFCs in the refrigeration and air-conditioning sector.NULL

D8 Refrigerant recovery

The process of removing refrigerant from a system and storing it in an airtight container.

D9 Systems using refrigerants

The criteria for this issue apply to all building services installed in the building, regardless of the systems refrigerant charge (kg). These services include, but are not limited to:

- Comfort cooling or space heating (including assessment of refrigerants in heat pumps)
- Cold storage, including commercial food and drink display cabinets but excluding small-scale white goods (see Definition)
- Process-based cooling loads (e.g. servers and IT equipment).

D10 Refrigerant pump down

Installation of automatic refrigerant pump down can further limit potential losses and damage to the environment and have consequent financial benefits for the building owner. Discharges of these refrigerants into the environment are an offence, and transport, storage, transfer of ownership and final disposal are regulated by the Product Regulations and the Waste Regulations, respectively.

D11 Robust and tested refrigerant leak detection system

This is normally defined as systems included on the Enhanced Capital Allowance (ECA) Energy Technology Product List (or an equivalent list). Where the system does not fall within the above scope the design team must demonstrate to the assessor that the specified system meets the principles of the scheme as far as is applicable.

D12 Small-scale white goods

These are defined as domestic-scale white goods and include small individual display cabinets (e.g. drinks cabinets in small retail shops).

Additional information

T1 Common refrigerants

Table Pol01-04 List of some common refrigerant types with low GWP

Table Pol01-04 Refrigerant types with low GWP

R-Number	Chemical name	GWP 100-yr
R-30	Dichloromethane	9
R-170	Ethane	3
R-290	Propane	3
R-600	Butane	3
R-600a	Isobutane	3
R-702	Hydrogen	5.8
R-717	Ammonia	0

R-718	Water	0.2–0.2
R-729	Air (nitrogen, oxygen, argon)	1
R-744	Carbon dioxide	1
R1150	Ethylene	3
R-1234yf	2,3,3,3-Tetrafluoropropene	4
R-1270	Propylene	3
Sources: The United Nations Environment Programme '2010 Report of the Refrigeration, Air-conditioning and Heat Pumps Technical Options Committee' EN 378-1:2016+A2:2012 Refrigerating systems and heat pumps - Safety and environmental requirements. Part 1: Basic requirements, definitions, classification, and selection criteria - Annex E. The Intergovernmental Panel on Climate Change' 5th Assessment Report, Chapter 8, 'Anthropogenic and Natural Radiative Forcing', 2013 'Global environmental impacts of the hydrogen economy', Derwent et al, Int. J. Nuclear Hydrogen Production and Application, Vol. 1, No. 1, 2006		

The formula used to calculate the DELC emissions in BREEAM-NOR is based on the total equivalent warming impact (TEWI) calculation method for new stationary refrigeration and air-conditioning systems. TEWI is a measure of the global warming impact of equipment that takes into account both direct emissions and indirect emissions produced through the energy consumed in operating the equipment. This BREEAM-NOR issue addresses direct emissions and the BREEAM-NOR energy section addresses indirect emissions.
Refer to BS EN 378-1 and the BRA's Guideline methods of calculating TEWI for further details. The BRA publication also includes sectorial release factors for new systems designed to best practice standards.

Pol 02 Local air quality

Number of credits available	Minimum standards				
	P	G	VG	E	O
2	–	–	–	–	–

Aim

Contribute to the reduction of local air pollution through heating and hot water installations with low emissions.

Fully fitted/shell and core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	Not applicable
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/ shell and core	
None	

Building type specific

Building type specific notes	
2.1	**New build extensions to existing building** If the heating or hot water demand for the new extension is being met by an existing system, then the emission levels for the existing system must be assessed against the criteria for this issue.

Assessment criteria

This issue is split into two parts:

- Non-combustion heating and hot water system (2 credits)

OR

- Combustion-powered heating and hot water (up to 2 credits)

Non-combustion heating and hot water systems – 2 credits

1. All heating and hot water is supplied by non-combustion systems. For example, only powered by electricity.

OR

Combustion-powered heating and hot water systems – up to 2 credits

2. Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels set in Table Pol 02-01 and Table Pol 02-02 below. See Methodology.

Table Pol 02-01 Maximum NO_x emission levels by appliance type, fuel and location

<table>
<tr><th>Appliance type and unit</th><th>Fuel</th><th>1 credit (low pollution location)</th><th>1 credit (high pollution location)</th><th>2 credits (low pollution location)</th><th>2 credits (high pollution location)</th></tr>
<tr><td>Boiler (mg/m³)</td><td>Biomass, solid fuel and wood pellets</td><td rowspan="2">130</td><td rowspan="2">56</td><td rowspan="2">70</td><td rowspan="2">50</td></tr>
<tr><td>Closed fronted local space heaters (mg/m³)</td><td>Biomass, solid fuel and wood pellets</td></tr>
</table>

Table Pol02.02 Maximum particulate matter and volatile organic compound emissions for appliances using biomass, solid fuel and wood pellets

<table>
<tr><th rowspan="2">Appliance type and unit</th><th rowspan="2">Fuel</th><th colspan="2">1 Credit (low pollution location)</th><th colspan="2">1 Credit (high pollution location)</th><th colspan="2">2 Credits (low pollution location)</th><th colspan="2">2 Credits (high pollution location)</th></tr>
<tr><th>PM10</th><th>VOC</th><th>PM10</th><th>VOC</th><th>PM10</th><th>VOC</th><th>PM10</th><th>VOC</th></tr>
<tr><td>Boiler (mg/m³)</td><td>Biomass</td><td>14</td><td>7</td><td>6</td><td>7</td><td>11</td><td>5</td><td>4</td><td>5</td></tr>
<tr><td>Closed face local space heater (mg/m³)</td><td>Wood pellets</td><td>26</td><td>26</td><td rowspan="2">20</td><td rowspan="2">20</td><td>22</td><td>22</td><td rowspan="2">10</td><td rowspan="2">10</td></tr>
<tr><td>Closed face local space heater (mg/m³)</td><td>Biomass and solid fuel</td><td>50</td><td>50</td><td>25</td><td>25</td></tr>
<tr><td colspan="10">PM10 = particulate matter < 10 micrometres.
VOC = volatile organic compounds.
For the purposes of BREEAM-NOR, PM and VOC emissions are only relevant to the assessment of biomass and solid fuel fired technologies.</td></tr>
</table>

3. The following is reported in the BREEAM-NOR Assessor report: direct and indirect NOx emissions, PM10 and VOC values in mg/m^3, and energy consumption in kWh/m^2/year arising from systems installed to meet the building's space heating, cooling and hot water demands.

Methodology

M1 Combustion-powered heating and hot water systems

M1.1 Determining the pollution level of the location

To identify whether the site is in a low or high pollution location please use https://www.miljodirektoratet.no/tjenester/fagbrukertjeneste-for-luftkvalitet/?kommune=4601&underside=aarsmiddel and select the following options:

- Select municipality for the project
- Select "Calculated"
- Select "Annual mean"
- Select "NO2" (as NOx)
- Select year "2019" (standard value)
- Find the location of the project on the municipality's map
- Take a screenshot which shows the area of the development and the max value and retain for audit purposes.
- 'Select "PM10".
- Select year "2019" (standard value)
- Find the location of the project on the municipality's map

- Take a screenshot showing the area of the development and max PM10 for the area and retain for audit purposes.

M1.2 High pollution location
Please follow "Regulations on the limitation of pollution" §7-9:
https://lovdata.no/dokument/SF/forskrift/2004-06-01-931/KAPITTEL_3-1-2#KAPITTEL_3-1-2

See M1.1 on how to determine the pollution level for the location.

M1.3 Low pollution location
Any location that does not meet the definition of a high pollution location in M1.2.

M1.4 Awarding credits
The number of credits awarded to an appliance is determined by the emission level that gives the lowest number of credits for that appliance. If for example the NO_x and PM10 requirements are achieved for the 1 credit (low p ollution location) scale but the VOC requirements are not, then no credits can be awarded.

M1.5 Back-up space or water heating systems
Back-up space or water heating systems can be excluded from the assessment, provided they are excluded from Ene 01 Building energy performance This is on the basis that these systems will only be used in an emergency so their impact will be limited.
If the systems are included in the Ene 01 calculations, then it must be assumed they will be used outside emergency situations and must therefore meet the emission benchmarks for Pol 02 credits to be awarded.

M1.6 Multiple systems
Where multiple systems are specified or installed, credits are awarded based on the worst performing system.

M1.7 Units of measure for emissions
The emission measurements must be provided by the manufacturers, in accordance with the labelling requirements of Ecodesign Directive 2009/125/EC. This sets performance requirements for combustion-powered heating systems and requires manufacturers to publish NO_x, particulate matter and VOC emission levels for their products. BREEAM-NOR uses the same units of measure as the Directive. These are:

- NO_x measured in mg/m^3 (11% O_2 dry basis) fuel input (Gross Calorific Value (GCV)) for biomass, solid fuel and wood pellets
- Particulate matter and VOCs for all solid fuel or biomass boilers measured in mg/m^3 10% O_2 dry basis
- Particulate matter and VOCs for all solid fuel or biomass local heaters measured in mg/m^3 13% O_2 dry basis.

M1.8 Combustion appliances not listed
No credits may be awarded if any combustion appliances are not covered in Table Pol02-01 and Table Pol02-02.

M1.9 Open flue
No credits may be awarded for open flue heating or hot water systems, unless they have non-return values that will stop combustion gases and emissions from entering the room in which they are located.

Evidence

Criteria	Design stage	Post-construction stage
1-2	A confirmation / obligation from the developer that a requirement will be made for non-combustion heating and hot water systems or combustion-powered systems that fulfills the criteria and methodology. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for relevant parties to design and install non-combustion heating and hot water systems or combustion-powered systems -------------- OR Documentation of projected location and specifications for non-combustion heating and hot water systems or combustion-powered systems. AND Manufacturers' product information and/ or documentation showing that the relevant criteria will be met.	Documentation of location and specifications for non-combustion heating and hot water systems or combustion-powered systems. Manufacturers' product information and / or documentation showing that the relevant criteria have been met. Assessor's inspection report with photographic documentation showing that the specified systems have been installed and that they fulfil the criteria and methodology, (where it is possible to inspect).
3	The BREEAM-NOR Assessor Report with completed values	As design stage.

Definitions

D1 Bioenergy

Bioenergy is a collective term for the utilisation of biomass (trees, plants, and organic waste from households, agriculture and industry) for energy production. The most common use of bioenergy is in the production of heat. It is also possible to produce electric power, liquid biofuels, biogas and hydrogen from biomass. Commercial bioenergy resources in Norway are mainly derived from forestry, agriculture and waste. Biomass can also be harvested from aquaculture, for example from fish waste and algae.

Additional information

None

Pol 04 Reduction of night time light pollution

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	-	-	-	-	-

Aim

To ensure that external lighting is concentrated in the appropriate areas and that upward lighting is minimised, thereby reducing unnecessary light pollution, energy consumption and nuisance to neighbouring properties.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	All
Assessment type specific notes	None	None See Appendix D	None See Appendix D

Notes for fully fitted/ shell & core	
None	

Building specific notes

Building type specific notes	
2.0	Annex: If the assessment only includes the building's annex, only new specified lightning shall be assessed in this issue.
2.1	Residential: Outdoor lighting associated with balconies and roof terraces shall be assessed in this issue.

Assessment criteria

This issue is split into two parts:

- No external lighting pollution (1 credit)

OR

- Minimising external lighting pollution (1 credit)

No external lighting pollution - 1 credit

1. External lighting pollution has been eliminated through effective design that removes the need for external lighting. This does not adversely affect the safety and security of the site and its users.

OR:

Minimising external lighting pollution – 1 credit

2. The external lighting strategy has been designed in compliance with the limit values of obtrusive light of chapter 5.5 in the Lyskultur Publication 1C Luxtabell.
3. All external lighting (except for safety and security lighting) can be automatically switched off between 23.00 and 06.00.
4. If illuminated advertisements (see Definitions), safety or security lighting is provided and will be used between 23.00 and 06.00:

a. illuminated advertisements have been designed in compliance with criteria 2 (above) except in zone E1, where maximum luminance (see Methodology) should be zero after turn-off time.
b. safety and security lighting are designed in compliance with the lower lighting levels recommended in Table 2 in Lyskulturs Publication 1C ("etter aftenklokke"), e.g. by using an automatic switch to reduce lighting levels.

Methodology

M1 Minimising external lighting pollution

M1.1 Scope of assessment

Where the assessment is of an individual building on an existing site then only areas within the construction zone need to be assessed. Where the assessment is of a building that forms part of an entirely new development, the criteria apply to the entire site.

For the purposes of this credit, 'external lighting' includes both lighting mounted externally, and lighting mounted inside a building that is primarily intended to enhance its external appearance, or light external spaces, after dark.

M1.2 Lighting for security purposes

Where light fittings are specified to comply with specific security standards and these conflict with the BREEAM criteria, they can be excluded from the assessment of this issue. In such circumstances, the assessor must procure evidence to confirm the specific security standards and that they are applicable to the assessed development.

