

4	<b>ENERGY USE</b>	<b>4.2 ENERGY EFFICIENT SYSTEMS</b>
		<b>EU 3 EMBODIED ENERGY IN BUILDING STRUCTURAL ELEMENTS</b>
	<b>EXCLUSIONS</b>	None.
	<b>OBJECTIVE</b>	Encourage the design of structural elements and choice of materials that results in lower embodied energy.
	<b>CREDITS ATTAINABLE</b>	1 + 1 BONUS
	<b>PREREQUISITES</b>	None.
	<b>CREDIT REQUIREMENT</b>	<p>1 credit for demonstrating the embodied energy in the major elements of the building structure of the assessed building has been studied through a Life Cycle Assessment (LCA).</p> <p>1 BONUS credit for demonstrating the major materials with low embodied energy are used in the project utilizing the LCA results.</p>
	<b>ASSESSMENT</b>	<p>The assessment covers only the elements and materials used in the building foundations, building core, walls, etc, i.e., major elements of building structure including building facade and primary and secondary structures, but does not include building services system.</p> <p>The Client shall provide a report detailing the methodology and result of the assessment. The method to estimate reduction in embodied energy should follow a well-established Life Cycle Assessment (LCA) approach. It is encouraged to use EMSD's tool or other equivalent tools to conduct a Life Cycle Assessment.</p> <p>The bonus credit will be given where changes in the design of the main structural elements, for example the use of less materials or alternative constructions, etc. enable a reduction in embodied energy compared with the same building where the enhancements were not included.</p>
	<b>BACKGROUND</b>	<p>The energy used in the extraction, processing and transportation of materials used in building construction can be a significant part of the total energy used over the life cycle of a building, particularly buildings that utilise natural ventilation where operating energy for cooling and ventilation are significantly less than for air-conditioned buildings. Estimations for Hong Kong residential buildings suggest that embodied energy amounts to 20-40% of total energy used over a 40-60 year lifetime [1,2,3].</p> <p>Heightened awareness of the importance of environmental protection, and the possible impacts associated with products manufactured and consumed, has increased the interest in the development of methods to better comprehend and reduce these impacts. One of the techniques being developed for this purpose is Life Cycle Assessment (LCA). ISO 14040 [4] describes the principles and framework for conducting and reporting LCA studies, and includes certain minimal requirements. LCA is a technique for assessing the environmental aspects and potential impacts associated with a product, by:</p> <ul style="list-style-type: none"> <li>• compiling an inventory of relevant inputs and outputs of a product</li> </ul>

- 1 Cole R J, Wong K S. Minimising environmental impact of high-rise residential buildings. Proc. Housing for millions: The challenge ahead. Hong Kong: Housing Authority, 1996, pp 262–5.
- 2 Humphrey S, Amato A, Frewer R. Whole Life Comparison of High Rise Residential Blocks in Hong Kong. International Housing Conference - Housing in the 21st Century: Challenges and Commitments. 2-4 February 2004.
- 3 Chen T Y, Burnett J, Chau C K. Analysis of embodied energy use in residential building of Hong Kong. Energy 26, 2001. pp 323-340.
- 4 International Organization for Standardization. EN ISO 14040:1997. Environmental management – Life cycle assessment – Principles and framework.

**Q9. EU 3, For BEAM Plus New Buildings Version 1.1 and 1.2, can Life Cycle Assessment (LCA) be carried out after the commencement of construction work?**

No, LCA must be carried out at the design stage. In other words, the Applicant shall complete the LCA covering the foundation components prior to the commencement of piling works. Prior to the commencement of superstructure works, the Applicant shall have completed LCA covering the superstructure, structural elements of facades and other remaining components of the building structures.

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The Applicant is also reminded to submit the master programme to substantiate on the claimed commencement date of various stages of construction works.

(Released on 11 September 2019)

**Q10. EU 3, For BEAM Plus New Buildings Version 1.1 and 1.2, does the Applicant need to update the Life Cycle Assessment (LCA) regarding the actual structural design for submission of the final assessment?**

For the normal credit, the objective of the LCA is to demonstrate the utilization of LCA tool to **study on embodied energy of structural elements and choice of materials**. In this respect, the Applicant shall carry the LCA at the design stage. Once the Applicant has shown that the LCA has been conducted at design stage, updating of the actual structural design for submission of the final assessment is not required.

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For the BONUS credit, the objective is to **utilize the LCA result and adopt structural elements and choices of materials with low embodied energy**. In this respect, the Applicant shall first conduct a preliminary LCA at the design stage. Upon completion of the construction works, the Applicant shall conduct a finalized LCA to confirm on the final embodied energy of the building structure. The credit will be awarded if the final embodied energy is lower than the embodied energy computed at design stage.

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**Q11. EU 3, For BEAM Plus New Buildings Version 1.1 and 1.2, does the Applicant need to include glazing in the Life Cycle Assessment (LCA)?**

No. Glazing (glass window) is not required to be included in the LCA.

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(Released on 11 September 2019)



Circular Letter No.: 2020.169

Issue Date: 5 June 2020

Application: BEAM Plus NB Version 1.1 and 1.2

Effective Date: All first assessment submission<sup>1</sup> made on or after 4 January 2021

**EU 3 Embodied Energy in Building Structural Elements &  
IA 2 Embodied Carbon During Construction Stage**

1. Construction Industry Council (CIC) has introduced the CIC Carbon Assessment Tool to facilitate the understanding of embodied carbon of construction materials and carbon emissions of on-site construction process.
2. To encourage the project proponents to make wider use of the CIC Carbon Assessment Tool, the Circular Letter announces an update to the credit requirement for EU 3 as follows:
  - 1 credit for demonstrating the embodied carbon for (a) permanent works – substructure and (b) permanent works – superstructure have been studied through the “design input” module for the CIC Carbon Assessment Tool or similar assessment tools.
  - 1 BONUS credit for demonstrating that the materials used for (a) permanent work – substructure and (b) permanent works – superstructure have a low embodied carbon in the as-built design than the original design, with the result of the study generated from the “construction input” module of the CIC Carbon Assessment Tool or similar assessment tools.
3. To incentivise the project proponents in studying the embodied carbon during the construction stage, BONUS credit will also be awarded under IA 2 Performance Enhancements. The requirement for achieving the BONUS credit is as follows:
  - 1 BONUS credit for providing a full embodied carbon assessment inclusive of (a) permanent works – substructure, (b) permanent works – superstructure, (c) temporary works and (d) site impact using the “construction impact” module of the CIC Carbon Assessment Tool or similar assessment modules.

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<sup>1</sup> First assessment submission refers to the date when the initial assessment is formally accepted by BSL. For example, if the project has both PA and FA, then it would be the date when BSL formally accepts the project for PA submission. If the project has only FA, then it will be the date when BSL formally accepts the project for FA submission.

4. Approved PA Projects: For projects that have already completed PA with certain life cycle assessment methodology approved, the Applicant may continue to adopt the same methodology for subsequent assessments or voluntarily comply with this Technical Circular. For the avoidance of doubt, the Applicant shall provide evidences to support the intention of using the same life cycle assessment methodology in subsequent assessments (e.g. extract of the PA report, documents submitted for assessment in PA, etc).



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Ir SK Ho  
Chairperson of Standards Sub-committee