

LOTUS New Construction V3

Technical Manual



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Acknowledgements

In researching and developing the LOTUS Certification system, the Vietnam Green Building Council (VGBC) conducted a survey of all the world's significant green building rating systems. Several became focal points from which the VGBC has taken inspiration to design LOTUS. These are Australia's Green Star, the USA's LEED and Malaysia's GBI rating systems and to a lesser extent, Britain's BREEAM, Hong Kong's BEAM Plus, Indonesia's Greenship and Singapore's Green Mark systems.

The VGBC is indebted to the Green Building Council Australia (GBCA) for its assistance, and also thank the US Green Building Council and the World Green Building Council and its Asia Pacific Network.

The VGBC would like to thank all the members of the technical advisory group for their continued help and support. Their dedication to a sustainable, climate change adapted built environment for Vietnam is essential to the accomplishment of the VGBC's goals and objectives.

The VGBC would also like to thank all staff and volunteers who have contributed to the development of LOTUS. In performing their unsung work, they have laid the groundwork for a fundamental shift toward sustainability in Vietnam's built environment.

VGBC is grateful to the Global Cities Institute of the Royal Melbourne Institute of Technology (RMIT), which provided major funding at its inception.

LOTUS NC V3 authors and contributors

Lead Author

Xavier Leulliette

Contributors

Melissa Merryweather, Nguyen Huu Hien, Nguyen Lang Tung, Nguyen Thi Huong Thu, Nguyen Trung Kien, Phan Thu Hang, Timothy Middleton, Vu Hong Phong

Lead Authors Previous versions of LOTUS NR and MFR

Alberto Perez Ortiz, Andrea Archanco, Andrew Crouch, Darren O’Dea, Đỗ Ngọc Diệp, Nguyễn Trung Kiên, Melissa Merryweather, Timothy Middleton, Trần Văn Thành, Tuan Anh Phan, Xavier Leulliette, Yannick Millet.

Supporting Authors Previous versions of LOTUS NR and MFR

Aaron May, Alan Williams, Alexandre Duverger, Andrea Archanco, Andrew Benham, Andrew Crouch, Anna-Carina Wallisch, Arsy Adiguna Christensen, Aurore Juliard, Benjamin Raux, Celine Pilain Panetta, Clara James, Diane Goetz, Claudia Weissman, Dang Hoang Anh, Dương Bình, Đoàn Quang Hưng, Dominik Pfaffenbichler, Franck Jung, Graham Horne, Heloise Pelen, Jalel Sager, Jens Leibold, Jérôme Botta, Joan Bennett, John Calloway, John Kilgallon, Jordan Colomb, Kevin Caille, Lê Kiên, Lê Vũ Cường, Liam Lafferty, Lương Thanh Thư, Manuel Valcárcel Rodríguez, Mark Edwards, Nancy Tran, Ngô Mai Hoa, Nguyễn Hữu Dũng, Nguyễn Quang Hiếu, Nguyễn Thị Mai, Nguyễn Văn Muôn, Nguyễn Việt Anh, Oliver John Kerr, Patrick Bivona, Phan Thị Quyên, Phạm Đức Nguyên, Phạm Ngọc Đăng, Sheldon de Wit, Rory Martin, Sarah Herrou, Soo Kim, Tahiana Ratsimba, Tamsin McCabe, Trần Ngọc Chấn, Trương Thanh Vân, Victor Sandoval, Vincent Mazens.

Authors LOTUS Pilot Version

Mateusz Bogdan, Lê Vũ Cường, Sheldon de Wit, Đỗ Ngọc Diệp, Tanguy Fabre, Marion Floret, Ngô Mai Hoa, Molly Hicks, Geoff Lewis, Natalie Mady, Mellissa Merryweather, Yannick Millet, Darren O’Dea, Phan Thị Quyên, Philip Sarn, Jalel Sager, Luke Smith, Mitchell Swann, Milena Tadani

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Preface

VGBC Background Information

The Vietnam Green Building Council (VGBC) is a project of the Green Cities Fund, Inc. (GCF), an international non-profit organization based in Oakland, California, USA. The VGBC's aim is to be the focal point for academia, government and the private sector in order to promote a more sustainable and adaptive built environment in the context of climate change.

The VGBC has been officially recognized by the Ministry of Construction of the Socialist Republic of Vietnam (March 2009) and also took part in the establishment of the WGBC Asia Pacific Network (September 2009).

The VGBC has set the following objectives:

- Raise awareness and advocate for the development of green buildings:
 - Enhance awareness of green building practice through workshops and online resources
 - Support the government in defining green building development policies and codes
 - Strengthen ties with academia, government and private sector partners
- Build capacity:
 - Develop and implement training curricula for academia and government
 - Define and implement an official Green Consultant training and examination program (LOTUS Accredited Professional)
- Define green building metrics for Vietnam:
 - Develop a set of green building systems (LOTUS)
 - Create a Green Database (products and services)
 - Continue long-term research on climate change resilience for the built environment

LOTUS General Information

LOTUS includes a set of market-based green building rating systems developed by the Vietnam Green Building Council specifically for the Vietnamese built environment.

LOTUS Rating Systems share the same goal with existing international green building rating systems (LEED, Green Star, BREEAM, GBI, Green Mark, Greenship, etc.) and aim at

establishing standards and benchmarks to guide the local construction industry towards more efficient use of natural resources and more environmentally friendly practices.

LOTUS Rating Systems have been developed through long-term research, with the expert advice of specialists giving particular consideration to Vietnam's economic and natural characteristics and existing Vietnamese standards and policy.

LOTUS Rating Systems currently include:

- LOTUS New Construction V3 (LOTUS NC)
- LOTUS Buildings in Operation V1 (LOTUS BIO)
- LOTUS Homes V1
- LOTUS Small Buildings V1 (LOTUS SB)
- LOTUS Interiors V1
- LOTUS Small Interior V1 (LOTUS SI)

LOTUS Accreditation for Professional Practitioners

One of the key roles of VGBC is to educate and update practitioners about “green building” design and implementation issues. The core of VGBC's educational offering is the LOTUS Accredited Professional Training Course which allows candidates to undertake an exam in order to achieve the qualification of **LOTUS Accredited Professional (LOTUS AP)**.

LOTUS APs are practitioners within the construction industry who have comprehensive knowledge of the LOTUS Rating Systems philosophy, structure and practical application within the lifecycle of a building project. LOTUS APs are listed on the VGBC website.

LOTUS New Construction Rating System

LOTUS NC Scope

LOTUS NC can be used for any building, including the following building types:

- Residential Buildings with multiple separate dwelling units
- Cultural Buildings (Library, Cinema, Museum, Theatre, Club, Radio Station, Television Station, Exhibition Centre, Community House)
- Educational Buildings (Nursery, Elementary, Secondary and Tertiary School, University, Vocational School, College)
- Health Care Buildings (Clinic, General Hospital, Specialist Federal and Local Hospital, Nursing Home and Temporary Health Care Facility)
- Retail Buildings (Market, Shop, Shopping Centre, Supermarket, Restaurant, Kiosk)
- Office Buildings
- Hotels and Guesthouse Buildings
- Transport Service Buildings (Train/Bus Station, Information Service Centre, Post Office)
- Stadia and Sports Centers
- Factories

LOTUS NC Eligibility

1. Whole distinct buildings

For a project to be eligible for LOTUS NC assessment, it must be a whole distinct building or a group of whole distinct buildings. A portion of a building that has clear separation from other building components may be eligible for assessment under guidance from the VGBC.

2. Major refurbishment

Major refurbishment projects are eligible for assessment under LOTUS NC. Other refurbishment projects should follow LOTUS BIO. A project is considered a major refurbishment when any of the following eligibility requirements is complied with:

- An **alteration** affects more than 50% of the Gross Floor Area (GFA) of the building at any one time
- An alteration disrupts the operations or relocates more than 50% of the building occupants
- An **addition** increases the GFA of the building by more than 30%

3. Core & Shell projects

Core & Shell projects (developments where some internal finishes and services are left out, for provision by the tenants or residents) are eligible for assessment under LOTUS NC and should follow requirements provided in Annex 1.

LOTUS NC for Residential and for Non-Residential projects

Residential buildings are buildings designed for people to live in. All other buildings are considered as Non-Residential (NR), including hospitality buildings that provide short-term lodging (on a nightly basis), such as: hotels, guesthouses, resorts, etc. However, hospitality buildings that provide long-term lodging (such as serviced apartments) are considered as Residential.

In LOTUS NC, there are some few differences between requirements for NR projects and requirements for Residential projects. All these differences are clearly marked and described throughout this Technical Manual.

For mixed-use Residential/NR projects combining some NR commercial and Residential components, guidance provided in Section 'Special project situations' should be followed.

LOTUS NC Categories

LOTUS NC is composed of 7 **Categories**, each containing a varying number of **Credits** and **Prerequisites** against which specific criteria have been set carrying individual scoring points.

Energy (E) - To monitor and reduce the energy consumption of a building through high building envelope thermal performance, natural ventilation and energy efficient equipment.