M1.3 Non-security lighting considered to be essential between 23.00 and 06.00

Where non-security lighting is considered to be essential between 23.00 and 06.00, i.e for buildings that are open or operate between these hours, the lighting system must be able to automatically switch to the lower levels of lighting recommended in the "Lyskultur publikasjon 1C" Table 2for lighting during these hours or provide such lower levels at all times.

M1.4 Illuminated advertisements

All types of illuminated advertisement must meet the criteria, both self-illuminated and those advertisements illuminated by reflection from other sources.

When considering the zone in which an advertising sign is sited, or is intended to be, sited, the contrast with the surroundings or background should be taken into account (e.g. the surroundings could be unlit when viewed from the road or a residential window) and the zone adjusted accordingly. Where an illuminated sign lies on the boundary of two zones or can be observed from another zone, the illumination level used should be the level that applicable to the most rigorous zone.

Evidence

Criteria	Design stage	Post-construction stage
All	A confirmation / obligation from the developer that a requirement for no external lighting or minimised external lighting pollution in accordance with the criteria and methodology will be made. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for relevant parties to design and install no external lighting or minimised external lighting pollution -------------- OR Documentation of projected location and/or specifications showing no external lighting or minimised external lighting pollution. AND Manufacturers' product information and/or documentation showing that the relevant criteria and methodology will be met.	Documentation of location and / or specifications showing no external lighting or minimised external lighting pollution. Manufacturers' product information and / or documentation showing that the relevant criteria and methodology have been met. Assessor's inspection report with photographic documentation showing that no external lighting or minimised external lighting pollution has been installed, (where it is possible to inspect).

Definitions

D1 Advertisements

Any word, letter, model, sign, placard, board, notice, awning, blind, device or representation, in the nature of, and employed wholly or partly for the purposes of advertisement or announcement. This also includes any hoarding or similar structure used, designed or adapted for use for the display of advertisements.

D2 Construction zone

Any area that is developed with buildings, hard surfaces, cultivated terrain, car parking and access roads to the site. If it is not known exactly where the building, area with hard surfaces, access roads and temporary warehouses are to be located, it must be assumed that the construction zone is the entire site.

Additional information

None

Pol 05 Reduction of noise pollution
(non-residential only)

Number of credits available	Minimum standards				
	P	G	VG	E	O
1	-	-	-	-	-

Aim
To reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings.

Fully fitted/shell & core

	Fully fitted	Shell and core	Shell only
Applicable assessment criteria	All	All	Not applicable
Assessment type specific notes	None	See ref. 1.0 See Appendix D	None See Appendix D

Notes for fully fitted/ shell & core	
1.0	If the future tenant is responsible for the specification and installation of the technical installations in the building/rental areas, the acoustician should assume the worst possible noise classification level. This can be based on references to maintenance strategies or installations and properties similar to the assessed building, or on a specification with maximum fittings.

Building type specific notes

Building type specific notes	
2.0	**Untreated buildings** This assessment issue does not apply to buildings designed to be untreated, i.e. where internal spaces will not be serviced by heating, ventilation or air-conditioning systems and therefore have no noise generating plant. Examples of such buildings could include industrial warehouse storage.

Assessment criteria
This issue is split into two parts:
- No noise-sensitive areas (1 credit)

OR
- Minimising noise pollution in noise-sensitive areas (1 credit)

No noise-sensitive areas - 1 credit
1. There are no noise-sensitive (see Definitions) areas in the assessed building or within an 800 m radius of the assessed site.

OR

Minimising noise pollution in noise-sensitive areas – 1 credit

2. Where there are noise-sensitive areas (see Definitions) in the assessed building or noise-sensitive areas within an 800 m radius of the assessed site, a noise impact assessment and measured or estimated noise levels must be compliant with ISO 1996-2:2017 . Noise levels must be measured or determined for the following:
   a. Existing background noise levels (see Definitions):
      i. at the nearest or most exposed noise-sensitive development to the assessed site, or an equivalent place where the background noise levels can be considered to be equivalent.
      ii. including existing plant on a building, where the assessed development is an extension to the building.
   b. Noise rating level from the assessed building.
3. The noise impact assessment must be carried out by a qualified acoustician (see Definitions).
4. The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise- sensitive development, must be at least 5dB lower than the background noise throughout the day and night.
5. If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.

Methodology

M1 Minimising noise pollution in noise-sensitive areas

M1.1 Compliance at the design stage

At the design stage of assessment, where noise-sensitive areas or buildings are present, actual measurement is unlikely to be possible due to the planned but non-existent installation. In such situations, compliance can be demonstrated through the use of acousticians' calculations or by scale model investigations.

For such cases, ISO 1996-2:2017 states that 'as universally agreed prediction models do not exist, the method adopted should be carefully described in the acoustician's report' and that 'when available, prediction models accepted by relevant authorities should be used'.

Where prediction using these methods is not possible, measurement will be necessary using either a noise source similar to the one proposed or, alternatively, measurement of the actual noise from the installation (once installed). Compliance with the latter approach requires a confirmation in writing that a suitably qualified acoustician will be appointed to carry out the required measurements post installation, and attenuate the noise sources to comply with criteria 4 and 5 if proved necessary by the measurements.

M1.2 Compliance at post-construction stage

Post-construction measurements of noise level are not necessary if the acoustician has accurately modelled the noise level from the system using the manufacturer's literature and on-site measurements during the design stage. It must be confirmed that any attenuating measures specified in the acoustician's report are present at the post-construction stage.

If the acoustician has been unable to model the noise level accurately, post-construction measurements are required to demonstrate compliance. In such cases, near-field measurements must be carried out near the noise sources after technical installations have been installed. Measurement data is then used in the calculation model to reduce the uncertainty in noise calculations.

Evidence

Criteria	Design stage	Post-construction stage
1	Documentation including distance measurements showing that there are no noise-sensitive areas or buildings within an 800-metre radius off the assessed development area	As design stage. BREEAM Assessor's site inspection report and photographic evidence including distance measurements showing that there are no noise-sensitive areas or buildings within an 800-metre radius off the assessed development area
2-5	A confirmation / obligation from the developer that a requirement will be made to carry out a noise impact assessment, measurements/ calculations and that noise levels will be fulfilled in accordance with the criteria and methodology. Applies in those cases where the relevant party is not selected. -------------- OR Documentation showing the contractual obligations for relevant parties to carry out a noise impact assessment, measurements/ calculations and to ensure that the design fulfils noise levels. -------------- OR 1. Documentation showing the competence and experience for the qualified acoustician. 2. Documentation of the location of the designed building including a mark-up of the distance to all existing and planned noise-sensitive buildings close to and within the development area. 3. Documentation of noise impact assessment, measurements/ calculations and specifications for the designed noise generating sources and their noise levels. 4. Description of any noise reduction measures, where applicable.	Documentation showing the competence and experience for the qualified acoustician. Documentation of the location of the building including a mark-up of the distance to all existing and planned noise-sensitive buildings close to and within the development area. Documentation of noise impact assessment, measurements/calculations and specifications for installed noise generating sources and their noise levels. Description of any noise reduction measures, if necessary. Assessor's inspection report with photographic evidence showing that any noise generating sources are in accordance with the documentation and that noise reduction measures have been installed (where relevant and possible to inspect).

Definitions

D1 Background noise

Background noise is the same as residual noise. Total ambient noise at a given position in a given situation when the specific noise source is suppressed to the extent that it will not contribute to the ambient noise.

D2. Qualified acoustician

An individual with the followingcan be considered to be 'qualified' for the purposes of a BREEAM-NOR assessment:

1. College or university education with expertise in acoustics (or equivalent qualifications)
2. A minimum of three years relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting acoustics in relation to construction and the built environment. This includes, acting in an advisory capacity to provide recommendations for suitable acoustic performance levels and mitigation measures.

Where a qualified acoustician is verifying acoustic measurements or calculations carried out by another acoustician who is not sufficiently qualified, they must, as a minimum, have read and reviewed the report and confirm in writing that they have found it to:

1. Represent sound industry practice
2. Is appropriate given the building being assessed and the scope of the proposed works

D3. Noise-sensitive areas

Landscapes or buildings in which the occupiers are likely to be sensitive to noise created by the new plant installed in the assessed building, including:

a. Residential areas
b. Hospitals, health centres, care homes, doctor's surgeries etc.
c. Schools, colleges and other teaching establishments
d. Libraries
e. Places of worship
f. Wildlife areas, historic landscapes, parks and gardens
g. Located in a protected area or near a site of special scientific or ecological interest
h. Any other development that can be considered noise-sensitive.

Not all of these locations will necessarily be sensitive at all times. The assessments should be carried out at times that are relevant to the location's use. For example, schools, libraries and doctor's surgeries may not require a night-time assessment of background noise if they are unoccupied at the time. When making the assessment the qualified acoustician should make it clear during which periods the receptor is considered noise-sensitive and must provide clear reasoning and justification.

Additional information

None

Innovation

Summary

The innovation category provides opportunities for exemplary performance and innovation to be recognised that are not included within or go beyond the requirements of the credit criteria. This includes exemplary performance credits, for where the building meets the exemplary performance levels of a particular issue. It also includes innovative products and processes for which an innovation credit can be claimed, where they have been approved by BRE Global Ltd.

The cost-saving benefits of innovation are fostered and facilitated by helping encourage, drive and publicise accelerated uptake of innovative measures.

Innovation

Number of credits available	Minimum standards				
	P	G	VG	E	O
10	0	0	0	0	0

Aim

To support innovation within the construction industry through the recognition of sustainability related benefits which are not rewarded by standard BREEAM-NOR issues.

Assessment criteria

Up to a maximum of 10 credits are available with the total BREEAM score capped at 100%, in aggregate from a combination of the following:

Exemplary level of performance

1. Where the building demonstrates exemplary performance by meeting defined exemplary level performance criteria in one or more of following BREEAM assessment issues described in table Inn-01 (please refer to the relevant BREEAM issue within this scheme document for details of the exemplary level performance assessment criteria).

Table Inn-01 Available innovation credits for exemplary level criteria

Emne ID	Emne tittel	Poengtittel mønstergyldig nivå
Man 03	Responsible construction practices	Reduction of direct greenhouse gas emissions from activities associated with the construction site
Hea 01	Visual comfort	Highest requirements for view out
Hea 02	Indoor air quality	Minimising emissions from construction products
Hea 06	Safe and healthy surroundings	Extensive biophilic design
Ene 01	Building energy performance	Energy management in post-occupancy stage
Ene 01	Building energy performance	Plus house
Wat 01	Water consumption	Highly water efficient components
Mat 01	Environmental impacts from construction products - LCA and GHG calculations	60% reduction of greenhouse gas emissions
Mat 06	Material efficiency and reuse	FutureBuilt criteria set for circular buildings, point 2.3 reuse of building components
Wst 01	Construction waste management	Very low amounts of waste
LE 02	Ecological risks and opportunities	Wider sustainability of the site
LE 04	Ecological change and enhancement	Significant net gain of biodiversity
LE 06	Climate adaption	Wider response to climate change
LE 08	Local surface water handling	Wider approach for surface water management

Innovation applications

2. One innovation credit can be awarded for each innovation application approved by BRE Global (see Methodology), where the building complies with the criteria defined within an Innovation application form (available at byggalliansen.no)

Methodology

M1 Exemplary level of performance

Refer to the compliance notes within the individual assessment issues that contain exemplary performance levels.

M2 Innovation applications

Innovation applications can be submitted to NGBC by a licensed BREEAM-NOR Assessor using the formal approved innovation application form (available from the NGBC website www.byggalliansen.no).

Evidence

Criteria	Design stage	Post-construction stage
1	As defined within existing BREEAM-NOR Issues.	As defined within existing BREEAM-NOR Issues.
2-4	A copy of the approved innovation application form AND A copy of the innovation application report stating the application outcome as 'approved' AND Relevant documentary evidence demonstrating specification of the approved innovation.	As per interim design phase AND Relevant documentary evidence confirming that the project has achieved or installed the approved innovation as described and quantified within the approved innovation application form.

Definitions

D1 Approved Innovation

Any new technology, design, construction, operation, maintenance or demolition method or process that can be shown to improve the sustainability performance of a building and is of demonstrable benefit to the wider industry in a manner that is not covered elsewhere in BREEAM-NOR. In addition, the innovation has been approved by BRE Global in accordance with its published BREEAM Innovation credit procedures.

Additional information

T1 Applying for innovation credits

Refer to the BREEAM Innovation section documents available from the NGBC websites www.byggalliansen.no for more information on BREEAM Innovation credit eligibility criteria, application process, application fees and previously approved innovations.

