

Life Cycle Assessment and Environmental Building Declaration for “Design Building”

With the increasing awareness of environmental impacts from buildings and construction, wood has become more popular for low-rise commercial building and multi-level residential building materials. The University of Massachusetts (UMass) Amherst is building a wood structure to house classrooms, studios, computer labs, meeting rooms, a wood shop, and cafe. This “Design Building” (UM 2016) is a case study for demonstrating the carbon footprint and other environmental impacts reduction using sustainable wood materials. The internationally recognized environmental assessment tool called life-cycle assessment (LCA) offers a holistic analysis for the whole building from cradle-to-gate or cradle-to-grave assessment. LCA results can also be used to publish a summarized document called an environmental building declaration (EBD) to display the carbon footprint and life-cycle impacts data, similar to a nutrition label on a food package.

Background

EBD was first developed by the Athena Sustainable Materials Institute. An EBD is a summary report of

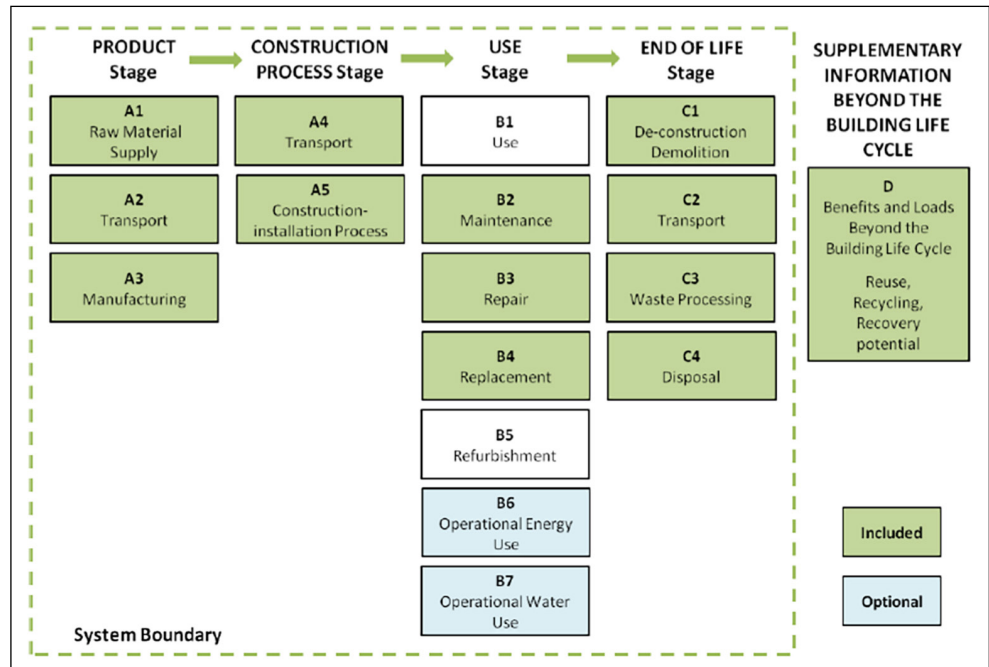


Figure 1—Proposed assessment system boundary.

the comprehensive environmental footprint data for a building and declares life-cycle impacts according to a standardized format. It is a statement of performance and is publicly disclosed, similar to a nutrition label on a food package. The intent of the document is to present results as transparently and concisely as possible. Athena’s EBDs are compliant with the European standard EN 15978, a whole-building LCA standard that is intended to support decision-making and documentation around the assessment of environmental performance of buildings. The Design Building would be the fourth building to be assessed as part of Athena’s EBD initiative and the first located in the United States.

Background information on this initiative can be found on-line (Athena 2016).

Objective

The objective of the study is to produce materials for communicating the environmental performance of the Design Building at UMass Amherst. The intended use of the EBD will therefore be for educational and marketing purposes.

Approach

Four tasks are planned to meet the objectives of the proposed work:

Task 1: Compile building model inputs—The objective of this task is to compile the three types of life-cycle building inputs (materials, operating energy, and operating water) required to model a building.

Task 2: Perform whole-building LCA—Whole-building LCA will be performed with the aid of a spreadsheet tool developed by the Athena specifically for EN 15978-compliant assessments. The tool houses the data required for an assessment, performs calculations, and returns appropriate results, graphs and tables.

Task 3: Prepare and verify EBD report—This task will be in four steps: (1) prepare draft EBD report, (2) internally verify assessment results and reporting for compliance with EN 15978, and (3) revise the assessment and/or report as required.

Task 4: Prepare summary document and discussion paper—This task will involve preparing a one-page summary document with key results, which can function as a brochure and/or a display poster suitable for the building lobby, and a short discussion paper explaining the contents and purpose of the EBD.

Expected Outcome

The outcome will be the EBD report detailing the building assessment, including but not limited to, the following:

- Objects of assessment—Description of building characteristics, along with model inputs (such as materials, operating energy and water systems)

- System boundaries—Information modules and underlying processes
- Scenarios—Assumptions (such as construction waste factors, transportation distances) used to model the buildings over their life cycle
- Information sources and quality—LCI data sources and quality, LCIA methodology, and other sources of information used to conduct the assessments
- Environmental indicator results—Presented for the whole building, including contribution and sensitivity analyses

The report will provide sufficient information such that results are reproducible and comparable to other buildings assessed according to the standard. Interpretation of results is not required by EN 15978 and will not form part of the report.

Timeline

The study will be completed by July 2017.

Cooperators

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References

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