Water (W) - To reduce the water consumption of a building through the use of water-efficient fixtures, water reuse/recycling/harvesting and associated water saving measures.

Materials & Resources (MR) - To reduce the use of high embodied energy materials and to minimize the use of natural resources.

Health and Comfort (H) - To ensure high indoor environmental quality, through maximizing indoor air quality, daylight, thermal comfort and acoustic comfort.

Site and Environment (SE) - To protect the ecology of the site, mitigate the environmental impacts and minimize pollution.

Management (Man) - To ensure that all targets set up for the various stages of the project are competently and effectively managed.

Exceptional Performance (EP) - To reward enhanced performance and innovative solutions not addressed in LOTUS.

LOTUS NC Prerequisites

The following table presents the 9 Prerequisites (PR) included in LOTUS NC. Each prerequisite must be carried out as a minimum requirement for all projects.

In a project with unique constraints, the VGBC recognizes that some prerequisites in LOTUS may not be attainable. Where it can be demonstrated that all reasonable strategies have been considered and a building is still not able to meet a prerequisite, or alternately that the prerequisite is patently unsuitable for that building, the VGBC reserves the right to waive the requirements. Such decisions will only be made through careful consideration by the VGBC.

Table 1: LOTUS NC Prerequisites

Prerequisite	Criteria
E-PR-1 Minimum Energy Efficiency Performance	Project complies with all mandatory requirements of QCVN 09:2017/BXD
E-PR-2 Passive Design	Conduct Passive Design Analysis
E-PR-3 Total Building Energy Use	Demonstrate a 10% reduction of the total building energy use compared to the baseline
W-PR-1 Water Efficient Fixtures	Reduce total building domestic water consumption through fixtures by 20% in comparison to a baseline model
MR-PR-1 Demolition and Construction Waste	Develop and implement a demolition and construction waste management plan
H-PR-1 Indoor Smoking	Prohibit smoking in the building
H-PR-2 Low-Emission Products	Specify and install low-VOC emission interior paints and coatings
Man-PR-1 Maintenance	Provide a Building Operation & Maintenance Manual
Man-PR-2 Green Awareness	Provide a Building User's Guide for occupants

LOTUS NC Credits

LOTUS is a point-based system where projects obtain points for complying with criteria set in the LOTUS credits. Credits are built on the following structure: Intent, Requirements, Overview, Approach & Implementation, Calculations (optional) and Submissions. For a project to be compliant with a credit, the intent of the credit has to be met, the requirements have to be achieved and the required submission documents have to be provided.

For some credits, requirements can encompass different options or strategies. A project can only select one of the proposed options to comply with a credit, but it can implement any of the proposed strategies and cumulate points for the credit (while being restricted by the maximum number of points available for the credit).

LOTUS NC Weighting

The weighting of categories within LOTUS NC (Table 2) has been carefully considered through analysis of other green building rating systems and in response to the environmental issues specific to the construction practices, development and the changing climate of Vietnam.

Table 2: LOTUS NC Weighting

Categories	Non-residential		Residential	
	Weight (%)	Max Points	Weight (%)	Max Points
Energy	32%	32	32%	32
Water	13%	13	13%	13
Materials & Resources	12%	12	13%	13
Health & Comfort	14%	14	14%	14
Site & Environment	21%	21	20%	20
Management	8%	8	8%	8
Total	100 %	100	100 %	100

Additionally, 8 points are allocated to the Exceptional Performance Category.

LOTUS NC Certification Levels

The thresholds for Certification (Figure 1) have been set up after a survey of several certification systems including: LEED (US), Green Star (Australia), GBI (Malaysia), BEAM Plus (Hong-Kong) and Greenship (Indonesia).

As a consequence of this research, the first certification level for LOTUS NC has been benchmarked at 40% (LOTUS Certified) of the total amount of points available (equal to 100 points with the 8 points reserved for the Exceptional Performance Category not being considered). This value reflects a good first level of performance and the minimum required for certification. The following thresholds correspond to 55% (LOTUS Silver), 65% (LOTUS Gold) and 75% (LOTUS Platinum) of the total number of points as shown in Figure 1.

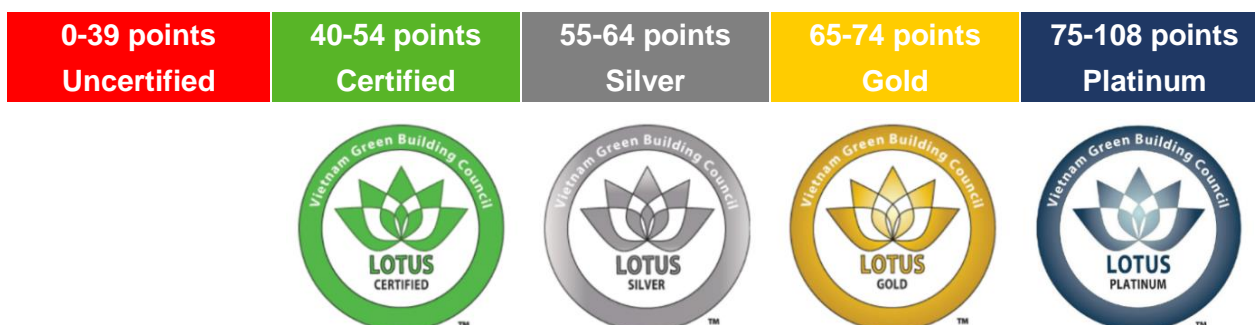


Figure 1: Certification System & Performance levels

Codes and Standards Referenced in LOTUS

LOTUS NC references 10 Vietnamese and 7 International Codes and Standards. These references are included in LOTUS for their relevance to green building construction.

Where a Vietnamese standard exists, LOTUS references or uses it as part of credit criteria, however, the construction sector in Vietnam often relies on International standards as well. VGBC has consciously prioritized the use and awareness of local standards wherever possible.

This list is intended to highlight the different codes and standards that LOTUS expects Applicants to consider as a minimum. This is by no means a comprehensive list of all codes and standards to be applied to New Building Construction. As such, the VGBC does not intend this list to be used as a checklist for construction projects.

Whilst every care has been taken to provide the most current codes and standards at the time of publishing, it is the responsibility of the project team to source the most current codes and standards for their project. When a code or standard becomes outdated in LOTUS, the Applicant will be expected to apply the most current version.

Table 3: Codes and Standards Referenced in LOTUS

Category	Vietnamese/ International	Code or Standard
General	Vietnamese	QCVN 02:2009/BXD – Vietnam Building Code Natural Physical & Climatic Data for Construction
Energy	Vietnamese	QCVN 09:2017/BXD – National Technical Regulation on Energy Efficiency Buildings
	International	VDI-Standard: VDI 4707 Part 1 – Lifts Energy Efficiency.
Water	Vietnamese	QCVN 02:2009/BYT – National technical regulation on domestic water quality
		QCVN 39:2011/BTNMT – National technical regulation on Water Quality for irrigated agriculture
		QCVN 01:2009/BYT – National technical regulation on drinking water quality
	International	NSF/ANSI Standard 350: On-site Residential and Commercial Water Reuse Treatment Systems
Health & Comfort	Vietnamese	TCVN 5687:2010 – Ventilation - Air conditioning - Design standards
		TCXDVN 175:2005 – Maximum permitted noise levels for public buildings – Design standard
		QCVN 24:2016/BYT – National technical regulation on noise – Permissible exposure levels of noise in the workplace
		TCXDVN 277: 2002 – Sound insulation standards of building elements between rooms
	International	ASHRAE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality

		AS 1668.2 – The use of ventilation and air-conditioning in buildings
		ASHRAE Standard 55-2004 – Thermal Environmental Conditions for Human occupancy
		US EPA Reference Method 24 – Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
		EN 16516 – Standard for emissions from construction products
Site & Environment	Vietnamese	TCVN 7957:2008 – Drainage and sewerage - External Networks and Facilities - Design Standard

LOTUS NC Updates

LOTUS NC V3 will be regularly updated with changes aiming to improve the system (e.g. to fix mistakes, to provide clearer explanations, to set more relevant requirements, etc.).

Whenever a change is made, a new version of the Technical Manual including the change will be published. Also, the complete list of all changes brought to the Technical Manual since the first published version, that can be found in the Addenda at the end of the manual, will be updated.

Projects will only be required to adhere to all the changes made prior to their registration date.

LOTUS NC Certification Process

LOTUS certification is a formal process to independently validate that a project has achieved the environmental performance specified in LOTUS Rating Systems. Documentation-based submissions need to be provided as evidence of this achievement.

The VGBC recommends that LOTUS certification is planned at the earliest possible stage of the project, ideally before the design stage even begins. This allows designers to make changes that not only will improve the project's overall performance but will also achieve a better LOTUS certification level.

LOTUS NC certification happens in 2 steps:

- LOTUS Provisional Certification
- LOTUS Full Certification

LOTUS Provisional Certification is an optional stage awarded after the completion of the design stage of a project. LOTUS Provisional Certification certifies that the necessary requirements and strategies are in place for the project to be constructed “green”.

LOTUS Provisional Certification is valid for a maximum of 18 months after the completion of construction. Provisional Certification allows for marketing opportunities (refer to marketing package).