Checklist A1

Ref	Requir-ed for one credit	Criterion
		A. Safe and adequate access This section is intended to demonstrate that the contractor operates the site in a manner that guarantees safe and appropriate access to, around and on the site.
1	X	Entrances, exits and construction site office(s) should be clearly marked with signs
2	X	At a multilingual construction site, important information must be communicated with symbols or the communication languages agreed upon in the project.
3		The construction site office shall be accessible to disabled people via a ramp, and must contain an adapted meeting room and toilet.
4		All road signs must be visible or hidden road signs should be replaced.
5	X	The construction site entrance must be managed in order to minimise the impact (e.g. safety, disruption) of from vehicles approaching and leavingthe development.
		B. Good neighbour This section is intended to demonstrate that the contractor operates the site in a manner that takes the surrounding neighbours into account.
6	X	Prevention of noise. The following points have been documented: The noise requirements that apply to the project (T-1442, municipal noise regulations, etc.) shall be clarified An initial dialogue shall be conducted with the neighbours with regard to the need for quiet periods The noise requirements shall be clearly communicated to those individuals working on site and those individuals who arrive at the site in vehicles for loading and unloading purposes.
7	X	The construction site must be clearly and securely marked and the area should be kept tidy. If there are any complaints, the affected area shall be immediately cleared and recurrence must be prevented.
8	X	Complaints should be quickly handled and logged.
9	X	Information about the project and contact information should be up to date and visible to passers-by.Draft
10	X	Dust from construction site activities shall be reduced by having clear procedures in place for covering materials and implementing irrigation, salting, etc., if necessary.
		C. Environmental awareness This section is intended to demonstrate that the contractor has considered the impact of the site on the environment and has implemented measures to mitigate such impact.
11	X	Light pollution from the construction site must meet the requirements in Table 2 of Lyskultur's publication 1C.
12		Construction site offices and changing facilities shall be adapted for low energy consumption and the following measures shall be implemented as a minimum: - energy-efficient lighting - thermostat control of heating and cooling - ventilation with heat recovery - night reduction of temperature
13		Procedures should be in place to verify that water taps are not left on unnecessarily and that they are turned off when the construction site closes for the day. Where relevant, water-saving equipment must be used.
14	X	There should be sufficient space to store equipment and building materials in order to ensure that the construction site is tidy and protected from inclement weather, where necessary.
15	X	An assessment of how the project handles surface and stormwater must be documented. If necessary, the project must refer to specific measures. The assessment shall refer to relevant measures, e.g. local infiltration, manholes/wells, vulnerable areas, the control of water from polluting activities such as casting, etc.
16		Relevant areas must be promptly revegetated.

Ref	Requir-ed for one credit	Criterion
		D. Safe and considerate working environment This section is intended to demonstrate that the constructor is operating the site in a clean and safe manner in order to ensure the well-being of its workers and to minimise the risk to their health and safety.
17		Individuals working on the construction site shall have access to regularly cleaned facilities that meet the requirements of the Workplace Regulations. This applies to canteens, toilets, changing rooms with showers (separate for men and women), lockable lockers, etc.
18		Dedicated smoking areas should not be adjacent to the building's entrance hall or air intakes and should be clearly marked and shown on the rig plan.
19	X	Protective equipment must be available to visitors at the construction site.
20	X	The construction site shall be adapted for safe evacuation in the event of a fire in accordance with the applicable regulatory requirements. As a minimum: - escape routes must be clearly marked - fire instructions must have been prepared for the project - fire drills must be carried out during construction work
21	X	Before the start of construction site work, the project will: 1. Make an initial risk assessment with regard to proximity to vulnerable recipients, municipal surface water network, etc. 2. Have efficient waste collection in place for tanks/temporary storage and emergency equipment (absorbents/booms) adapted to the project's environmental risk. 3. 3. Provide workers with training in the use of chemicals, fuel and emergency equipment in the event of a spill.

Signed by:

Representative from the construction site date

BREEAM-NOR Assessor date

Checklist A2

IAQ plan

The checklist is used when writing an IAQ plan. If reference number 1-7 under section A cannot be fulfilled, reference number 8-30 under section B-E must be fulfilled.

Ref.	Criterion
	A. Strategy for the removal of contaminant sources (see Definitions under Hea 02) Aim: Identify and minimise or eliminate sources of air pollution at early stages of the design process in order to subsequently reduce the amount of air pollution that needs to be removed and diluted using ventilation strategies.
1	Implications of building location and development configuration (see Methodology in Hea 02)
2	Reducing outdoor air pollutants ingress through consideration of building form, layout and permeability of the building envelope (see Methodology in Hea 02).
3	Locating air intakes and openable windows away from sources of external pollution, such as car parks and delivery/vehicle waiting areas. (see Methodology in Hea 02),
4	Selecting construction products and finishes with a low impact on indoor air quality
5	Protecting HVAC equipment and ductwork from dust and other pollutants during installation and when in the vicinity of other construction/installation works.
6	Checking and cleaning ventilation systems and ductwork prior to or during commissioning, so that pollutants are not released into the building.
7	Practical procedures and checks to ensure that the above outcomes are achieved and documented.
	B. Where A above is not relevant – dilution and control of contaminant sources (see Definitions in Hea 02) Aim: Minimise the ingress of external pollutants and remove/minimise sources of internal pollutants to reduce and regulate the levels of indoor air pollution in buildings. Moreover, this sub-section should provide consideration of the building's ventilation strategy and its mitigating impact on indoor air quality levels.
8	Design targets for the concentrations of relevant/different internal pollutants (see Definitions under Hea 02).
9	Strategies for dealing with breaches of internal pollutant concentration targets.
10	Sources of external air pollution, where these are likely to impact indoor air quality, to inform building ventilation strategies.
11	The impact of specified construction materials and finishes specified to help inform dilution and control strategies.
12	The impact of recirculation, where relevant, and ventilation rates on indoor air quality.
13	Considering whether the building has functions with specific air quality requirements, e.g. laboratories, hospitals, manufacturing facilities etc.
14	Establish exhaust ventilation for printers, photocopiers and other equipment that creates pollutants.
15	Indoor air quality monitoring provisions/systems and links to ventilation control.
16	The influence/effect of occupants on ventilation control.
	C. Procedures for pre-occupancy flush out and adjustment of ventilation before the building's handover Aim: Ensure that pre-occupancy flush out processes remove residual sources of pollution which may have accumulated in the building during construction and higher concentrations of pollutants which are released by new products such as sealants, wood-based products and textiles. This ensures that any subsequent testing is carried out in conditions that are representative of indoor air quality when the building is occupied.
17	Defining appropriate flushing procedures and timings for the project, in order to purge the building of internal pollutants.
18	Completing and cleaning the building prior to measuring the indoor air quality.
19	In the case of a phased development: Measures to protect against subsequent pollution ingress from construction that has not been completed in other areas.
	D. Third party testing and analysis of ventilation in the building during commissioning (see Definitions under Hea 02). Aim: Ensure that third party testing and analysis uses a recognised method of testing for different air pollutants, in addition to providing impartial and objective measurement results that record levels of air pollution in the newly constructed building.
20	Determining procedures for performing IAQ testing (post-construction but pre-occupancy) on the pollutants of concern.

Ref.	Criterion
21	Ensuring that the maximum concentration requirements for total volatile organic compounds (TVOCs) and formaldehyde have not been exceeded, and that all measurements are appropriately recorded.
22	Taking into account the remedial measures to be undertaken should the prescribed levels not be met, the circumstances in which re-testing is required and its timing and methodology in relation to ruling out occupancy-related pollutants.
E. Maintaining good indoor air quality in-use Aim: Ensure that commitments and measures are in place to maintain indoor air quality at acceptable levels throughout the building's operational life.	
23	Dissemination of relevant information to the building's occupier via a building user guide, regarding on how to operate, manage and maintain the building to maintain acceptable levels of indoor air quality. This may include:
24	Recommendations for establishing policies and procedures that minimise the use of products within the building that emit VVOCs, VOCs and other air pollutants (e.g. cleaning materials and products used in maintenance activities) throughout the building's operational life.
25	Recommendations for establishing policies and procedures for performing regular cleaning of the building's interior to prevent the accumulation of dust and other pollutants.
26	Recommendations for establishing policies and procedures for the correct use of HVAC, mechanical ventilation or natural ventilation to avoid mould growth due to unappropriated temperature and relative humidity, and accumulation of other pollutants.
27	Recommendations for establishing policies and procedures for the correct use of exhaust systems installed in cooking areas to prevent accumulations of pollutants.
28	Recommendations for establishing policies and procedures for regular cleaning and maintenance of ventilation systems, including replacing filters and cleaning of heating/cooling coil surfaces, ductwork and humidifiers.
29	Recommendations for monitoring indoor air quality for the pollutants of concern including frequency, methodology and appropriate sampling locations.
30	Guidance on measures to be implemented to maintain adequate indoor air quality in the event of changes to occupant density or working practices.

Signed by:

Responsible designer of indoor climate: date

Responsible contractor of indoor climate: date

Individual responsible for 3rd party testing and analysis: date

Appendix A BREEAM-NOR Case Study Template

The case study template can be found on NGBCs website www.byggalliansen.no.

Appendix B Mixed use developments and similar building types (or units)

1 Mixed use developments

Developments with a number of separate buildings of differing functional types, or a single building with different functions, e.g. office and retail or retail and Doctor´s surgery, will require an assessment and therefore BREEAM rating and certificate for each individual building in the development or each functional use within a single building.

This is necessary as BREEAM-NOR defines criteria and benchmarks for some assessment issues according to building type, function and use. To maintain comparability and consistency of the assessment and BREEAM - NOR rating, a separate registration, assessment score and rating are therefore required for each building type function or use in the development.

A single building that has a number of clearly separated dominant functions, i.e. mixed-use, will require separate assessments, ratings and certificates for each dominant function, as the scheme and/or assessment criteria for such building uses and users differs markedly. Examples of such buildings include:
1. A building with retail units on ground floor and offices in the rest
2. A building with retail units in one wing and residential units in another

A single building with a dominant function but containing a number of different functional areas can have a single BREEAM-NOR assessment, rating and certificate. Examples of such buildings include:
1. An office or industrial unit with some laboratory space, workshop space, canteen and/or staff gym
2. A residential building with a small kiosk on the ground floor

Dominant function will be regarded as 95% or more of the total area and where the non-dominant function(s) is 100 m^2 or less.

Where a building includes several non-dominating functions that are not clearly distinct, and which have shared access, common areas or supporting functions, please contact NGBC for further advice regarding bespoke assessments.
Functions that are a natural part of a building type shall be considered as the main function and shall not be regarded as a separate building type. Examples of such buildings include:
1. School building with offices for principal and teachers
2. Hotel with a restaurant
3. Cultural building with administrative offices

The above examples are not an exhaustive list. They are used to highlight the types of scenarios where a single BREEAM-NOR assessment or multiple assessments is required. Clients are advised to consult a licensed assessor for advice on applying BREEAM-NOR to mixed-use developments. The BREEAM-NOR assessor will ensure that the building(s)/development is registered correctly, seeking advice from Grønn Byggallianse on classification where needed.

2 Similar buildings (or units) on the same site

It is possible to assess and therefore rate and certify a number of separate but similar buildings, or individual units within a larger building development, within one BREEAM-NOR assessor's report. This is subject to the following conditions:

1. The buildings/units must all be on the same site
2. The buildings/units must be of the same building type e.g. an office building or residential building, with the same building functions/spaces and fitted out to a similar specification and therefore assessed using the same BREEAM-NOR issues
3. Each BREEAM-NOR issue must be assessed, and its credits awarded, based on the worst performing building/unit
4. The assessment and assessors report produce a single BREEAM-NOR rating covering all buildings/units assessed

For the above scenario, a single BREEAM-NOR certificate will be issued listing all the buildings/units covered by the single BREEAM-NOR assessor's report.

If one or more building/unit performs markedly better than another on the same site and the client wishes to recognise this, a separate BREEAM –NOR assessment and therefore rating and certificate is required for that building or unit.

Appendix C Refurbishment and fit out assessments

The scope of the BREEAM-NOR New Construction scheme is mainly the quantification and mitigation of environmental impacts of new building projects. This manual is thus not specifically designed to cater for the assessment of refurbishment and fit-out projects

Prior to the launch of a Norwegian refurbishment scheme for buildings, clients may continue to apply BREEAM-NOR and certify refurbishment and fit-out projects using the method.

1 Definition of new buildings and extensions

New buildings and extensions can use the BREEAM-NOR manual without adaptations, see alternative A in figure C-01.

Overall, a newly constructed building is defined as a building that has been constructed from scratch and in general does not incorporate any part of an existing building. Where a building is constructed on the site of a pre-existing building, it will be defined as a new build where it does not incorporate any part of the former building above ground level, with the exception of a retained cellar, basement and ground floor slab. Extensions can also share certain building parts with an existing building, such as a wall in a fill-in project.

2 Major refurbishment

Major refurbishment assessments can use the BREEAM-NOR manual without adaptations, see the description of alternative A below.

In BREEAM-NOR, the term refurbishment is used throughout the manual, but a distinction is made between major refurbishment and other refurbishment and fit-out assessments. Major refurbishment is the same as a *main renovation*, a term that is used in the Planning and Building Act's descriptions of work on existing buildings.

Major refurbishment means that the building undergoes radical changes or repairs that are so extensive that the entire building structure is essentially a new building.

Existing building parts that can be included in a major renovation assessment:

- Load-bearing structures
- Basement, lower floor, covering the ground or other building parts below ground level

It should be noted that the majority of major refurbishment assessments will reuse the majority of the buildings existing supporting sub and superstructure. In some cases the building façade will be retained, albeit with remediation or renovation.

3 Other refurbishment and fit-out assessments

Assessments that do not meet the requirements described for "Major Refurbishment" can use the BREEAM-NOR manual with adaptations. See description of alternative B below.

4 Available alternatives

There are two options available for refurbishment and fit-out assessments depending on the scope. See Figure C-01 and the description below.

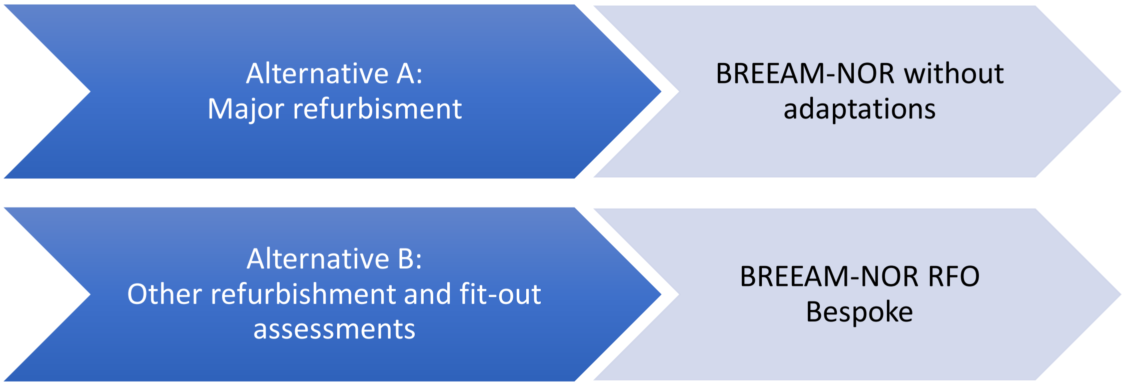


Figure C-01 Alternative A and B for refurbishment and fit-out assessments

4.1 Alternative A

When using alternative A, the project can use the BREEAM-NOR manual without adaptations. This means that the scope of refurbishment must correspond to BREEAM-NOR's definition of major refurbishment (see above).

Buildings that are listed and have protection regulations associated with the building must always choose alternative B.

Some assessments might be suitable for alternative A, even though the scope of refurbishment does not correspond to BREEAM-NOR's definition of major refurbishment. The assessor can then send in a technical query to NGBC on behalf of the project.

4.2 Alternative B

For all other scopes of refurbishment than alternative A, the assessment needs a BREEAM-NOR Bespoke RFO criteria set. The criteria set is an adaptation based on the BREEAM-NOR manual but includes elements from BREEAM International Refurbishment & Fit-Out. This way, the criteria and credits available are better adapted to the assessment. The basic principles of the Bespoke criteria set and the Bespoke process are similar to those for other Bespoke projects. More information about Bespoke can be found in the introduction to this manual, the website on BREEAM-NOR Bespoke projects on www.byggalliansen.no or by contacting NGBC directly.

4.3 Refurbishment scope

BREEAM-NOR RFO -Bespoke is divided into four parts, see table C-01. The assessment scope may include one or more parts.

Table C-01 Refurbishment scope and available parts

Part	Element	Component	Description
Part 1	Fabric and Structure	- Building facade - Roof - Windows	Available when the area to be renovated is greater than 50% of the surface of the individual element or 25% of the total building envelope Two or more of the elements in the list must be included in the renovated area.
Part 2	Core services	- Central air handling unit - Heating - Cooling - Sanitary services and fittings - Building management system - Energy sources	Two or more of the installations in the list must be replaced or upgraded
Part 3	Local services*	- Lighting - Zone controls - Local ventilation - Local heating units - Local cooling units - Local water heaters	One or more of the local installations in the list must be replaced or upgraded Lighting must be included as a minimum due to minimum standards in the issue Hea 01
Part 4	Interior design	- Wall coverings - Floor coverings - Ceiling covering and systems - Partitions - Raised floor system - Furniture and fittings (fixed) And at least one of the following: - Sanitary fittings - Other equipment (fixed) - Local electrical installations, e.g. sub-metering	Two or more of the installations in the list must be replaced or upgraded Surfaces must be part of the scope if the assessment wants to achieve a higher classification level than Good. The fit-out must include at least 50% 50% of the area of the individual element

*Local services are defined as services that supply a specific area and may connect into the distribution systems from the core services within the tenanted area.

4.4 Classification level available for the different parts

The classification level that can be achieved for alternative B depends on which, and how many parts from table C-01 are included in the refurbishment scope and the combination of these.

Due to the minimum standards for the different classification levels in BREEAM-NOR, it will be difficult to achieve a higher classification level than Very Good if the refurbishment scope only includes one or two of the four parts.
NGBC can be contacted for further guidance.

5 Part new-build, part refurbishment projects

If the project consists of a combination of new construction and rehabilitation, alternative A or B can be chosen. The options are described below:

a. The assessment uses alternative A covering the entire project, i.e. both for the new building and the rehabilitation project.
b. The assessment uses alternative A for the new building. The refurbishment is omitted from the certification scope
c. The assessment is divided in two. The new building uses alternative A. The refurbishment uses alternative B. The assessment achieves two certificates, one for the new building and one for the refurbishment.
d. If the project is mainly a refurbishment, but with some new components, alternative B can be used for both the new building and the refurbishment if the conditions described in table C-02 below are met. The assessment achieves one certificate covering the entire project.

Table C-02 Distribution between the original building and the new building / extension when alternative d. is used

	Distribution 1	**Distribution 2**	**Distribution 3**
Original building	$\geq$ 1000 and < 2500 m^2	$\geq$ 2500 m^2	<u>Where none of the above options are deemed suitable for the project, there are two further options:</u> - Separate BREEAM-NOR New Construction and BREEAM- NOR RFO Bespoke OR - BREEAM-NOR Bespoke Mixed use: combined criteria for Newbuild and rehabilitation
New building/extension	$\leq$ 20% of the original building area	$\leq$ 500 m2	

6 Assistance to the assessments in choosing an alternative

In determining the appropriate option for a refurbishment or part new-build part-refurbishment project, the BREEAM-NOR assessor should review the scope of the proposed works and consider in-particular the scope of the refurbished elements. Questions to be answered are:

- is it major refurbishment?
- will there be a significant change of use?
- and will the buildings thermal and structural elements remain 'as existing'?

Using this information, the assessor should advise the client on the most suitable option. Where the assessor is unsure, project details and a copy of the plans showing the existing and planned building must be sent to the NGBC for assistance in choosing an alternative.

Appendix D Shell and core/Shell Only assessments (apply to all building types except residential)

Shell and core and shell only new buildings (see Definitions) can be assessed using the BREEAM-NOR NC scheme. The methodology below applies to all building types except residential. If a residential building is not to be assessed as fully fitted, NGBC should be contacted for a bespoke process.

The application of the BREEAM-NOR assessment criteria, for the majority of BREEAM-NOR assessment issues, will be straightforward. However, several of the BREEAM-NOR issues and their criteria are tailored to assess a building that is being fitted out. These BREEAM-NOR issues will not be scoped out of the assessment of a shell and core or shell only new building. Ultimately the building will be used in a fitted-out state, the BREEAM-NOR assessment and rating must therefore reflect the environmental performance of the building based on its intended use.

It is recognised however, that it may not be possible for a shell and core or shell only design/specification to demonstrate compliance with some of the BREEAM-NOR criteria, as fit-out decisions relating to certain aspects of a new building will be made by the future tenant, who at the time of the interim or final assessment stage may not be known. Subsequently NGBC recognise that there is a need for a degree of flexibility in applying BREEAM-NOR to new shell and core or shell only building design and specification, to recognise the scope of limitations and opportunities open to the developer to influence the final fitted-out performance of the building.

Shell and core and shell only assessments will have a different weighting of the categories than fitted assessments. See Introduction for details.

1 Which issues provide specific information relating to shell and core assessments?

Table D-01 lists the BREEAM-NOR New Construction assessment issues and highlights the assessment issues that are either specific to or contain criteria that potentially rely on or influenced by building fit out design/specification issues.
whether or not specific notes are provided concerning the application of the assessment criteria to shell and core or shell only building design and construction.

Table D-01: Available issues relating to shell and core and shell only assessments.

Issue ID	Issue Title	Shell and core	Shell only	Note
Management				
Man 01	Project brief and design	Yes	Yes	No
Man 02	Life cycle cost and service life planning	Yes	Yes	Yes
Man 03	Responsible construction practices	Yes	Yes	No
Man 04	Commissioning and handover	Yes	Yes	Yes
Man 05	Aftercare	No	No	Yes
Health and wellbeing				
Hea 01	Visual comfort	Yes	Yes	Yes
Hea 02	Indoor air quality	Yes	Yes	Yes
Hea 03	Thermal comfort	Yes	No	Yes
Hea 05	Acoustic performance	Yes	No	No
Hea 06	Safe and healthy surroundings	Yes	No	Yes
Hea 08	Private space	Yes	Yes	No
Energy				
Ene 01	Building energy performance	Yes	Yes	Yes
Ene 02	Energy monitoring	Yes	No	Yes
Ene 03	External lighting	Yes	Yes	No

Issue ID	Issue Title	Shell and core	Shell only	Note
Ene 05	Energy efficient cold storage	Yes	No	Yes
Ene 06	Energy efficient transportation systems	Yes	Yes	No
Ene 07	Energy efficient laboratory systems	No	No	No
Ene 08	Energy efficient equipment	No	No	No
Transport				
Tra 01	Transport assessment and travel plan	Yes	Yes	No
Tra 02	Sustainable transport measures	Yes	Yes	No
Water				
Wat 01	Water consumption	Yes	No	Yes
Wat 02	Water monitoring	Yes	Yes	Yes
Wat 03	Water leak detection and prevention	Yes	Yes	Yes
Wat 04	Water efficient equipment	Yes	Yes	Yes
Materials				
Mat 01	Environmental impacts from construction products - LCA and GHG calculations	Yes	Yes	Yes
Mat 02	Environmental impacts from construction products – Product requirements	Yes	Yes	Yes
Mat 03	Responsible sourcing of construction products	Yes	Yes	No
Mat 05	Designing for durability and climate adaptation	Yes	Yes	No
Mat 06	Material efficiency and reuse	Yes	Yes	Yes
Mat 07	Disassembly and adaptability	Yes	Yes	Yes
Waste				
Wst 01	Construction waste management	Yes	Yes	No
Wst 03a	Operational waste	Yes	Yes	Yes
Wst 03b	Operational waste	No	No	Yes
Wst 04	Speculative finishes	Yes	No	Yes
Land use and ecology				
Le 01	Site selection	Yes	Yes	No
Le 02	Ecological risks and opportunities	Yes	Yes	No
Le 03	Managing impacts on ecology	Yes	Yes	No
Le 04	Ecological change and enhancement	Yes	Yes	No
Le 05	Long-term ecological management and maintenance	Yes	Yes	No
Le 06	Climate adaptation	Yes	Yes	No
Le 07	Flooding and storm surge	Yes	Yes	No
Le 08	Local surface water handling	Yes	Yes	No
Pollution				
Pol 01	Impact of refrigerants	Yes	No	Yes
Pol 02	Local air quality	Yes	No	No
Pol 04	Reduction of night-time light pollution	Yes	Yes	No
Pol 05	Reduction of noise pollution	Yes	No	Yes

2 Shell and core building assessments and minimum BREEAM-NOR standards

Please note that all minimum BREEAM-NOR standards remain applicable for shell and core and shell only buildings unless otherwise described in the issue. For issues with minimum standards, compliance can in some cases be demonstrated for the areas of the shell and core building that are directly under the influence of the developer.

For issues reliant upon compliance of tenant areas/fit-out items, the minimum standards are still applied to those areas and compliance can be demonstrated via a green fit-out agreement (see Definitions).

It is worth noting that shell only buildings will not be able to fulfil the requirements sat in EU taxonomy for sustainable finance. The taxonomy requires documented qualities in several areas that are included in interior design work. It is considered that a raw building cannot solve this with an interior design agreement as the tenant or owner in many cases is not known.

3 Partly fully fitted assessments

For assessments where 95% or more of the total area (BRA) is fully fitted, the general rule is that the whole building can be assessed as fully fitted. The area of the building that is not fully fitted must still be fitted to fulfil the definition of "shell and core assessments". In addition, the following areas and functions must be fitted or installed:

- All common areas, such as reception, stairs, hallways, large meeting rooms, canteen, changing rooms etc.
- All sanitary equipment. This does not include water-related installations for kitchenettes.
- Technical systems, such as lighting, ventilation, sensors, etc. For the shell and core areas, this is installed according to a preliminary layout and completed as far as is technically and economically justifiable.

If the above conditions are met, the project must send in a technical query to NGBC to get confirmation that the building can be certified as fully fitted. The project will then receive a certificate as a fully fitted building.