LOTUS Full Certification assesses the performance of the as-built building. LOTUS Full Certification can be applied for as soon as handover is completed and must be completed before 18 months of the completion of construction. It demonstrates that all green building strategies and attributes defined at the design stage are incorporated and achieved at the construction stage.

At this stage, points can be lost or gained. Where the construction or installation differs from that which is specified within the LOTUS Provisional Certification, projects must justify how these changes provide an equal or greater environmental benefit for the points to be awarded.

LOTUS Full Certification is valid for 5 years and certified projects are required to provide monthly energy and water consumption data for the building each year during these 5 years.

Special project situations

Core & Shell projects

Core and Shell projects (C&S projects) are building developments where some internal finishes and services are left out, for provision by the tenants or residents.

As specified in eligibility criteria 1, LOTUS NC applies to whole buildings. To obtain certification, as for other projects, the entire gross floor area of a C&S project must be assessed against LOTUS NC. Compliance to all prerequisites and targeted credits will have to be demonstrated for the entire gross floor area with few exceptions depending on the credits and the scope of work of the developer.

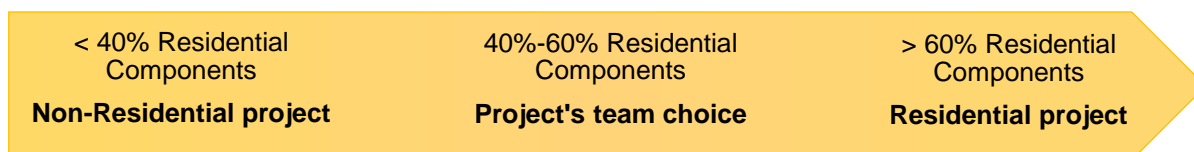
All the exceptions are listed in Table A.1 in Annex in which the scope of applicability and the procedure to follow for each credit and prerequisite is outlined.

In general, in the limited scope of applicability, the same requirements as given in the prerequisites and credits should be followed. As for the parts of the project outside of the scope of applicability, they are not required to meet LOTUS NC requirements, but, in most cases, the project team is required to prepare green fit-out guidelines that explain how tenants/residents should design their interior spaces. These guidelines should be based on the LOTUS NC V3 Technical Manual and different guidelines should be provided for the residents and for the different types of tenants.

Mixed-Use Residential/NR buildings

For mixed-use buildings combining some NR Commercial and Residential components:

- projects should be considered as NR and should follow requirements for NR projects if they have less than 40% of residential components
- projects should be considered as Residential and should follow requirements for Residential projects if they have more than 60% of residential components
- other projects with 40% to 60% of residential components can be considered as NR or Residential (and follow requirements for NR or Residential projects) depending on project's team choice



Since the entire gross floor area of a LOTUS Project must be certified, mixed-use projects considered as NR are subject to the requirements set for NR projects for all prerequisites and targeted credits and mixed-use projects considered as Residential are subject to the requirements set for Residential projects for all prerequisites and targeted credits.

Additionally, in some prerequisites and credits, a section 'Mixed-use Residential/NR projects' is included to add requirements and introduce further details specific to mixed-use projects combining some NR and Residential components.

Design-Build projects

Design-Build is a method to deliver a project in which the design and construction services are contracted by a single entity known as the design–builder or design–build contractor.

As projects following a Design-Build approach do not need to prepare tender documentation, 2 options are proposed for these projects.

Option 1:

To demonstrate compliance with the prerequisites and the targeted credits, wherever tender documents (specifications, drawings, etc.) are required, the Applicant should provide alternative pieces of evidence, such as: design drawings, manufacturer's data, letter of commitment signed by the owner, etc.

If the project cannot provide sufficient evidence to demonstrate compliance with all the prerequisites and achieve enough points to obtain Provisional Certification, Option 2 should be followed.

Option 2:

LOTUS Provisional Certification Stage is modified as follows:

- The typical Provisional Certification Stage, as described above in the Technical Manual, is replaced by a Pre-assessment Stage.
- The Pre-assessment Stage only aims to provide projects with indicative results of their performance. The Assessment Organization will check that projects are on a right path to LOTUS Certification and provide some advice on how performance could be improved.
- The Pre-assessment Stage includes 2 rounds of submissions as the Provisional Certification stage but, at the end of the Pre-assessment Stage, no Certificate will be awarded to projects.
- In the credits where tender stage specifications are required for submission, projects do not need to provide tender stage specifications but instead can provide necessary information under any form (narrative, letter of commitment, project brief, etc.)

- After review of these credits, the Assessment Organization will provide assessment results as follows:
 - Credits and prerequisites are “on-track” if the information submitted shows a clear indication that the project will achieve the credit at Full Certification stage.
 - Credits and prerequisites are pending if the information submitted fails to show a clear indication that the project will achieve the credit at Full Certification stage: it could be due to either a lack of information or mistakes in the information.

Projects with incomplete spaces

Incomplete spaces are spaces that are not ready for occupancy at the time of submissions for Full Certification.

For the incomplete spaces that are intended to be finished by the resident or tenants, the project should follow requirements for Core & Shell projects.

For the incomplete spaces that are intended to be finished by the owner:

- they shouldn't represent more than 10% of the project's GFA. Else, Full Certification cannot be awarded.
- the project should submit a letter of commitment signed and stamped by the owner declaring that the incomplete spaces will meet the requirements of all the prerequisites and credits achieved by the project when completed.
- for prerequisites and credits using baselines to calculate performance (E-PR-3 & E-2 Total Building Energy Use and W-PR-1 & W-1 Water Efficient Fixtures), the design model should be set equal to the baseline model for all the systems, equipment, appliances that have not been installed in the incomplete spaces. All the systems, equipment, appliances serving the incomplete spaces that have been installed should be modelled as-installed.
- for the other prerequisites and credits, the works that have not been completed in the incomplete spaces, and the systems, equipment, appliances that have not been installed in the incomplete spaces don't need to be considered.

Project sites with multiple buildings

For a site with multiple buildings, it is possible to certify some buildings individually (individual project certification), certify a group of buildings as one project (group project certification) and have some buildings left uncertified.

All the requirements for sites with multiple buildings are outlined in the separate document LOTUS NC V3 Guidelines - Sites with multiple buildings.

LOTUS NC Credit List

Credit	Title	Non-Residential (NR)	Residential (R)
ENERGY		32 points	32 points
E-PR-1	Minimum Energy Efficiency Performance	Prerequisite	Prerequisite
E-PR-2	Passive Design	Prerequisite	Prerequisite
E-1	Passive Design	1	1
E-PR-3	Total Building Energy Use	Prerequisite	Prerequisite
E-2	Total Building Energy Use	14	14
E-3	Building Envelope	3	3
E-4	Building Cooling	6	6
E-5	Artificial Lighting	3	3
E-6	Energy Monitoring and Management	2	1
E-7	Lifts	N/A	1
E-8	Renewable Energy	3	3
WATER		13 points	13 points
W-PR-1	Water Efficient Fixtures	Prerequisite	Prerequisite
W-1	Water Efficient Fixtures	5	5
W-2	Water Efficient Landscaping	2	2
W-3	Water Metering	1	1
W-4	Sustainable Water Solutions	5	5
MATERIALS & RESOURCES		12 points	13 points
MR-1	Reduced Concrete Use	2	2
MR-2	Sustainable Materials	5	5
MR-3	Non-baked Materials	2	2
MR-PR-1	Demolition and Construction Waste	Prerequisite	Prerequisite
MR-4	Demolition and Construction Waste	2	2
MR-5	Operation Waste Management	1	2

HEALTH & COMFORT		14 points	14 points
H-PR-1	Indoor Smoking	Prerequisite	Prerequisite
H-1	Ventilation for indoor air quality	3	3
H-PR-2	Low-Emission Products	Prerequisite	Prerequisite
H-2	Low-Emission Products	2	3
H-3	Biophilic Design	1	1
H-4	Daylighting	3	3
H-5	External Views	2	N/A
H-6	Thermal Comfort	2	2
H-7	Acoustic Comfort	1	2
SITE & ENVIRONMENT		21 points	20 points
SE-1	Flood Resistance	1	1
SE-2	Development Footprint	2	2
SE-3	Vegetation	4	4
SE-4	Stormwater Management	2	2
SE-5	Heat Island Effect	2	2
SE-6	Refrigerants	2	1
SE-7	Construction Activity Pollution Control	1	1
SE-8	Light Pollution Minimization	1	1
SE-9	Green Transportation	3	3
SE-10	Community Connectivity	1	1
SE-11	Outdoor Communal Space and Facilities	2	2
MANAGEMENT		8 points	8 points
Man-1	Effective Design Process	1	1
Man-2	Construction Stage	1	1
Man-3	Commissioning	4	4
Man-PR-1	Maintenance	Prerequisite	Prerequisite
Man-4	Maintenance	1	1
Man-PR-2	Green Awareness	Prerequisite	Prerequisite
Man-5	Green Awareness	1	1
EXCEPTIONAL PERFORMANCE		8 points	8 points
EP-1	Enhanced Performance	8	8
EP-2	Innovative Solutions		

Energy

As urbanization is speeding all over the world, buildings and construction have been described as a hidden culprit, responsible for more than 35% of global final energy use and nearly 40% of energy-related CO₂ emissions (c.f. Global status report 2017 coordinated by United Nations Environment Programme).