Areas that are shell only cannot be part of a fully fitted assessment.

4 Definitions

4.1 Shell only assessments

This option is available where the developer's scope of works covers new build works to the fabric, substructure and superstructure of the building only, including:

- External walls
- Windows
- Doors (external)
- Roof
- Core internal walls
- Structural floors
- Hard and soft landscaping areas (where present and within the scope of works).

4.2 Shell and core assessments

This option is available where the developer's scope of works covers shell works, as described the definition of shell only assessment, plus core building services. Core building services relates to the installation of:

- central or communal transport systems
- water systems
- fit-out of common areas
- central mechanical and electrical systems, including HVAC, but without local fitting of systems within tenant areas. The systems will typically be centralised with capped-off distribution to each tenanted area (for future connection as part of a tenant's/owners fit-out works).

4.3 Green fit-out agreement

A formal contractually binding agreement between a building developer or owner and tenants. As such, a green fit-out agreement (or ‘green’ clauses or sections in a lease agreement) can be used as evidence for demonstrating compliance with the relevant BREEAM-NOR issue criteria at the interim design and final post-construction stages of assessment. The agreement should make specific reference to the specification requirements or levels claimed, and as defined by BREEAM-NOR in this technical manual, where credits are awarded.

BREEAM-NOR aims to encourage a mutually beneficial relationship between the shell and core developer or owner of a building and its future tenants/users so that the fully fitted operational building achieves performance against the highest possible environmental standards. In order to achieve this, BREEAM-NOR encourages and rewards the use of formal legally binding green fit-out agreements between a developer or owner and tenant.

Where a legally binding green fitout agreement is provided as evidence and it commits the tenant's fit-out to meet the criteria of this BREEAM-NOR issue, credits are available to be awarded.

Appendix E: Methodology for the calculation of biodiversity changes

1 Scope and applicability

This appendix lists the methodology and process used to calculate a "change in biodiversity" (see Definitions) in the project. The methodology and process should be carried out by a qualified ecologist (see Definitions in LE 02).

The methodology is directly relevant to calculating change in biodiversity. It is therefore part of LE 04 and the criterion "Calculation of change in biodiversity". It is also relevant to the issues below:

- LE 02 for which it can be used to calculate the condition before the development starts
- LE 03 for which it can be used to calculate the effect of measures to mitigate the negative impact on ecology
- LE 05 for which it can be used to lay the foundation for long-term ecological management

The outputs of this calculation should be used by the assessor to determine the number of credits available.

2 Background to the methodology

Significant advances have been made in understanding, measurement, calculation and data quality since BREEAM started evaluating the change in ecological value in 1998. These changes have been taken into account in determining the methodology set out in this Appendix. The methodology has been developed by BRE Global and described in Guidance Note 36. It has then been adapted to Norwegian conditions with input and guidance from public and professional bodies, practising ecologists and other relevant experts and stakeholders.

The Norwegian adaptation of the method is mainly based on Nature Types in Norway (NiN) (see Definitions), which is a descriptive method for nature. NiN has been developed by the Norwegian Biodiversity Information Centre, which is an agency under the Ministry of Climate and Environment. In addition, elements from sample mapping according to the impact assessment methodology of the Norwegian Environment Agency (see Definitions) have been used.

3 Overview of the methodology

The methodology complements, but does not negate or replace the need for any legally required ecological assessments, i.e. assessments required by the Planning and Building Act.

This methodology uses the change in 'biodiversity units' (see Definitions) as an indicator of a site's overall change in ecological value. It uses a simplified set of key ecological attributes and assessment characteristics before, during and after the development. This provides an appropriate degree of consistency and comparability to establish the change in biodiversity for the site. See figure E-01 for an overview of the methodology.

The methodology requires the calculation of biodiversity units for both "linear" and "area-based" habitats (See Definitions) impacted by a project and is carried out pre- and post-development. It provides a simple and accessible methodology that estimates changes, promotes the protection of existing ecology, contributes to impact mitigation and enhancement in relation to the built environment.

The methodology is therefore an accounting tool used to demonstrate biodiversity losses and gains and so determine the awarding of credits at BREEAM-NOR. It should not be used for other purposes without careful consideration of its relevance to the task being undertaken.

The methodology is based on three main attributes:

i. the area or length of a habitat (dependent on the type of habitat)
ii. the condition of the habitat
iii. the distinctiveness of the habitat

These attributes are assigned numerical values to allow biodiversity units to be calculated for each habitat type. The number of biodiversity units can then be compared both pre- and post-development to determine the relative change, thereby giving an indication of the changes in the overall ecological value.

Whilst some sites have a significant ecological value that is often, but not always, recognised in the planning process, many other sites have limited value pre-development. These still have the potential to enhance value through development and management changes. For many sites, overall value is and will remain relatively insignificant. It is therefore important that an appropriate level of rigour is used to consider ecological impacts that are commensurate with the complexity and scale of the potential impacts and risks involved.

The calculation methodology requires a suitably qualified ecologist to undertake site visits and surveys of the existing habitats in the development footprint (see Definitions) and (if relevant) any areas of habitat that are indirectly affected. In addition, areas outside the site that are used for the creation or improvement of habitats must be included in order to compensate for impacts on the development area. These surveys are used to establish a value for three attributes (described in the following sections) and should be undertaken before any works commence, including preparatory works such as site clearance. They should be carried out together with any other required ecological surveys wherever possible (e.g. for planning purposes).

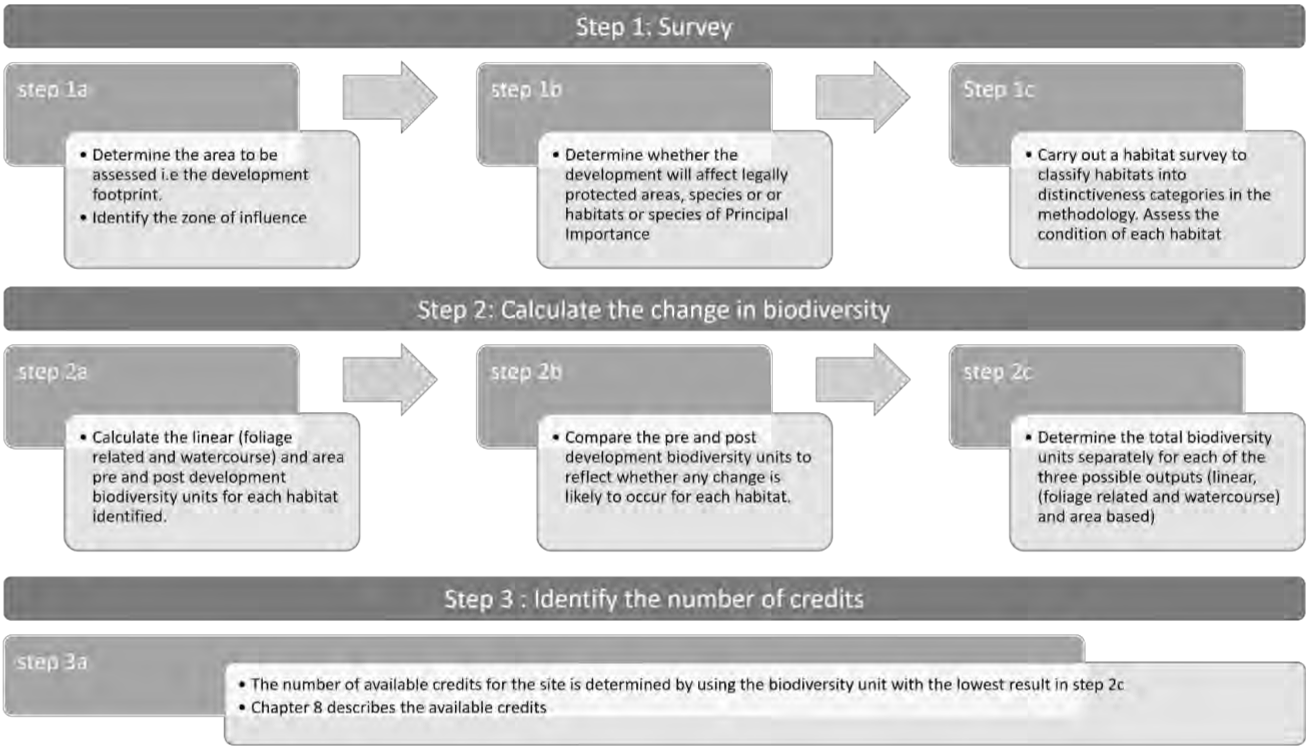


Figure E-01 – Overview of the methodology to calculate change in Ecological Value

4 Step 1: Survey

A qualified ecologist should use the survey methodology described in LE 02 and figure E-01.

All habitats with an area of at least 10 m², including individual trees (calculated on the basis of the root protection area), in the development footprint (see Definitions) should be identified using data from the following sources in order of priority, and if available:

1. Recent ecological inspections and assessments (maximum three years old) carried out by competent professionals
2. Site-specific searches in databases such as:
   a. Ecological base maps (artsdatabanken.no)
   b. Nature base Naturbase – The Norwegian Environment Agency (miljodirektoratet.no)
   c. Species map from the Norwegian Biodiversity Information Centre (Artsdatabanken - Kunnskapsbank for naturmangfold
   d. Environmental Status (Miljøstatus (miljodirektoratet.no)
3. Recent aerial photos (no more than two years old)

All habitats in the development footprint should be recorded, including areas not directly affected by development activity or those areas that are temporarily affected, indirectly affected, as well as any existing habitats at offsite compensation sites. Habitats should be classified into habitat categories following the methodology set out by Nature Types in Norway (NiN)

Overlapping habitats should not be recorded more than once.

Linear habitats should be mapped as a line rather than a polygon if using GIS.

NiN habitat types do not always identify all habitats of principal importance. Additional field notes should be taken to identify such habitats using the current Norwegian Red List of Habitats and Species. Please see section 8.1 on habitats of principal importance for further information.

It is acknowledged that it will not always be possible to conduct surveys according to the NiN methodology, for example, due to lack of access to parcels of land. Where this is the case, and other means of classifying habitats are used, the inability to access the land should be justified and an alternative means of identifying habitats, such as the use of existing data from Local Record Centres or aerial photography, should be stated and justified.

Surveys according to NiN may not be required where all habitats present in the site are of low distinctiveness (irrespective of the area). In such cases, a site walk over should be undertaken in which an ecologist follows good professional practice and judgment.

Where a NiN survey or walk over are not possible, the habitats should be identified based on the best available information (e.g. aerial photography).

5 Step 2: Calculation of biodiversity

The methodology calculates biodiversity units for the development area. Biodiversity units should be calculated for each habitat. Habitat biodiversity units are found by setting a value for the factors defined in the method. These are multiplied and together give a number for the biodiversity units of the habitat. This is done before and after development and is used to calculate changes in biodiversity as a result of the development. The LE calculator “Change in Ecological Value Calculator” should be used for the calculation.

6 Pre-development calculations

Pre-development, the ecologist should determine the biodiversity of the site based on the following biodiversity factors:

- Area for area-based habitats (m²) or length of linear habitats (m) (see Definitions)
- Distinctiveness (see Definitions)
- Condition (see Definitions)

Pre-development units should be calculated based on the habitats present on the site prior to development, including any site clearance, temporary use of land and preparatory works. These should be calculated to provide a baseline for the ecological value of the site.

Habitats that are dominated by invasive organisms should not be considered as habitats. If invasive organisms can be removed by weeding etc. to a reasonable extent, the habitat can be included.

6.1 Specific for linear habitats

Linear habitats and area habitats should be treated separately for the purpose of biodiversity unit calculations. The contribution of linear habitats to the biodiversity in the landscape is far greater per unit of area than even the most biodiversity rich localised habitats because of their multiple role in maintaining structures in open areas, i.e. the provision of shade, hiding and filtering nesting/spawning sites, corridors, feeding sites, shelterbelts, growing areas, etc. (Defra 2012 a). As a result, these habitats should be treated separately.

When calculating linear biodiversity units, foliage based habitats and watercourse calculations should be completed independently (see Definitions). This is partly because they provide habitat spaces that are not comparable with each other, e.g. a vegetated ditch or border zone do not necessarily provide the same benefits as a watercourse.

Another reason for keeping these outputs separate is because the methodology for assessing the condition of a water body, as described in 02: 2018 Classification of environmental condition in water (vannportalen.no), involves biological and physio-chemical analyses that are too complex for this methodology.

6.2 Habitat Distinctiveness

Habitat distinctiveness (see Definitions) is a measure of biodiversity that has regard for the number and variety of species found there (richness and diversity), whether any of the species are endangered, and how many species the habitat supports that are not common elsewhere.

Distinctiveness is scored against a three-category scale as detailed in Table E-01.