While fast economic growth and urbanization rates are improving living conditions in Vietnam, they are also leading to an increasing energy demand and worsening of climate change. According to the Vietnam Energy Outlook Report 2017 developed by Ministry of Industry and Trade (MOIT) in collaboration with the Danish Energy Agency (DEA), it is expected that electricity demand will grow by 8% annually on average until 2035 and that almost half of the new power generation capacity needed will be coal fired.

However, since buildings, especially in urban areas, consume most of the energy produced annually in Vietnam, there is potential for mitigating climate change and energy insecurity through integrating energy efficiency measures into buildings which can potentially reduce their energy consumption up to 50% and more.

With this target in mind, the LOTUS rating systems rewards efforts taken to reduce the building energy consumption through optimized thermal performance, incorporating natural ventilation and energy efficient technologies, as well as utilizing renewable energy sources.

Credit	Title	NR	Residential
E-PR-1	Minimum Energy Efficiency Performance	Prerequisite	Prerequisite
E-PR-2	Passive Design	Prerequisite	Prerequisite
E-1	Passive Design	1 point	1 point
E-PR-3	Total Building Energy Use	Prerequisite	Prerequisite
E-2	Total Building Energy Use	14 points	14 points
E-3	Building Envelope	3 points	3 points
E-4	Building Cooling	6 points	6 points
E-5	Artificial Lighting	3 points	3 points
E-6	Energy Monitoring and Management	2 points	1 point
E-7	Lifts	N/A	1 point
E-8	Renewable Energy	3 points	3 points
Total of points available		32 points	32 points

E-PR-1 Minimum Energy Efficiency Performance

Scope

E-PR-1 prerequisite applies to NR and Residential projects.

Intent

To ensure a minimum energy efficiency performance by complying with mandatory requirements from Vietnamese regulations.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Project complies with all mandatory requirements of QCVN 09:2017/BXD	Energy Prerequisite 1

E-PR-2 & E-1 Passive Design

Scope

E-PR-2 prerequisite and E-1 credit apply to NR and Residential projects.

Intent

To identify, analyze and incorporate design techniques that take advantage of the natural climate and site to minimize mechanical cooling and heating in the building, while ensuring comfort for all occupants.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Conduct a Passive Design Analysis	Energy Prerequisite 2

NR & Residential (1 point)

Criteria	Points
Conduct a Passive Design Analysis including thermal and daylight simulations at early design stage	1

E-PR-3 & E-2 Total Building Energy Use

Scope

E-PR-3 prerequisite and E-2 credit apply to NR and Residential projects.

Intent

To reduce the total building energy use through energy modelling, allowing the identification of strategies to reduce energy consumption and the evaluation of their effectiveness.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Demonstrate a 10% reduction of the total building energy use compared to the baseline	Energy Prerequisite 3

NR & Residential (1-14 points)

Criteria	Points
1 point for every additional 2.5 % reduction of energy use from the baseline (Up to 45%)	14

E-3 Building Envelope

Scope

E-3 credit applies to NR and Residential projects.

Intent

To ensure the thermal performance of the building envelope is optimized.

Requirements

NR & Residential (1-3 points)

Only one of the 2 following options can be pursued:

Option A: Overall Thermal Transfer Value (Available to all projects)

Criteria	Points
Building's average OTTV surpasses QCVN 09:2017/BXD requirements by 15%	1
1 point for every additional 15% reduction of building's average OTTV compared to QCVN 09:2017/BXD requirements (Up to 45%)	3

Option B: Building Envelope Design

Option B is only available to:

- non-residential projects with more than 50% of occupied spaces without air-conditioning
- residential projects with more than 50% of dwelling units with a building layout design that meets requirements of Strategy A1 of credit E-4

Criteria	Points
Strategy B1: Solar radiation	
Implement strategies to reduce the solar radiation absorbed by opaque surfaces	1
Strategy B2: West facing façade*	
West facing façade area is lower than 20% of total facade area	1
West facing façade area is lower than 10% of total facade area	2
Strategy B3: Window-to-Wall Ratio on West and East facing facades	
Window-to-Wall Ratio of the West and East facing façades is lower than 30%	1
Window-to-Wall Ratio of the West and East facing façade is lower than 15%	2
Strategy B4: Effective external shading	
Install effective external shading devices on glazing areas	1

* The west facing façade is defined as the facades oriented within the range of 22.5 degrees North of West and 22.5 degrees South of West. East facing façade is defined similarly.

E-4 Building Cooling

Scope

E-4 credit applies to NR and Residential projects.

Intent

To reduce the energy consumption for space cooling.

Requirements

Both Strategy A and Strategy B can be pursued with a maximum of 6 points available.

Strategy A: Natural Ventilation

NR (1-6 points)

Criteria	Points
10 % of occupied areas are naturally ventilated	1
1 point for every additional 15% of occupied areas that are naturally ventilated	6

Residential (1-6 points)

Criteria	Points
Strategy A1: Building layout design	
1 point is awarded for every 20% of dwelling-units that have window openings facing prevailing wind directions (up to 80%)	4
Strategy A2: Dwelling unit design	
1 point is awarded for every 20% of living rooms and bedrooms that have effective cross ventilation (up to 80%)	4
Strategy A3: Common areas	
80% of the lobby, corridor and staircase areas is naturally ventilated	1

Strategy B: Air-conditioning

NR & Residential (1-6 points)

Criteria	Points
Strategy B1: Efficiency improvement	
1 point is awarded for every: 20% improvement of CSPF for non-ducted air-conditioners -AND- 10% improvement of COP for other types of direct electric air-conditioners -AND- 5% improvement of COP for chillers with cooling capacity under 1055 kW -AND- 3% improvement of COP for chillers with cooling capacity above 1055 kW	6
Strategy B2: Variable Controls	
Install variable controls on all suitable HVAC systems	1
Strategy B3: Alternative HVAC system types	
Install a Dedicated Outdoor Air System (DOAS) and/or a Radiant Cooling system	1

E-5 Artificial Lighting

Scope

E-5 credit applies to NR and Residential projects.

Intent

To reduce energy consumption associated with the use of artificial lighting systems.

Requirements

NR (1-3 points)

Both Strategy A and Strategy B can be pursued with a maximum of 3 points available.

Residential (1-3 points)

Only Strategy A can be pursued.

Strategy A: Lighting Power Density

Criteria	Points
NR Installed LPD surpasses QCVN 09:2017/BXD requirements by 20%	1
Residential Installed LPD surpasses QCVN 09:2017/BXD requirements by 15%	
NR 1 additional point for every 20% of reduction of the installed LPD compared to QCVN 09:2017/BXD requirements (up to 60%)	3
Residential 1 additional point for every 15% of reduction of the installed LPD compared to QCVN 09:2017/BXD requirements (up to 45%)	

Strategy B: Lighting Control System

Criteria	Points
Implement a lighting control system in more than 50% of the building GFA and in 100% of the outdoor car park area	1

E-6 Energy Monitoring and Management

Scope

E-6 credit applies to NR and Residential projects.

Intent

To ensure continuous monitoring and control of building's energy consuming systems.

Requirements

NR (1-2 points)

Criteria	Points
A Power Monitoring System (PMS) monitors major energy uses	1
A Building Management System (BMS) monitors and controls the electrical and mechanical equipment of the building	2

Residential (1 point)

Criteria	Points
Provide each dwelling unit with a home energy monitor to record electricity consumption	1

E-7 Lifts

Scope

E-7 credit only applies to Residential projects.

Intent

To reduce energy consumption associated with the use of lifts.

Requirement

Residential (1 point)

Criteria	Points
All lifts installed in the building shall either: <ul style="list-style-type: none">• Reach energy efficiency class A following the certification guideline VDI 4707 Part 1 – Lifts Energy Efficiency -OR- <ul style="list-style-type: none">• Follow at least 4 ways to reduce energy consumption among the following:<ul style="list-style-type: none">- efficient hoisting- efficient lighting system- standby mode- energy regeneration- efficient controls	1

E-8 Renewable Energy

Scope

E-8 credit applies to NR and Residential projects.

Intent

To promote the use of renewable sources of energy and encourage their use in the built environment.

Requirements

NR & Residential (1-3 points)

Criteria	Points
1% of the total energy used in the building is produced from renewable sources	1
1 point for every additional 1% of the total energy used in the building produced from renewable sources (up to 3%)	3

Water

Water scarcity - including poor availability and quality - is a growing risk threatening both food and energy security of many countries in Southeast Asia. Several river basins in the country are expected to face acute stress or shortage by 2025, and groundwater sources are rapidly declining.

Even though Vietnam used to be considered as a country with high water availability with intensive river systems, it is now recognized that Vietnam has poor clean water resource, with only enough clean water to provide 4000 m³/year/person, compared to the global average of 7000 m³/year/person. Moreover, seasonal shortages have already worsened, especially around major metropolitan areas such as the Red river delta or big rice-producing areas like the Mekong delta due to high demand, water pollution and climate change impacts. Since these two river deltas are the country's premier rice-growing regions, water shortage threatens the nation's food security.

As clean water becomes less readily available within Vietnam, the cost of this service is bound to increase in near future. Therefore, a water-efficient building not only ensures consistency in operation and production but also saves building owners money in operational costs. Furthermore, such building improvements will also help reduce the load on many of the antiquated sewage systems in urban areas of Vietnam.

Understanding the circumstance, LOTUS prioritizes the reduction of water consumption in the Water Category with credits encouraging the installation of water-efficient equipment, the use of water recovery solutions such as wastewater reuse/recycle and rainwater collection, landscape designs with low-water demand, and water metering.

Credit	Title	NR	Residential
W-PR-1	Water Efficient Fixtures	Prerequisite	Prerequisite
W-1	Water Efficient Fixtures	5 points	5 points
W-2	Water Efficient Landscaping	2 points	2 points
W-3	Water Metering	1 point	1 point
W-4	Sustainable Water Solutions	5 points	5 points
Total of points available		13 points	13 points

W-PR-1 & W-1 Water Efficient Fixtures

Scope

W-PR-1 prerequisite and W-1 credit apply to NR and Residential projects.

Intent

To reduce the consumption of water in buildings by means of water efficient fixtures.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Reduce building domestic water consumption through fixtures by 20% in comparison to a baseline model	Water Prerequisite 1

NR & Residential (1-5 points)

Criteria	Points
Reduce building domestic water consumption through fixtures by 25% in comparison to a baseline model	1
1 point for every additional 5% reduction of the building domestic water consumption through fixtures (Up to 45%)	5

W-2 Water Efficient Landscaping

Scope

W-2 credit applies to NR and Residential projects.

Intent

To promote landscape designs which incorporate native species and limit the use of domestic water for irrigation.

Requirements

NR & Residential (1-2 points)

Only sites with a landscaped area which is greater than 100m² are eligible for this credit.

Criteria	Points
Reduce the amount of domestic water used for landscaping by 50% compared to benchmark consumption	1
Reduce the amount of domestic water used for landscaping by 80% compared to benchmark consumption	2

W-3 Water Metering

Scope

W-3 credit applies to NR and Residential projects.

Intent

To meter water uses and find opportunities to reduce water consumption in the building.

Requirements

NR & Residential (1 point)

Criteria	Points
Install water meters for all major water flows	1

W-4 Sustainable Water Solutions

Scope

W-4 credit applies to NR and Residential projects.

Intent

To encourage the implementation of sustainable solutions as a means to reduce domestic water consumption.

Requirements

NR & Residential (1-5 points)

Criteria	Points
Strategy A: Water recycling/reuse/harvest	
Recycled, reused or harvested water contributes to 10% of the project's total water consumption	1
1 point for every additional 10% contribution of recycled, reused or harvested water to the project's total water consumption (Up to 50%)	5
Strategy B: Swimming Pool Water Efficiency	
Implement strategies to reduce water use for swimming pools	1
Strategy C: Cooling Tower Water Efficiency	
The cooling tower system is designed to operate at 6 or more cycles of concentration at acceptable water quality	1
Strategy D: Drinking Water	
Provide a drinking water filtration system	1

Materials & Resources

With one of the fastest urbanization rates in the world and a population living in urban areas that reached 34.24% in 2016 (World Bank), construction sites are rising in all corners of Vietnam and the demand of construction materials is continuously increasing.

During the lifecycle of any construction material, its extraction, processing, transportation, use and disposal can have negative effects on the environment. Especially, the acquisition of virgin material destroys natural habitats, pollutes air and water, and depletes energy and natural resources. Therefore, to mitigate the negative impacts of construction on the natural environment, usage of materials produced from virgin sources must be limited.

Also, Vietnam's urban areas generate over 11 million tonnes of solid waste per year, of which 84% is collected and treated (report from the Centre for Environmental Monitoring Portal under the Vietnam Environment Administration, 2014). This means almost 2 million tonnes of untreated solid waste is released into the environment each year.

The Materials & Resources Category of LOTUS includes three main goals which are to reduce the amount of virgin natural resources used, to promote the use of low-energy embodied materials, and to reduce the amount of waste generated. To achieve the goals, credits within this category encourage the reuse and recycling of building materials, and the use of recycled materials, materials from sustainable sources and unbaked materials.

Credit	Title	NR	Residential
MR-1	Reduced Concrete Use	2 points	2 points
MR-2	Sustainable Materials	5 points	5 points
MR-3	Non-Baked Materials	2 points	2 points
MR-PR-1	Demolition and Construction Waste	Prerequisite	Prerequisite
MR-4	Demolition and Construction Waste	2 points	2 points
MR-5	Operation Waste Management	1 point	2 points
Total of points available		12 points	13 points

MR-1 Reduced Concrete Use

Scope

MR-1 credit applies to NR and Residential projects.

Intent

To encourage projects to consider and implement strategies that minimize the use of concrete in buildings.

Requirements

NR & Residential (1-2 points)

Criteria	Points
Strategy A: Reduce concrete usage for slabs	
Design and construct slabs that reduce concrete use	1
Strategy B: Reduce concrete usage for beams and columns	
Design and construct beams and columns that reduce concrete use	1
Strategy C: Reduce concrete usage for non-structural systems	
Design and construct non-structural systems that reduce concrete use	1

MR-2 Sustainable Materials

Scope

MR-2 credit applies to NR and Residential projects.

Intent

To encourage projects to use sustainable materials minimizing the use of natural resources.

Requirements

NR & Residential (1-5 points)

This credit is only available at Full Certification.

Criteria	Points
10% of the total value of the materials in the project is from sustainable materials	1
1 point for every additional 5% of the total value of the materials that is from sustainable materials (up to 30%)	5

MR-3 Non-baked Materials

Scope

MR-3 credit applies to NR and Residential projects.

Intent

To reduce the use of baked materials and replace them with non-baked materials.

Requirements

NR & Residential (1-2 points)

Criteria	Points
80% of all non-structural walls are made up of non-baked materials	1
100% of all non-structural walls are made up of non-baked materials	2

MR-PR-1 and MR-4 Demolition and Construction Waste

Scope

MR-PR-1 prerequisite and MR-4 credit apply to NR and Residential projects.

Intent

To encourage the reuse, salvage and recycling of demolition and construction waste and to minimize disposal in landfill.

Requirement

NR & Residential (Prerequisite)

Criteria	PR
Develop and implement a demolition and construction waste management plan	M&R Prerequisite 1

NR & Residential (1-2 points)

This credit is only available at Full Certification.

Criteria	Points
Strategy A: Waste Diversion	
Reuse, salvage and/or recycle 50% of the demolition and construction waste	1
Reuse, salvage and/or recycle 70% of the demolition and construction waste	2
Strategy B: Reduction of Waste Generation	
Implement 2 strategies to reduce the waste generation during construction	1

MR-5 Operation Waste Management

Scope

MR-5 credit applies to NR and Residential projects.

Intent

To implement waste sorting and facilitate the recycling of waste generated during the operations of the building.

Requirements

NR (1 point)

Only Option A can be pursued with a maximum of 1 point available.

Residential (1-2 points)

Only Option B can be pursued with a maximum of 2 points available.

Option A: Dedicated recycling storage area

Criteria	Points
Provide a dedicated recycling storage area for use by all building occupants	1

Option B: Management and sorting of wastes

Criteria	Points
Strategy B1: Management and sorting of recyclables	
Manage and sort the recyclables	1
Strategy B2: Management and sorting of organic wastes	
Manage and sort the organic wastes	1

Health & Comfort

The World Health Organization reported in its Air Quality Guidelines (2nd Edition) that most of an individual's exposure to air pollutants comes from inhalation of indoor air. Besides air quality, the amount of noise and light pollution can also affect occupants as well as the surrounding communities. As the population of Vietnam is increasingly urbanized, it is estimated by the Ministry of Construction that urbanization rate will reach 50% for about 52 million people in 2025. This urban migration results in an increasing number of people spending an increasing amount of their time within the built environment. As a result, building occupants quality of life depends greatly on the indoor environment quality (IEQ).

Ensuring workers' productivity is done most effectively by maintaining and increasing the building's IEQ which results in reduced cases of asthma, allergies, respiratory disease and other occupant ailments described as "sick building syndrome". Reduced absenteeism and increased productivity can translate into reduced costs and increased savings for building owners and operators. Proper IEQ also increase the resale value of any building.

All credits within the Health & Comfort Category of LOTUS NC targets the overall improvement of the indoor environment in buildings with four different aspects considered. First and most important aspect is the indoor air quality: the building has to ensure fresh, clean air free of toxic chemicals and dust for occupants. Moreover, a healthy indoor environment should be comfortable visually, acoustically and thermally for most of the occupants of the building.