Table E-01 – Habitat Distinctiveness Categories and Scores

Distinctiveness Category	Distinctiveness Score	Habitat Types Included
High	6	Areas or species of principal importance. This means that the habitat type or species in the habitat are categorised as critically endangered (CR), highly endangered (EN), vulnerable (VU) or near endangered (NT) in the Norwegian Red List of Habitats and the Norwegian Red List of Species, as well as selected habitat types according to the Biodiversity Act. OR The ecosystem to which the habitat belongs, or species it contains, is categorised in the Norwegian Nature Index as dark red or red in the geographical area in which the site is located. https://www.naturindeks.no

Medium	4	Habitats of minor principal importance according to the Norwegian Environment Agency's impact assessment methodology, such as: – habitats with an important ecosystem function but with very low locality quality – near endangered habitats (NT) with very low locality quality – habitat types that have been mapped to a small extent and have very low locality quality. OR The ecosystem to which the habitat belongs or the species it contains are categorised in the Norwegian Nature Index as dark orange or orange in the geographical area in which the site is located. https://www.naturindeks.no OR The habitat is of one of the following types: – Larger natural gardens or gardens with a high proportion of native vegetation or species. – Forest areas that do not fall into the category of tree plantation or production forest. – Other nature areas with a high proportion of native species. For example, uncultivated field edges, road edges and railway embankments. Habitats that have been considerably altered by human activity should not be counted.
Low	2	Highly transformed nature. For example, lawns, arable land (excluding any uncultivated margins), built-up areas, smaller gardens characterised by cultivation and intensive management, regularly disturbed bare ground (e.g. quarry floor, landfill sites, etc.).

For some habitat types, multiple distinctiveness categories can apply, depending on the quality of the habitat. For example, it is important that any habitats of principal importance can be identified alongside the habitat classification.

The ecologist may also assess distinctiveness on the basis of an overall assessment, such as the function of the habitat in a landscape ecological context with the surrounding environment.

6.2.1 Distinctiveness is not calculated for linear habitats

Due to the potential ecological importance of linear habitats, it is assumed in the methodology that all linear habitats will have a high distinctiveness both before and after development. Thus, in order to simplify the calculation, distinctiveness should not be included when linear biodiversity units are being calculated.

If the ecologist believes that a linear function has a significantly lower biodiversity value than the calculation shows, the condition factor can be adjusted to make room for this in the calculation. NOTE: Such adjustments are not possible for the other factors.

6.3 Habitat Condition

Condition (see Definitions) is the quality of a particular habitat. For example, a habitat is in poor condition if it fails to support the species for which it is valued, or if it has become degraded as a result of pollution, erosion, regrowth, invasive species, logging or other factors.

The condition should be assessed according to the criteria in table E-02 and the score awarded according to Table E-03.

Table E-02 – Criteria for Condition Assessment

Criterion	Habitat Condition Assessment Criteria
1	A diverse age range or that the habitat is well developed (late stage of succession)
2	A diverse species mix, including indicator species for the habitat type, number of species
3	Diverse structure variety/diverse form and/or dead wood
4	Presence of protected species (see Definitions) or species on the Norwegian Red List
5	No presence or a limited presence of invasive species
6	No damage or limited damage, for example, by machinery

Table E-03 - Habitat Condition Category and Scores

Condition Category	Condition Score	Criteria for Assigning Condition
Good	3	Any habitat which satisfies at least five of the criteria.
Moderate	2	Any habitat which satisfies at least three of the criteria.
Poor	1	Any habitat which satisfies two or less of the criteria

Where a condition assessment is not possible and the condition cannot be based on local relevant data (such as surveys on other similar habitats in the development footprint) the condition of the habitats should be assumed to be moderate, giving a condition score of 2, unless there is other evidence to suggest that the habitat is in good condition, such as the presence of species of principal importance (see Definitions).

If a different methodology is used, a qualified ecologist should provide evidence to demonstrate why that methodology is more appropriate.

6.3.1 The condition of watercourses

The preferred methodology for assessing the condition of water bodies is described in guidance 02:2018 Klassifisering av miljøtilstand i vann (vannportalen.no). It is complex and is therefore not used in this methodology unless the condition of the water body has been mapped previously. If this is not the case, it should be assumed that all watercourses on the site are in moderate condition unless they are homogeneous, paved canals or similar, in which case it should be assumed that they are in poor condition.

The use of alternative methodologies is acceptable where they are appropriate. If another methodology is used to assess the condition of watercourses, its use should be justified by a qualified ecologist in their reporting.

6.4 Pre-development calculation of biodiversity

6.4.1 Calculating pre-development biodiversity for linear habitats

For each habitat in the development footprint, the following calculation should be made:

Length in metres x condition = Number of biodiversity units for the habitat pre-development

Watercourse habitats and foliage habitats should be calculated separately. See further information in Chapter 6.1. Existing green walls consisting of climbing plants where the wall is simply acting as a support for the plants should be treated as linear habitats.

The results for all linear habitats are then summarised as:

Total number of biodiversity units for linear foliage habitats pre-development
Total number of biodiversity units for linear watercourse habitats pre-development

6.4.2 Calculating pre-development biodiversity for area-based habitats

For each area-based habitat in the development footprint, the following calculation should be made:

Area in m² x distinctiveness x condition = Number of biodiversity units for the habitat pre-development (see Definitions)

Hardstanding and buildings should be included in this calculation although the condition and distinctiveness of such habitats will be given a zero score.

Green walls and roofs
To take account of existing green roofs (see Definitions) and walls, these habitats need to be identified by a qualified ecologist.

1. Green roofs should be separated into two categories: extensive and intensive (see Definitions). Either type of roof should be treated as an area-based habitat.
2. A qualified ecologist should also separate green walls into two categories, those that are plug planted and those that consist of climbing plants.
   - Plug planted green walls should be treated as area-based habitats being aligned to the closest equivalent habitat type.
   - Green walls consisting of climbing plants where the wall is simply acting as a support for the plants should be treated as linear habitats.

The results for all area-based habitats are then summarised as:

Total number of biodiversity units for area-based habitats pre-development

7 Post-development calculations

A revised assessment of a habitat's distinctiveness and condition will be carried out post-development. The assessment should include all habitats within the development's footprint that have been lost due to the development, as well as any newly created or enhanced habitats.

Pre- and post-development units should be compared with each other. This is to verify whether there will be any changes to the biodiversity of the site as a result of existing habitats being lost, enhanced or a new one created

7.1 Habitat creation and enhancement

Habitat creation (see Definitions) involves the removal or loss of any present habitat(s) in the action of creating the new one or creating habitat where none was previously present. For example, removing a habitat with little distinctiveness and in poor condition in order to create a wetland habitat, or removing hardstanding to create a meadow.

Habitat enhancement (see Definitions) consists of improving the condition of an existing habitat, thereby increasing the ecological value of a habitat type through measures that improve its biodiversity capacity and/or by removing factors that detract from its value, such as by increasing the diversity of species that can be supported by a habitat, for example, turning an ordinary lawn into a species-rich meadow. .

Post-development biodiversity units should be calculated to reflect whether the change is due to the habitat being enhanced or the existing habitat being lost and a new habitat created. It is important to clearly identify which areas of habitat are being created and which are being enhanced.

Decisions on which habitats are being created or enhanced should be based on the area and linear biodiversity units of individual habitats in combination with qualitative ecological information, and not simply the total number of units.

For compensation to be taken into consideration in the assessment calculations, it should be the same habitat type as the type that has been or will be lost, and of the same or higher ecological value, based on the number of biodiversity units. If a habitat of higher ecological value is created or enhanced, it should be an appropriate habitat type that is still capable of supporting the species affected by the habitat loss resulting from the development. For example, it is appropriate to replace lawn with meadow.

If the development has no negative impact on biodiversity, for example, if the development area only comprises buildings and hard surfaces, the area of habitat created should be compared to the area of the development footprint to calculate the percentage of the development footprint that is covered by habitats post-development. A length of linear habitat should also be provided, as appropriate to the site and of an appropriate length that is justified by a qualified ecologist.

7.1.1 Creating linear watercourses

It is often not possible to create linear water elements, such as watercourses, but it is possible to improve their condition, for example, a section of watercourse that undergoes meaningful improvement, such as reinstating meanders/curves, marginal vegetation or laying gravel for spawning.

7.2 Risk factors applied to post-development calculations

Post-development, for each newly created and improved habitat, an ecologist should include risk factors (see Definitions) in the calculation of biodiversity units.

The risk factors should take account of the likely scale of impact and the potential for success or failure of a new or improved habitat to be established and function as intended over time. The risk factors are only applicable to area-based habitat calculations. They do not cover all eventualities but provide a numerical value for the main risks to delivering biodiversity gains.

The following three risk factors should be used:

1. Spatial risk: distance from the relevant scheme.
2. Temporal risk: time taken for created or enhanced habitats to reach target condition.
3. Delivery risk: how difficult it is to create or enhance a given habitat.

The risk factors are not included in the calculation for linear habitats. This is because risks associated with creating linear features are considered to be taken into account in the condition multiplier used to calculate the pre-development linear units.

7.2.1 Spatial risk

Spatial risk (see Definitions) is the risk associated with delivering compensation for the loss of a habitat at a distance from that loss (i.e. generally, a greater distance can mean greater risk) and in relation to areas of strategic priority for biodiversity. Thus, the spatial risk factor is applied to the post-development biodiversity unit calculation when compensation for habitat loss is being delivered at the distances prescribed in Table E-04.

Table E-04 – Spatial Risk Factors

Location of Habitat Creation or Enhancement	Risk Factor
One of the two alternatives are achieved: a. The habitat being created or enhanced to compensate for the loss of a habitat is within 500m of the area of loss b. The habitat being created or enhanced to compensate for the loss of a habitat is in the same ecological network (see Definitions) identified in a local (county or equivalent) biodiversity, blue-green infrastructure (see Definitions) or offsetting strategy (see Definitions)	1
The habitat type being created or enhanced to compensate for the loss of a habitat contributes to and is in a location identified within a local (county or equivalent) biodiversity, blue-green infrastructure or offsetting strategy	0.67
The habitat being created or enhanced to compensate for the loss of a habitat does not contribute to a local (county or equivalent) biodiversity, blue-green infrastructure or offsetting strategy.	0.50

Adapted from the Defra metric, 2012

Where a qualified ecologist is able to demonstrate that the habitats being created or enhanced are outside of an area identified within a local (county or equivalent) biodiversity, blue-green infrastructure or offsetting strategy but provide a meaningful contribution to achieving the objectives of the strategy (e.g. buffering the site), then a qualified ecologist can apply the 0.67 spatial risk factor and set out justification for doing so in their report.

Spatial risk factors can be excluded if the loss of a pre-development habitat has a low distinctiveness and is compensated for within 1 km of the area lost. In these instances, a risk factor of 1 should be applied, unless a qualified ecologist is able to determine that the pre-development habitat was providing vital habitat for a species with a shorter homing range. In these instances, the relevant spatial risk factor should apply.

7.2.2 Delivery risk

Delivery risk (see Definitions) is the risk associated with the difficulties linked to the creation or enhancement of any specific habitat. Table E-05 below shows the risk factors that should be used for this methodology. The risk factor should be set based on the professional judgement of a qualified ecologist according to evidence relevant to the habitat type, for example. published studies or experience from the establishment or improvement of similar habitat types in similar environments. The basis for the assessment should be described in the report.

Table E-05 –Delivery Risk Factors

Difficulty of Recreation/ Enhancement	Risk Factor
Very High	0.10
High	0.33
Medium	0.66
Low	1

Adapted from the Defra metric, 2012

7.2.3 Temporal risk

When compensating for habitat loss, it may take time for the new habitat to reach a sufficient quality or level of maturity, which can lead to the loss of biodiversity until the level of maturity is reached. Additionally, there may be a time gap between the habitat loss and the start of the creation or enhancement of a new habitat. Where possible, the development should decrease or prevent this additional time gap. Where this is not possible and is justified, this additional time gap must be accounted for. These two time lags are collectively called *temporal risk* (see Definitions).

For example, a development clears an area of woodland. Five years later it implements its offset by planting new trees that will take 25 years to reach target condition. Thus, the time to target condition is 30 years (i.e. from the time of habitat clearance) and the associated risk factor is 0.36.

The risk factors are outlined in Table E-06.

Table E-06 –Temporal Risk Factors

Years to Target Condition	Risk Factor
5	0.84
10	0.71
15	0.59
20	0.50
25	0.42
30	0.36
>30	0.33

Adapted from the Defra metric, 2012

There is no set guidance for each habitat type for the time it takes to reach a specific condition. A qualified ecologist should present documentation and his expert assessment relevant to the habitat type and the environment to estimate the number of years to target condition. The expert assessment can be a quality assessment of similar habitats according to the Norwegian Environment Agency's directivesi for sample mapping, or relevant variables from the Nature Index. This should be fully justified in the ecologist's report.

7.3 Calculation of post-development linear biodiversity units

Post-development linear biodiversity units should be calculated based on the post-development landscape plans or equivalent, as well as the temporary use of land during the development, for example, a stream that is temporarily routed through pipes in order to make a construction road but which is reopened and restored at the end of the construction period.

When calculating linear biodiversity units, foliage and watercourse units are kept separate. See section 6.1 for further details.