Credit	Title	NR	Residential
H-PR-1	Indoor Smoking	Prerequisite	Prerequisite
H-1	Ventilation for indoor air quality	3 points	3 points
H-PR-2	Low-Emission Products	Prerequisite	Prerequisite
H-2	Low-Emission Products	2 points	3 points
H-3	Biophilic Design	1 point	1 point
H-4	Daylighting	3 points	3 points
H-5	External Views	2 points	N/A
H-6	Thermal Comfort	2 points	2 points
H-7	Acoustic Comfort	1 point	2 points
Total of points available		14 points	14 points

H-PR-1 Indoor Smoking

Scope

H-PR-1 prerequisite applies to NR and Residential projects.

Intent

To minimize the effect of passive smoking.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Prohibit smoking in the building	H&C Prerequisite 1

H-1 Ventilation for indoor air quality

Scope

H-1 credit applies to NR and Residential projects.

Intent

To maintain a good indoor air quality during occupancy.

Requirements

NR (1-3 points)

Only Strategies A, B and C can be pursued with a maximum of 3 points available.

Residential (1-3 points)

Only Strategies A, B and D can be pursued with a maximum of 3 points available.

Criteria	Points
Strategy A: Fresh Air Supply	
Provide sufficient fresh air supply to a minimum of 95% of the net occupied area of the building	2
Strategy B: Air filtration	
Install air filters on fresh air intake	1
Strategy C: CO ₂ -based demand-controlled ventilation	
Install a CO ₂ -based demand-controlled ventilation system	1
Strategy D: Ventilation in Wet Areas	
Install a local exhaust system in wet areas to remove moisture and odors from wet areas	1

H-PR-2 & H-2 Low-Emission Products

Scope

H-PR-2 prerequisite and H-2 credit apply to NR and Residential projects.

Intent

To minimize the negative impacts of hazardous materials such as volatile organic compounds (VOCs) & Formaldehydes from building materials on occupant's health.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Specify and install low-VOC emission interior paints and coatings	H&C Prerequisite 2

NR (1-2 points) & Residential (1-3 points)

Criteria	Points
Strategy A: Adhesives and sealants	
Specify and install low-VOC emission adhesives and sealants	1
Strategy B: Floorings	
Specify and install low-VOC emission floorings	1
Strategy C: Composite wood	
Specify and install low-formaldehyde emission composite wood	1
Strategy D: Ceilings, partitions and insulation	
Specify and install low-VOC emission ceilings, partitions and insulation	1

H-3 Biophilic Design

Scope

H-3 credit applies to NR and Residential projects.

Intent

To incorporate natural environment in the project to nurture the human-nature relationship.

Requirements

NR & Residential (1 point)

Criteria	Points
Provide building occupants access to natural environment	1

H-4 Daylighting

Scope

H-4 credit applies to NR and Residential projects.

Intent

To encourage building designs which maximize the use of daylight.

Requirements

NR & Residential (1-3 points)

Only one of the 2 following options can be pursued:

Option A: Daylight Factor

Criteria	Points
60% of the net occupied area has an average daylight factor between 1.5% and 3.5%	1
80% of the net occupied area has an average daylight factor between 1.5% and 3.5%	2

Option B: Daylight Autonomy

Criteria	Points
Achieve a spatial daylight autonomy _{300/50%} (sDA _{300/50%}) of more than 50% of the net occupied area while controlling solar glare	1
1 point for every additional 15% of the net occupied area that achieves a spatial daylight autonomy _{300/50%} while controlling solar glare (Up to 80%)	3

H-5 External Views

Scope

H-5 credit only applies to NR projects.

Intent

To increase the occupants' connection to the outdoors by providing views to the exterior.

Requirements

NR (1-2 points)

Criteria	Points
Strategy A: External views	
70% of the net occupied area achieves a direct line of sight to the outdoor environment	1
90% of the net occupied area achieves a direct line of sight to the outdoor environment	2
Strategy B: Quality views	
70% of the net occupied area has quality views	1

H-6 Thermal Comfort

Scope

H-6 credit applies to NR and Residential projects.

Intent

To encourage designs which achieve comfortable thermal conditions for occupants.

Requirements

NR & Residential (2 points)

Criteria	Points
Design the building to avoid overheating under hot summer conditions in a minimum of 95% of occupied spaces	2

H-7 Acoustic Comfort

Scope

H-7 credit applies to NR and Residential projects.

Intent

To ensure a proper acoustic comfort within buildings.

Requirements

NR (1 point)

Only one of the 2 following options can be pursued:

Option A: Internal Noise Levels

Option A is only available at Full Certification.

Criteria	Points
Limit internal noise to recommended levels in all occupied spaces	1

Option B: Noise absorption and insulation

Criteria	Points
Average reverberation time (T60) in the occupied spaces meet requirements of the Performance Measurement Protocols for Commercial Buildings - AND - Design all walls and floors to comply with the requirements of TCXDVN 277:2002 on airborne and impact sound insulation	1

Residential (1-2 points)

Criteria	Points
Design all walls and floors to comply with the requirements of TCXDVN 277:2002 on airborne and impact sound insulation	1
Exceed requirements of TCXDVN 277:2002 to achieve: • Airborne Sound Insulation = $CK_{tc} + 5$ dB • Impact Sound Insulation = $CV_{tc} - 5$ dB	2

Site & Environment

Climate change is widely accepted as being among the greatest challenges to face the human race this century. Today, the term climate change is generally used with regard to changes in global climate, which result from human activities. The impacts of climate change can be seen in the form of stronger and more frequent storms, frequent flooding and drought, sea level rise, and other extreme weather phenomena.

In the first part of the century, it has been predicted that Vietnam will be one of the five countries most affected by climate change. Therefore, it is crucial for buildings to start incorporating design strategies and technologies to improve resilience to natural disasters and maximize life span.

All credits within the Site & Environment Category target the building's resistance towards natural disasters, the protection of the ecology of the site and the reduction of pollution including GHG emissions. A green building has to account for natural disaster risks and, at the same time, should alleviate its own impacts on climate change by increasing the perviousness of the site and reducing the amount of paved surface that contributes to the heat island effect. It should also reduce the consumption of fossil fuels required for transport by inhabitants, throughout the life of the building.

Credit	Title	NR	Residential
SE-1	Flooding Resistance	1 point	1 point
SE-2	Development Footprint	2 points	2 points
SE-3	Vegetation	4 points	4 points
SE-4	Stormwater Management	2 points	2 points
SE-5	Heat Island Effect	2 points	2 points
SE-6	Refrigerants	2 points	1 point
SE-7	Construction Activity Pollution Control	1 point	1 point
SE-8	Light Pollution Minimization	1 point	1 point
SE-9	Green Transportation	3 points	3 points
SE-10	Community Connectivity	1 point	1 point
SE-11	Outdoor Communal Space and Facilities	2 points	2 points
Total of points available		21 points	20 points

SE-1 Flood Resistance

Scope

SE-1 credit applies to NR and Residential projects.

Intent

To encourage flood resistant designs and building features to adapt to climate change.

Requirements

NR & Residential (1 point)

Criteria	Points
Building design resists current highest flood level	1

SE-2 Development Footprint

Scope

SE-2 credit applies to NR and Residential projects.

Intent

To minimize the area affected by any development activity.

Requirements

NR & Residential (1-2 points)

Criteria	Points
Reduce the development footprint and/or provide open space within the project boundary to exceed the local open space requirement for the site by 10%	1
Reduce the development footprint and/or provide open space within the project boundary to exceed the local open space requirement for the site by 20%	2

SE-3 Vegetation

Scope

SE-3 credit applies to NR and Residential projects.

Intent

To encourage the introduction of more sustainable greenery into the built environment.

Requirements

NR & Residential (1-4 points)

Criteria	Points
Strategy A: Greenery Index	
Provide greenery to achieve a Greenery Index higher than 1.0	1
1 point for every additional 0.5 point of Greenery Index achieved	4
Strategy B: Landscape management plan (Not applicable to projects with a Greenery Index lower than 1.0)	
Establish and implement a landscape management plan	1

SE-4 Stormwater Management

Scope

SE-4 credit applies to NR and Residential projects.

Intent

To reduce stormwater runoff and thus reduce temporary load to municipal drainage system, reduce urban flooding risks and improve groundwater recharge.

Requirements

NR & Residential (1-2 points)

Only one of the 2 following options can be pursued:

Option A: Site perviousness

Option A is only available to projects that have a non-building area + green roof area that makes up more than 20% of the total site area or makes up more than 200 m².

Criteria	Points
Average perviousness of the site is at least 30%	1
Average perviousness of the site is at least 50%	2

Option B: Stormwater Control

Option B is available to all projects.

Criteria	Points
Decrease volume of on-site stormwater runoff from the 2-year storm event by 30%	1
Decrease volume of on-site stormwater runoff from the 2-year storm event by 50%	2

SE-5 Heat Island Effect

Scope

SE-5 credit applies to NR and Residential projects.

Intent

To minimize heat island effect and to reduce the impact of the built environment on microclimates, as well as human and wildlife populations.

Requirements

NR & Residential (1-2 points)

Criteria	Points
30% of the paved and roof area limits heat island effect	1
50% of the paved and roof area limits heat island effect	2

SE-6 Refrigerants

Scope

SE-6 credit applies to NR and Residential projects.

Intent

To encourage the selection and use of refrigerants that do not increase global warming nor damage the ozone layer.

Requirements

NR (1-2 points)

Only one of the 3 following options can be pursued with a maximum of 2 points available.

Residential (1 point)

Only Option A or Option B can be pursued with a maximum of 1 point available.

Option A: No Refrigerant Use

Criteria	Points
Residential No air-conditioning system is installed in dwelling-units	1
NR No refrigerant is used in the building	2

Option B: Refrigerant Atmospheric Impact (RAI) of Air-conditioning systems

Criteria	Points
Average Refrigerant Atmospheric Impact of all the air-conditioning systems installed in the building is below 12	1
Average Refrigerant Atmospheric Impact of all the air-conditioning systems installed in the building is below 10	2

Option C: Strategies to limit emissions

Only applicable for non-residential projects with commercial refrigeration systems

Criteria	Points
1 point granted for each of the following strategies implemented for air-conditioning, heat pump and commercial refrigeration systems: <ul style="list-style-type: none">- No centralized direct expansion system is used- All refrigerants used have a GWP100 below 2000 and ODP \leq 0.02- At least one system (not a stand-alone equipment) is using natural refrigerants- The commercial refrigeration system is an indirect (secondary) system	2

SE-7 Construction Activity Pollution Control

Scope

SE-7 credit applies to NR and Residential projects.

Intent

To limit pollution arising from construction activities.

Requirements

NR & Residential (1 point)

Criteria	Points
Implement strategies to limit pollution arising from construction activities	1

SE-8 Light Pollution Minimization

Scope

SE-8 credit applies to NR and Residential projects.

Intent

To minimize light pollution into the night sky.

Requirements

NR & Residential (1 points)

Only one of the 2 following options can be pursued with a maximum of 1 point available.

Option A: Light trespass

Criteria	Points
Limit illuminance at the site boundary during night time	1

Option B: Fully shielded fixtures

Criteria	Points
All exterior lighting fixtures are fully-shielded	1

SE-9 Green Transportation

Scope

SE-9 credit applies to NR and Residential projects.

Intent

To raise awareness of the different collective transport means available to occupants of the building and implement policies to encourage occupants to use green transportation.

Requirements

NR & Residential (1-3 points)

Criteria	Points
Strategy A: Bicycle Friendly	
NR Provide covered and secured bicycle parking spaces for 5% of occupants (at peak period) and shower facilities for 0.5% of full-time occupants.	1
Residential Provide covered and secured bicycle parking spaces for 15% of residents	
Strategy B: Public Transportation	
Situate the building within a 500 m walking distance from 2 different public transportation routes	1
Strategy C: Electric Vehicles	
NR Install electric vehicle charging stations for 3% of the total vehicle parking capacity of the site	1
Residential Install electric vehicle charging stations for 5% of the total vehicle parking capacity of the site	
Strategy D: Green transportation program	
Set up a green transportation program	1

SE-10 Community Connectivity

Scope

SE-10 credit applies to NR and Residential projects.

Intent

To encourage developments to access existing amenities, infrastructure and services.

Requirements

NR & Residential (1 point)

Criteria	Points
Locate the building within a 500 meters walking distance from 10 basic services	1

SE-11 Outdoor Communal Space and Facilities

Scope

SE-11 credit applies to NR and Residential projects.

Intent

To encourage projects to set aside a portion of the space and provide facilities for use and enjoyment by the occupants and community.

Requirements

NR (1-2 points)

Only Strategy A can be pursued.

Exception: For buildings where, for safety and security concerns, public cannot be allowed to come on site (such as: factories, schools, embassies, etc.), Strategy B can be followed instead of Strategy A.

Residential (1-2 points)

Both Strategy A and Strategy B can be pursued with a maximum of 2 points available.

Criteria	Points
Strategy A: Public Space	
5% of the site area is a public space with social and recreational value	1
10% of the site area is a public space with social and recreational value	2
Strategy B: Outdoor communal facilities	
Provide 2 outdoor communal facilities for occupants	1
Provide 4 outdoor communal facilities for occupants	2

Management

The execution of an environmentally sustainable construction project involves a number of parties from various backgrounds, with a wide range of specialization. To attain the standards expected of a LOTUS NC certified building, high levels of communication and coordination between all parties involved is vital. It is extremely important that the entire project team works together towards adopting all appropriate environmental principals at the project's inception. It is also vital that this information is passed on to buildings users and managers so that the building's design features are understood and used, ensuring the intended performance goals are met throughout the life of the building.

During the construction phase, it is necessary to implement a complete and systematic management scheme to ensure the construction phase is carried out without discrepancies. LOTUS encourages the use of an internationally recognized project management scheme during this phase to ensure this is realized. LOTUS also encourages the training of contractors on the green aspects of the building to ensure that the design intent flows down to all teams that are working on the building and construction progresses smoothly.

Commissioning is a critical operation to ensure building performance meets design specification. Recognizing the vital importance of a properly employed commissioning program, LOTUS NC will award points to ensure the step is executed effectively. In order to benefit fully from the commissioning stage, it is necessary to implement targeted and continuous preventative maintenance programs to ensure optimized performance of all equipment. This will decrease the risk of breakdown and increase the building's life span.

Credit	Title	NR	Residential
Man-1	Effective Design Process	1 point	1 point
Man-2	Construction Stage	1 point	1 point
Man-3	Commissioning	4 points	4 points
Man-PR-1	Maintenance	Prerequisite	Prerequisite
Man-4	Maintenance	1 point	1 point
Man-PR-2	Green Awareness	Prerequisite	Prerequisite
Man-5	Green Awareness	1 point	1 point
Total of points available		8 points	8 points

Man-1 Effective Design Process

Scope

Man-1 credit applies to NR and Residential projects.

Intent

To encourage projects to follow effective design processes in order to reach high performance.

Requirements

NR & Residential (1 point)

Criteria	Points
Strategy A: Integrated Design Process	
Follow an integrated design process	1
Strategy B: Building Information Modelling	
Use a coordinated BIM model to design the building	1
Strategy C: Cost-effective Design	
Demonstrate that the design is cost-effective	1

Man-2 Construction Stage

Scope

Man-2 credit applies to NR and Residential projects.

Intent

To encourage the development of a recognized Project Management framework for a smooth construction process and to encourage the education and training of contractors regarding the green requirements of the project.

Requirements

NR & Residential (1 point)

Criteria	Points
Strategy A: Project management	
Project management is performed in accordance with an internationally recognized system	1
Strategy B: Trades training	
Conduct trades training on the green aspects of the building design	1

Man-3 Commissioning

Scope

Man-3 credit applies to NR and Residential projects.

Intent

To ensure the building systems are installed, calibrated and performing up to the design intent and end-user satisfaction.

Requirements

NR & Residential (2-4 points)

Requirements for 3 and 4 points are only available at Full Certification.

Criteria	Points
Ensure that building systems are well-installed and are performing as intended	2
Ensure a proper handover to the owner O&M staff and end users	3
Conduct commissioning activities during the operations of the building	4

Man-PR-1 & Man-4 Maintenance

Scope

Man-PR-1 prerequisite and Man-4 credit apply to NR and Residential projects.

Intent

To encourage the development of a preventative maintenance plan to ensure that the building's systems and equipment are achieving optimum performance.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Provide a Building Operation & Maintenance Manual	Man Prerequisite 1

NR & Residential (1 point)

This credit is only available at Full Certification.

Criteria	Points
Produce a preventative maintenance plan	1

Man-PR-2 & Man-5 Green Awareness

Scope

Man-PR-2 prerequisite and Man-5 credit apply to NR and Residential projects.

Intent

To promote awareness and knowledge about sustainability issues in the community.

Requirements

NR & Residential (Prerequisite)

Criteria	PR
Provide a Building User's Guide for occupants	Man Prerequisite 2

NR & Residential (1 point)

This credit is only available at Full Certification.

Criteria	Points
Implement 2 of the following strategies to raise awareness on sustainability: <ul style="list-style-type: none">- Provide signs and/or displays to demonstrate the project's green features- Provide sustainable practice guides to building occupants- Organize regular Green activities and events	1

Exceptional Performance

The purpose of this category is to reward innovative techniques/initiatives, as well as exceptional performance enhancement.

There are up to 8 points available over the 2 credits, but these points are not specifically assessed to one or the other credit.

Credit	Title	NR	Residential
EP-1	Enhanced Performance	8 points	8 points
EP-2	Innovative Solutions		
Total of points available		8 points	8 points

EP-1 Enhanced Performance

Scope

EP-1 credit applies to NR and Residential projects.

Intent

To encourage exceptional performance and recognize projects that achieves environmental benefits in excess of the current LOTUS rating system benchmarks.

Requirements

NR & Residential (1-8 points)

Criteria	Points
Exceed significantly the credit requirements of LOTUS NC credits	1-8

EP-2 Innovative Solutions

Scope

EP-2 credit applies to NR and Residential projects.