7.3.1 Calculation of biodiversity units for lost linear habitats

For each individual habitat lost, the following calculation should be made:

Length of lost habitats in metres x condition = Number of lost linear biodiversity units post-development

Foliage related and water based linear habitats should be calculated separately.

The results for all lost linear habitats are then summarised as:

Total number of biodiversity units for lost linear foliage habitats post-development
Total number of biodiversity units for lost linear watercourse habitats post-development

7.3.2 Calculation of biodiversity units for created or enhanced linear habitats

For each created or improved linear habitat, the following calculation should be made:

Number of metres created or improved x condition = number of biodiversity units created or enhanced after development

Created green walls consisting of climbing plants where the wall is simply acting as a support for the plants should be treated as linear habitats.

Foliage related and water based linear habitats should be calculated separately. See Chapter 7.1 on habitat creation and enhancement and Chapter 7.1.1 on creating linear water bodies.

Due to the unique nature of linear habitats, it will normally only be acceptable to offset unavoidable losses of such habitats through the provision of the same habitat type, i.e. loss of edges or streams should only be offset by the creation of more habitats of a similar type.

The results for all created or enhanced linear habitats are then summarised as:

Total number of biodiversity units for linear foliage habitats created or enhanced post-development
Total number of biodiversity units for linear watercourse habitats created or enhanced post-development

7.3.3 Calculation of the change in biodiversity units for linear habitats

The linear biodiversity units before and after development should be compared with each other to see whether the loss, enhancement or creation of linear habitats results in a change in biodiversity.

When calculating changes in biodiversity for linear habitats, the difference between habitats before and after development should first be calculated then converted into a percentage. Two calculations should be performed, one for foliage based linear habitats and one for water based linear habitats. The calculation below should be used:

	Total number of biodiversity units for linear foliage habitats pre-development (Chapter 6.4.1)
-	Total number of biodiversity units for lost linear foliage habitats post-development (Chapter 7.3.1)
+	Total number of biodiversity units for linear foliage habitats created or enhanced post-development (Chapter 7.3.2)
=	**Total number of biodiversity units for linear foliage habitats post-development**

This is converted into a percentage that is rounded to the nearest whole percentage. This will result in two figures:

Percentage change in linear foliage biodiversity units (A)
Percentage change in linear watercourse biodiversity units (B)

7.4 Calculation of post-development area-based biodiversity units

Post-development area-based biodiversity units should be calculated based on landscape plans or equivalent after development, as well as the temporary use of the area during the development, e.g. an area that is temporarily paved with gravel to make a construction road, but which is reopened and restored at the end of the construction period.

Hardstanding and buildings should be included in this calculation although the condition and distinctiveness of the habitats will be given a zero score.

7.4.1 Calculation of biodiversity units for lost area-based habitats

For each individual habitat lost, the following calculation should be made post-construction:

m² lost area x distinctiveness x condition = number of lost area-based biodiversity units post-development

The results for all lost area-based habitats are then summarised as :

Total number of biodiversity units for lost area-based habitats post-development

Please note that areas of enhanced habitat are not considered lost and should not be included in the area biodiversity units that are lost.

7.4.2 Calculation of biodiversity units for created area-based habitats

To take account of created green roofs and walls, these habitats need to be identified by a qualified ecologist.

1. Green roofs should be separated into two categories: extensive and intensive (see Definitions). Either type of roof should be treated as an area-based habitat.
2. A qualified ecologist should also separate green walls into two categories, those that are plug planted and those that consist of climbing plants.
   - Plug planted green walls should be treated as area-based habitats being aligned to the closest equivalent habitat type.
   - Green walls consisting of climbing plants where the wall is simply acting as a support for the plants should be treated as linear habitats.

For each individual habitat created, the following calculation should be made post-development:

m² created area x distinctiveness x target condition x delivery risk x temporal risk x spatial risk = number of created area-based biodiversity units post-development

The results for all created area-based habitats are then summarised as:

Total number of biodiversity units for created area-based habitats post-development

7.4.3 Calculation of biodiversity units for enhanced area-based habitats

For each individual enhanced habitat, the following calculation should be made post-development:

	(m² created area x distinctiveness x target condition)
–	**(Pre-development biodiversity units for the area of the habitat that is enhanced)**
X	**(delivery risk x temporal risk x spatial risk)**
=	**Number of enhanced area-based biodiversity units post-development**

The results for all created area-based habitats are then summarised as:

Total number of biodiversity units for enhanced area-based habitats post-development

7.4.4 Calculation of the change in biodiversity units for area-based habitats

The area-based biodiversity units before and after development should be compared with each other to see whether the result of the improvement or creation of area-based habitats results in a change in biodiversity.

When calculating changes in biodiversity, the difference between habitats before and after development should first be calculated then converted into a percentage. The calculation below should be used:

	Total number of biodiversity units for area-based habitats pre-development (Chapter 6.4.2)
-	**Total number of biodiversity units for lost area-based habitats post-development (Chapter 7.4.1)**
+	**Total number of biodiversity units for area-based habitats created post-development (Chapter 7.4.2)**
+	**Total number of biodiversity units for area-based habitats enhanced post-development (Chapter 7.4.3)**
=	**Total number of biodiversity units for area-based habitats post-development**

This is converted into a percentage that is rounded to the nearest whole percentage. This will result in:

Percentage change in area-based biodiversity units (C)

8 Step 3: Change in biodiversity and rewarding credits

The assessor should review the calculation in the LE calculator "Change in Ecological Value Calculator". All three outputs of the calculation must be considered:

- **Percentage change in linear foliage biodiversity units (A)**
- **Percentage change in linear watercourse biodiversity units (B)**
- **Percentage change in area-based biodiversity units (C)**

The assessor should use the output with the lowest percentage score (rounded to the nearest whole percentage point) to identify the reward level available for the development according to the list below:
- Between 75% and 94% – Minimising loss
- Between 95% and 104% – No net loss for the assessed habitats
- Between 105% and 109% – Net gain for the assessed habitats
- 110% or above – Significant net gain.

There are also additional requirements associated with each of the reward levels. These are detailed in Table E-07.

Table E-07: Reward Scale

Reward Scale*	Additional requirements
Minimising Loss	A suitably qualified ecologist must confirm that it is not practically feasible to achieve the No Net Loss requirements AND There are no residual impacts on protected sites or habitats/species of principal Importance (see Chapter 8.1)
No Net Loss	If there is no impact on area or linear habitats, then the total area of habitat created should cover at least 2.5% of the development footprint AND a length of linear habitat should be created. AND there are no residual impacts on protected sites or habitats/species of principal importance. (see Chapter 8.1)
Net Gain	If there is no impact on areas or linear habitats, then the total area of habitat created should cover at least 5% of the development footprint. AND a length of linear habitat should be created. AND there are no residual impacts on protected sites or habitats/species of principal importance. (see Chapter 8.1)
Significant Net Gain	There are no residual impacts on protected sites or habitats/species of principal importance (see Chapter 8.1)

8.1 Protected sites or habitats/species of principal importance and the mitigation hierarchy

Biodiversity in/on protected sites or habitats/species of principal importance are covered by statutory requirements and procedures. BREEAM-NOR recognises the steps taken that go beyond these regulatory requirements. Thus, credits for this methodology can only be gained in relation to biodiversity that does not form part of a designated site or irreplaceable habitat, or form part of the mitigation or compensation identified for these sites.

Whilst impacts on designated sites and irreplaceable habitats must be dealt with separately, credits cannot be gained unless it is demonstrated that all requirements of environmental legislation and national policy have been met by the project. The assessor will need to seek confirmation that the mitigation hierarchy has been followed (see LE 02 for details on the mitigation hierarchy and figure E-02 for a visual illustration) and that the appropriate measures have been agreed with the relevant statutory bodies. Whilst habitat losses and gains relating to legally protected species should be included in the assessment of change in biodiversity, evidence must also be provided that the appropriate measures have been agreed with the relevant statutory bodies.

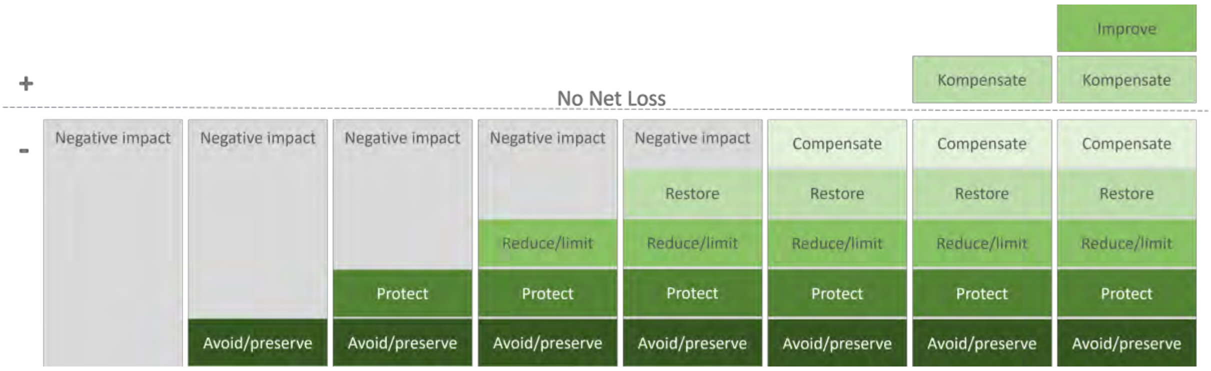


Figure E-02 The mitigation hierarchy

9 Definitions

D1 Area-based habitat

An area-based habitat is any habitat that is assessed using an area-based measure. This effectively means that it covers all habitats other than features assessed as linear habitats. The recommended minimum size of a habitat is 10 m².

D2 Area-based biodiversity unit

A nominal figure that is derived from a calculation using numerical values assigned for the distinctiveness, condition and area of a habitat and associated risk factors. Biodiversity units are not a full representation of ecological value but are used to provide a quantification of a loss of biodiversity, no net loss or a net gain in biodiversity as a result of development.

D3 Spatial risk

Spatial risk is the risk associated with delivering compensation for the loss of a habitat at a distance from that loss. In general, a greater distance from the original habitat can mean greater risk, particularly in relation to areas of strategic priority for biodiversity.

D4 Biodiversity

All the variations of life forms that exist on earth, in the soil, oceans or other aquatic ecosystems and the ecological complexities of which they are a part. This includes diversity within species (genetic diversity), at species level and at ecosystem level. Biodiversity is equivalent to the term *biological diversity*.

D5 Blue-green infrastructure

Multifunctional urban and rural areas that can form a network or be independent, and that can provide local communities with a wide range of benefits, both environmentally and in terms of quality of life. This includes both "green" and "blue" (aquatic environment) functions in natural and man-made environments. Examples include parks, open areas, sports fields, forest areas, wetlands, grasslands, rivers, canals, plots, private gardens and green roofs and facades.

D6 Individual trees and Rows of trees

For rows of trees, BREEAM-NOR uses the definition in the Norwegian Public Roads Administration's guide: Trees and avenues (2006):

- Alley: Two rows of trees, with a minimum of five trees in each row, with an approximately equal distance between each tree.
- Row of trees or one-sided avenue: A row with a minimum of five trees in a row, with an approximately equal distance between each tree.
- Double avenue: Three or more rows of trees with a minimum of five trees in a row with an approximately equal distance between each tree.

Other groups of trees and individual trees should be treated in the same way as an area-based habitat. For these trees, the root protection area, identified using established methodologies such as the Norwegian Public Roads Administration's Handbook V271 Vegetation in roads and street environments should be used as an estimated area.

D7 Habitat enhancement

The improved management of ecological functions or facilitation of new ecological functions that leads to net biodiversity improvement (NBF). This is not related to handling negative impact and is a measure in addition to what is required to reduce, restore or compensate for impact.

This includes increasing the diversity of species that can be supported by a habitat, for example, by managing a lawn so that over time it develops into semi-natural grassland, which would seek to increase species diversity.

D8 Habitats and species of principal importance

Habitats and species of principal importance (or administrative priority habitats and species) are those that have been identified as being of principal importance for biodiversity in accordance with the Norwegian Red List of Habitat Types and Species. These habitat types will always be habitats with a 'high distinctiveness' attribute.

Natural marginal vegetation in ditches, along roads and arable field margins specifically managed for wildlife also qualify as habitats of principal importance.

D9 Legally protected species and areas

Legally protected species are European Protected Species listed in Annex IV of the European Habitats Directive and those protected under the Biodiversity Act and corresponding regulations.

Protected areas are sites that are protected by the Biodiversity Act and the Ramsar Protocol.

D10 Green roofs – Extensive green roofs

Extensive green roofs generally provide greater biodiversity interest than intensive roofs but are considered to be less appropriate in providing amenity and recreational benefits. Typical vegetation can be sedum, mosses, herbs and grass on thin growth substrate.

D11 Green roofs – Intensive green roofs

Intensive green roofs are principally designed to provide amenity and are normally accessible for recreational use. They may be referred to as roof gardens or terraces. Generally, intensive green roofs comprise a lush growth of vegetation and are based on a relatively nutrient-rich and deep substrate. They allow for the establishment of large plants and conventional lawns.