Intent

To promote innovative solutions that are not considered in LOTUS NC.

Requirements

NR & Residential (1-8 points)

Criteria	Points
Implement innovative solutions that are outside the scope of LOTUS NC	1-8

Annex 1: Applicability and procedures for C&S projects

Table A.1: Applicability and procedures to follow for all credits and prerequisites for C&S projects

PR/Credit	Requirements	Applicability	Procedure
E-PR-1	Requirements on R-values and SHGC values	Whole building	Follow all the requirements of the prerequisite.
	Requirements on efficiency of HVAC systems	Limited to the HVAC systems installed by the developer	Follow all the requirements of the prerequisite in the scope of applicability and include guidance on the selection of HVAC systems in the green fit-out guidelines.
	Requirements on Lighting power density	Limited to the spaces where lighting is fully installed by the developer	Follow all the requirements of the prerequisite in the scope of applicability and include guidance on the selection of lighting fixtures in the green fit-out guidelines.
E-PR-2 & E-1	Whole credit/PR	Whole building	Follow all the requirements of the prerequisite/credit.
E-PR-3 & E-2	Whole credit/PR	Whole building	Follow all the requirements outlined in the prerequisite/credit. For all items under residents/tenants' control, the proposed and baseline buildings should be modelled identically.
E-3	Whole credit/PR	Whole building	Follow all the requirements of the credit.
E-4	Strategy A: Natural Ventilation	Whole building	Follow all the requirements of the credit.
	Strategy B: Air-conditioning	Limited to the HVAC systems installed by the developer	Follow all the requirements of the credit in the scope of applicability and include guidance on the selection of HVAC systems in the green fit-out guidelines.
E-5	Artificial Lighting	Limited to the spaces where lighting is fully installed by the developer	Follow all the requirements of the credit in the scope of applicability and include guidance on the selection of lighting systems in the green fit-out guidelines.
E-6	Requirements on PMS and BMS	Limited to the equipment and systems installed by the developer	Follow all the requirements of the credit in the scope of applicability and include guidance on the energy monitoring in the green fit-out guidelines. Also, separate tenancies should be individually metered (but not necessarily connected to the PMS/BMS system).
	Requirements on Energy Monitors	Whole building	Follow all the requirements of the credit.
E-7	Whole credit/PR	Whole building	Follow all the requirements of the credit.
E-8	Whole credit/PR	Whole building	Follow all the requirements of the credit.
W-PR-1 & W-1	Whole credit/PR	Limited to the water fixtures installed by the developer	Follow all the requirements of the prerequisite/credit in the scope of applicability and include guidance on the selection of water fixtures in the green fit-out guidelines.
W-2	Whole credit	Whole building	Follow all the requirements of the credit.
W-3	Whole credit	Whole building	Follow all the requirements of the credit.

W-4	Whole credit	Whole building	Follow all the requirements of the credit.
MR-1	Whole credit	Whole building	Follow all the requirements of the credit.
MR-2	Whole credit	Limited to the materials installed by the developer	Follow all the requirements of the credit in the scope of applicability and include guidance on the selection of sustainable materials in the green fit-out guidelines.
MR-3	Whole credit	Limited to the non-structural walls installed by the developer	Follow all the requirements of the credit in the scope of applicability and include guidance on the selection of non-baked materials in the green fit-out guidelines.
MR-PR-1 & MR-4	Whole credit/PR	Limited to the construction works realized by the developer	Follow all the requirements of the prerequisite/credit in the scope of applicability and include guidance on the management of construction waste in the green fit-out guidelines.
MR-5	Whole credit	Whole building	Follow all the requirements of the credit.
H-PR-1	Whole PR	Whole building	Follow all the requirements of the prerequisite.
H-1	Strategy A Requirements on mechanically and mixed-mode ventilated spaces	Limited to the HVAC systems installed by the developer	Follow all the requirements of the credit in the scope of applicability: <ul style="list-style-type: none"> fresh air supply requirements should be met for the completed occupied spaces for the tenant and/or resident areas served by HVAC systems installed by the developer, the requirements on fresh air supply should be met for the total area of incomplete spaces based on expected occupancy type. for the tenant and/or resident areas not served by HVAC systems installed by the developer, guidance on fresh air supply should be included in the green fit-out guidelines.
	Strategy B	Limited to the HVAC systems installed by the developer	Follow all the requirements of the credit in the scope of applicability: <ul style="list-style-type: none"> air filtration should be installed on all the fresh air intakes installed by the developer for the tenant and/or resident areas not served by HVAC systems installed by the developer, include guidance on air filtration in the green fit-out guidelines.
	Strategy C	Limited to the HVAC systems installed by the developer	Follow all the requirements of the credit in the scope of applicability: <ul style="list-style-type: none"> CO₂-based demand-controlled ventilation system should regulate the fresh air ventilation rate in all the completed high density occupied spaces for the incomplete spaces, guidance on CO₂-based demand control ventilation should be included in the green fit-out guidelines.
	Strategy D	Whole building	Follow all the requirements of the strategy.
H-PR-2 & H-2	Whole credit	Limited to the construction works realized by the developer	Follow all the requirements of the prerequisite and credit in the scope of applicability and include guidance on the selection of low-emission products in the green fit-out guidelines.
H-3	Whole credit	Whole building	Follow all the requirements of the credit.

H-4	Whole credit	Whole building	<p>Follow all the requirements of the credit for the whole building:</p> <ul style="list-style-type: none"> requirements should be met for the completed occupied spaces as described in credit H-4 requirements should be met for the incomplete spaces that should be considered as occupied spaces. Recommended reflectance values should be used and spaces should be considered as they are (i.e. without interior layout completed). Guidance on the provision of daylight should be included in the green fit-out guidelines.
H-5	Strategy A	Whole building	<p>Follow all the requirements of the credit for the whole building:</p> <ul style="list-style-type: none"> requirements should be met for the completed occupied spaces as described in credit H-5 requirements should be met for the incomplete spaces that should be considered as occupied spaces and as they are (i.e. without interior layout completed). Guidance on the provision of external views should be included in the green fit-out guidelines.
H-6	Requirements for air-conditioned spaces	Limited to the HVAC systems installed by the developer	<p>Follow all the requirements of the credit in the scope of applicability:</p> <ul style="list-style-type: none"> thermal comfort requirements should be met for the completed occupied spaces for the tenant and/or resident areas served by HVAC systems installed by the developer, the requirements on thermal comfort should be met for the total area of incomplete spaces based on expected occupancy type. for the tenant and/or resident areas not served by HVAC systems installed by the developer, guidance on thermal comfort should be included in the green fit-out guidelines.
	Requirements for non-air-conditioned spaces	Whole building	Follow all the requirements of the credit
H-7	Requirements for non-residential projects	Not applicable	This pathway is not available to C&S projects.
	Requirements for residential projects	Whole building	Follow all the requirements of the credit.
SE-1	Whole credit	Whole building	Follow all the requirements of the credit.
SE-2	Whole credit	Whole building	Follow all the requirements of the credit.
SE-3	Whole credit	Whole building	Follow all the requirements of the credit.
SE-4	Both options	Whole building	Follow all the requirements of the credit.
SE-5	Whole credit	Whole building	Follow all the requirements of the credit.

SE-6	Option A	Whole building	Follow all the requirements of the credit and include guidance on natural ventilation in the green fit-out guidelines.
SE-6	Option B and C	Limited to the HVAC systems installed by the developer	Follow all the requirements of the credit in the scope of applicability and include guidance on the selection of HVAC systems in the green fit-out guidelines.
SE-7	Whole credit	Limited to the construction works realized by the developer	Follow all the requirements of the credit.
SE-8	Requirements on automatic lighting shutoff strategies	Limited to the spaces managed by the building management team	Follow all the requirements of the credit in the scope of applicability and include guidance on lighting shutoff strategies in the green fit-out guidelines.
	Other requirements in both options	Whole building	Follow all the requirements of the credit.
SE-9	Whole credit	Whole building	Follow all the requirements of the credit.
SE-10	Whole credit	Whole building	Follow all the requirements of the credit.
SE-11	Whole credit	Whole building	Follow all the requirements of the credit.
Man-1	Whole credit	Limited to the construction works realized by the developer	Follow all the requirements of the credit.
Man-2	Whole credit	Limited to the construction works realized by the developer	Follow all the requirements of the credit.
Man-3	Whole credit	Limited to the systems and equipment installed by the developer	Follow all the requirements of the credit in the scope of applicability and include guidance on commissioning in the green fit-out guidelines.
Man-PR-1 & Man-4	Maintenance	Limited to the systems and equipment installed by the developer and managed by the building management team	Follow all the requirements of the prerequisite and credit in the scope of applicability and include guidance on maintenance in the green fit-out guidelines.
Man-PR-2	Whole PR	Whole project	Different building user's guides should be produced for residents and for different types of tenants (office, retail...).
Man-5	Whole credit	Limited to the construction works realized by the developer	Follow all the requirements of the credit.
Inn-1	Enhanced Performance	Based on the credit	Based on the credit
Inn-2	Innovative Solutions	Depending on the solution	Depending on the solution