D12 Zone of influence

The area(s) in which ecological features may be affected by the biophysical changes caused by a proposed project and associated activities. For example, this could include areas of land, flight paths or water bodies that are impacted by the site being assessed.

These areas could be adjacent to the site or could be areas that are impacted by the site although not physically linked. For example, wildlife populations could be isolated as a result of barriers along migration routes and changes in waterways could affect areas that are downstream in relation to the development area.

Species and habitats within the zone of influence can be negatively affected by changes on an assessment site but they also provide further opportunities to maximise enhancement activities.

D13 Compensation

Measures taken to make up for the loss of, or permanent damage to, ecological features despite mitigation measures being put in place to avoid, protect, reduce or restore as a result of negative impact. Compensation could be in the form of a replacement habitat or improvements to existing habitats similar in terms of biological features and ecological functions to the habitats that were lost or damaged. Compensation could be provided either within or outside the project site.

The purpose of this measure is to avoid the net loss of natural values in the development area. Ecological compensation is used as a last resort to counteract the negative impact of construction activity after doing what is possible in the mitigation hierarchy to avoid negative impact on ecological qualities. Compensation could include ensuring ecological quality in new areas or creating new valuable habitats to replace habitats that were destroyed.

D14 Linear habitats

Linear habitats are up to 10-metre wide habitats that form linear ecological functions. Examples include edge vegetation along watercourses, species-rich field and ditch edges, beach/tidal zones, streams, rivers, brook gorges, rows of trees and green walls consisting of climbing plants where the wall is simply acting as a support for the plants.

D15 Linear biodiversity units

A nominal figure that is derived from a calculation using numerical values assigned for the condition and length of a linear habitat. The distinctiveness of linear habitats is not calculated as most linear features will be habitats of principal importance (HPI).

Using biodiversity units will not provide a complete assessment of biodiversity. They are used to quantify whether a development has led to a loss, no net loss or a net improvement in biodiversity.

D16 Impact assessment methodology for climate and environment

This methodology is used for analysing the consequences of measures for climate and the environment, managed by the Ministry of Climate and Environment. Guide M-1941 is used for such analyses and describes the method for mapping climate and environmental issues, valuation, as well as the assessment of impact and consequences. [Environmental and climate impact assessment – Norwegian Environment Agency (miljodirektoratet.no)]

D17 Suitably Qualified Ecologist

An individual achieving the following can be considered to be 'suitably qualified' to carry out a BREEAM-NOR survey:

1. Holds a degree on a bachelor or master level or has an equivalent qualification in ecology or an ecology-related subject.

2. Is a practising ecologist, with a minimum of three years' relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment, including: acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures.

Education in an ecology-related subject must comprise at least 60% ecology. The following forms of education can be considered relevant if they meet the requirement:

- Education in biology, such as ecology, biology, zoology, botany and marine and freshwater biology. Nature management
- Environmental science

D18 Nature Types in Norway (NiN)

NiN is a system for describing and mapping habitat types that cover all nature in Norway, both common and uncommon. The system is owned by the Norwegian Biodiversity Information Centre. www.artsdatabanken.no/NiN.

D19 Habitat creation

The removal or the loss of the present habitat in the process of creating a new habitat or creating a habitat where no habitat previously existed (including bare earth, asphalt, gravel pitch, etc.).
This includes removing scrub to create a wetland habitat or removing hardstanding to create a new grassland habitat.

D20 Delivery risk

Delivery risk is the risk associated with the difficulty in creating or enhancing any specific habitat. For habitat types not sufficiently described in the NiN system, the applied delivery risk factor should be one for similar habitat types defined in NiN and should be fully justified by a qualified ecologist.

D21 Risk factors

Risk factors are used in the post-development biodiversity unit calculation to account for the main risks in delivering biodiversity gains. These do not cover all eventualities but provide a numerical value for the most likely risks. These are spatial risk, temporal risk and delivery risk. Risk factors are assigned to each risk to be applied to the post-development biodiversity unit calculation.

It should be noted that risk factors only apply to area-based habitats because risks associated with creating linear features are taken into account in the condition multiplier.

D22 Distinctiveness

Habitat distinctiveness is a measure of biodiversity that has regard for the number and variety of species found there (richness and diversity), whether any of the species are endangered, and how many species the habitat supports that are not common elsewhere.

Habitat distinctiveness is scored against a three-category scale (high, medium and low). Broadly, all habitats of principal importance (HPI) will be assigned high distinctiveness. Other habitats which are not of such quality will be assigned medium distinctiveness and any habitats that have been intensively managed, such as lawns or arable pasture, will be assigned low distinctiveness.

D23 Temporal risk

Temporal risk is the time required for the new habitat to reach the required quality or level of maturity. This is a combination of:

- The time the habitat takes to be enhanced or created; and
- The time gap between the habitat loss and the start of the creation or enhancement of a new habitat.

D24 Condition

Condition is defined as the quality of a particular habitat. For example, a habitat is in poor condition if it fails to support the species for which it is valued, or if it is degraded as a result of pollution, erosion, invasive species or other factors.
Habitat condition is assessed using the system in Chapter 6.3.

D25 Development footprint

The development footprint consists of the site. This includes any land used for buildings, hardstanding, landscaping, site access or where construction work is carried out (or land that is disturbed in any other way). It also includes any areas used for temporary site storage and buildings. If the precise location of buildings, hardstanding, site access and temporary storage is unknown, it must be assumed that the development footprint comprises the entire development site.
For the purpose of the Change in Ecological Value calculation, this area will also include any land outside the development boundary where:

- there is an indirect impact on biodiversity, for example, because of run-off to a watercourse including but not limited to the zone of influence, and
- land is being used to compensate for impacts, either on the site or outside it as a biodiversity offset.

D26 Ecological network

Networks and interactions between the organisms that live in an ecosystem. The species form nodes (nodes) and these nodes are combined via a network. The networks could be food networks and trophic-level food chains, biofilm, or forms of symbiosis, mutualism, or competition within the species or between species. Ecological networks can contribute to ecosystem stability and resource circulation.

Appendix F The BREEAM-NOR evidential requirements

BREEAM-NOR is a third-party assessment and certification scheme operated in accordance with international standards. Operating to international standards ensures that certification schemes such as BREEAM-NOR are run in a consistent and reliable manner. The BREEAM-NOR Assessor's assessment report and the NGBC quality assurance process are the fundamental tenets of BREEAM-NOR, ensuring consistency of, and confidence in, the BREEAM-NOR rating awarded by the assessor.

To maintain this consistency and credibility, all certification decisions must be based on verified and credible project information that is traceable, i.e. evidence based. This is not only important for ensuring compliance with the international standards to which BREEAM -NOR operates, but also in terms of managing risk to clients and BREEAM-NOR Assessors in the event that a certification outcome is challenged.

It is the BREEAM-NOR assessor's role to gather building information and use it to evaluate and verify the building's performance against the BREEAM-NOR standards. A range of building design and procurement information types, as well as the end product itself i.e. the building can be used by the client/project team to demonstrate compliance with the BREEAM-NOR assessment criteria.

To aid the assessor, client and project team members in the information gathering exercise, each assessment issue within the scheme document contains a 'schedule of evidence' table. The table and its content serve to outline the typical types of information that the assessor is obliged to ask for at each stage of assessment. Without this information the assessor has no means of verifying compliance with the relevant BREEAM-NOR criteria (where BREEAM-NOR credits are sought by the project team/client).

In addition to the information listed in each issue's schedule, the assessor may ask for other additional information types where they feel that this is required in order to adequately demonstrate compliance, given the specific nature of the building or the contents of the document listed.

Documentation will vary from one new building project to another and as such BREEAM-NOR is not overly prescriptive about the form in which evidence should be provided. In general, the following types of project information can serve as suitable evidence of compliance for most, if not all BREEAM-NOR assessment issues and criteria:

- Relevant section/clauses of the building specification or contract
- Design drawings (e.g. new and existing site plans, elevations, internal layouts)
- Certificates of compliance (e.g. ISO14001, BES6001, Environmental Profiles, FSC, EPC)
- Calculation/software modelling results/outputs (e.g. Energy, thermal modelling)
- Professional reports/studies (e.g. ecologist report, flood risk/security consultant report)
- Project/construction phase programme
- Construction phase data/information (e.g. purchase orders, metering data)
- Letters of appointment (e.g. Professional appointment)
- Letters of commitment (e.g. Client/contractor commitment which, unless otherwise stated in the schedule of evidence, are only acceptable at the Design Stage Assessment)
- Letters of action (e.g. Client/contractor confirming specific compliance with criteria)
- BREEAM-NOR Assessor's site inspection report and photographic evidence
- Meeting minutes
- Third party information (e.g. maps, public transport timetable, product manufacturers details)
- Green fit-out agreements (for shell and core buildings, refer to Appendix D for more guidance on types of evidence).

Other types of formal information/evidence could be used to demonstrate compliance, provided it demonstrates robust assurance to the same level, or better than those types outlined above or in the schedule of evidence table.

NGBC endeavours to ensure that BREEAM-NOR requests only types or categories of information which already exist as a result of the design and procurement process for a new building. This information should therefore be readily available and easily referenced if the building is justifiably claiming compliance with BREEAM-NOR criteria.

It is the assessor's role to inform the project team as to what types of information are required and who should provide this material. If the information is not provided, the assessor will be unable to verify compliance and award the credit(s). As a result, the building may not achieve the required BREEAM-NOR rating. All information referenced in an assessment which is submitted to NGBC for certification must be verifiable and must be produced by licensed BREEAM –NOR assessor organisations upon request by NGBC.

1 Final Post Construction stage assessment and certification

In some instances, the client or project team may not need to, or may choose not to certify the building at the 'interim' design stage of assessment, instead choosing to certify at the final, post construction stage only. In such instances, verification of compliance with the BREEAM-NOR criteria will be based on actual 'as-built' information, relying less on design stage information and letters of commitment (unless relevant to the assessment issue).

The 'Post Construction Stage' column in the schedule of evidence table describes the typical information the assessor requires to validate 'as-built' performance and, for a number of issues and criteria, an assessor's site visit and subsequent report and photographs will be adequate.

Note: interim assessment and certification is strongly advised as it provides assurance of BREEAM –NOR performance prior to the start of construction works. This will give the project the best possible chance of achieving the desired rating and maintaining performance at that rating level through to final certification, handover and building occupation.

2 Final Post Construction stage review and certification

A Post Construction Stage review (PCR) can be carried out where the building has been assessed and certified at the interim design stage of assessment. The post construction stage review differs from the post construction stage assessment in that a PCR serves to confirm the BREEAM-NOR rating achieved at the interim stage as the final 'as-built' rating (as opposed to a complete assessment at the post construction stage). For a post construction review, the BREEAM-NOR assessor is required to:

1. Review each assessment issue and confirm the criteria and the number of credits committed to at the interim stage of assessment are still valid.
2. Re-assess any issues where changes have occurred on the project since the interim assessment. This will be the case where such changes will or may have had an effect on compliance with a particular requirement and therefore the number of credits awarded/withheld and potentially the BREEAM–NOR rating achieved.

In the case of point 1 the assessor will require evidence confirming the validity of the review. For some assessment issues and criteria this will take the form of new information, for example where compliance at the interim stage was based on a formal letter from the client or design team confirming an intention to comply, at the post construction stage evidence confirming that this commitment was undertaken is required. This evidence is likely to be in one of the forms listed above e.g. assessor's site photographs, metered data, purchase orders etc. For other assessment issues and criteria it may be the case that information referenced as evidence at the interim design stage is a true reflection of 'as-built' performance, for example a map or site location plan highlighting proximity to public transport nodes or a bus timetable. In such instances the assessor may simply confirm the validity of the evidence referenced at the interim design stage assessment.

In the case of point 2, where changes have occurred that potentially affect the award of a BREEAM-NOR credit, the assessor has two options. Either, it is clear that compliance with a particular issue is no longer possible, in which case the credits awarded at the interim stage are withheld and the final score and BREEAM-NOR rating re-calculated. Or additional, new information or altered versions of existing information are provided and the assessor re-evaluates and verifies compliance.

3 How to facilitate your report through the quality assurance process

1. Ensure that you have appropriate evidence, which means the documentation.
   a. Demonstrates all the BREEAM-NOR requirements
   b. Is robust e.g. legally binding or similar
   c. Is clear and easy to read (electronic or hard copy)

Note: The scheme document gives examples of acceptable evidence

2. Record an audit trail
   a. NGBC require there to be a clear route to evidence (no point having a trail that can't be followed)
   b. This route should allow someone to undertake a swift third-party review of assessment decisions.

Note: The audit trail is as important as the type of evidence

3. Be mindful that the most common reasons why NGBC rejects assessment reports are.
   a. Missing evidence for a claimed credit criteria or methodology
   b. Unclear justification of compliance via evidence and notes.
   c. Imprecise evidence reference requiring unreasonable effort to locate the necessary information
   d. Requirement / criteria misunderstood, and credit awarded incorrectly