

An introduction to ENVIRONMENTAL BUILDING DECLARATIONS

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The Athena Sustainable Materials Institute recently began publishing a new kind of document, something we call Environmental Building Declarations [EBDs]. An EBD is a summary report of comprehensive environmental footprint data for a building and declares the life cycle impacts of a building according to a standardized format. It is a statement of performance and is typically publicly disclosed, like 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 life cycle assessment [LCA] standard that is intended to support decision-making and documentation around the assessment of environmental performance of buildings. Since one of the stated purposes of the standard is to guide "environmental declarations," we've adopted the name "environmental building declaration" for this kind of report. While many people are using EN 15978 in their practice and reporting of whole-building LCA, Athena may be the first to formalize the documentation and apply the term "EBD."

The EN 15978 Standard

EN 15978 is the most advanced consensus standard for whole-building LCA. It includes provisions on how to calculate results for a uniform set of environmental indicators, and how to report the results transparently. The standard has filled a critical gap in building LCA practice and taken the guesswork out of what constitutes a good assessment. EN 15978 is now the most widely-used standard for building LCA studies and is referenced by various green building rating systems worldwide. Athena's EBDs aim to advance the emerging consensus on whole-building LCA practice.

Quantification and Validation of Green Building Performance

Our mandate at the Athena Institute is to help bring quantification and validation to sustainability decisions. How confident is the design community that self-declared "green" buildings deliver measurable environmental benefits over standard buildings? We believe it is time for performance assessment and standardized transparent reporting on what the community calls sustainable design.

Example EBD Results

EN 15978 Environmental Indicator	Unit	Total	Per-m2
Environmental Impacts			
Global warming potential	kg CO ₂ eq.	2.28E+06	4.16E+02
Ozone depletion potential	kg CFC-11 eq.	2.81E-03	5.16E-07
Acidification potential	kg SO ₂ eq.	1.11E+04	2.04E+00
Eutrophication potential	kg N eq.	4.90E+02	8.99E-02
Smog potential	kg O ₃ eq.	1.94E+05	3.55E+01

Transparency is the big buzz word right now, putting pressure on manufacturers to measure and publish environmental performance data on their products. The result is a rapidly increasing number of environmental product declarations [EPDs]. We believe it is time for similar disclosures to be made for entire buildings. As a think tank, the Athena Institute has a responsibility to establish innovative methodologies and help implement them.

The Relationship Between EBDs and EPDs

EBDs and EPDs are similar in the sense that both publicly report LCA results according to standards. However, an EPD has further requirements which, if applied to building declarations, would add complexity and cost that we feel is unnecessary. In addition to following LCA standards, an EPD is developed according to "product category rules" [a PCR] and is issued through an EPD "program operator" who arranges for third-party review. This increased level of standardization and oversight is important for product declarations, which are reliant on high-quality fundamental data and which may be used to compare competing products against each other.

In contrast, a building declaration has very little fundamental data – it's a compilation of product and process data that has already been developed elsewhere. This means a building declaration could be viewed more like an in-house engineering report, which would be internally reviewed for technical accuracy and would be credibly published by, for example, an architect-

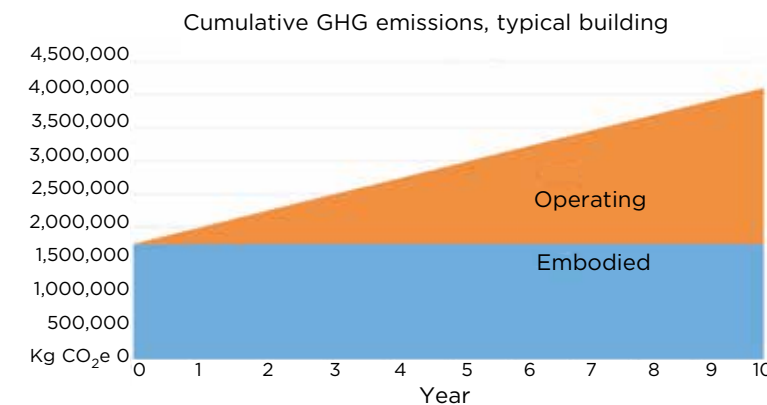
ture or engineering firm. So, in summary, we view an EBD as a whole-building EPD without the usual EPD process.

Design Tool or Confirmation Report?

An EBD is not a design tool, rather it is a statement after the fact. Ideally, an EBD is the final step after a project team has used LCA throughout the design process in order to minimize the environmental impacts of the proposed building. In other words, the background life cycle assessment work is the design tool, if used early enough. The key element for the best practice and reporting of LCA is adherence to a standard, which is why Athena uses EN 15978.

Advancing Green Design with EBDs

EBDs motivate effective sustainability decisions because actual performance data is available to the public. In other words, building owners and their designers are accountable for the claims they make about their building. The reported data is also useful for future design projects. Athena's EBDs include contribution analyses [identification of "hot spots"], which help to identify what decisions are really working and where to look for reductions next time. And once the pool of EBDs gets large enough, the collective data will provide performance benchmarks.



TOTAL CARBON FOOTPRINT FOR A TYPICAL MID-RISE BUILDING IN CANADA. AN EBD HELPS HIGHLIGHT THE EMBODIED PORTION, WHICH IS TYPICALLY IGNORED.

DATA SOURCE: AN EXTENSIVE ATHENA INSTITUTE LCA STUDY OF MID-RISE CONCRETE BUILDINGS [SEE "LIFE CYCLE ASSESSMENT FOR SUSTAINABLE DESIGN OF PRECAST CONCRETE COMMERCIAL BUILDINGS IN CANADA," M. MARCEAU ET AL, 2012]. THESE RESULTS ARE HIGHLY CONSERVATIVE AS THE STUDY IS STRICTLY CORE AND SHELL AND DOES NOT INCLUDE FINISHES, FURNISHINGS, HVAC AND SO FORTH. THIS IS THE CARBON FOOTPRINT FOR A TYPICAL NEW 5-STORY BUILDING IN TORONTO.

Data Contained In EBDs

An EBD reports cradle-to-grave life cycle assessment [LCA] data for the whole building. The results reflect the impact of materials manufacturing, transportation to the building site, construction, building operation, and building end-of-life activities. It includes typical LCA environmental indicators like global warming potential, eutrophication, acidification and smog potential. It also reports quantities of resource consumption [materials, energy and water] and waste creation.

Interpreting the Information in an EBD

The kind of data that LCA produces is still unfamiliar to most people. The first challenge is to understand the terminology, then we need some context to understand what the numbers mean. Construction product specifiers are already confronting this challenge as they encounter an increasing number of EPDs [environmental product declarations], which also report LCA data. This will take time, as it is a complex situation involving a need for education and more standardization. It begins with measuring and reporting, and over time the context for interpretation, making comparisons, and taking responsive actions will develop.

Comparing Building Performance using EBDs

As with EPDs, an EBD states the facts without judgement – it's up to the reader to apply that judgement. What will come with time are industry or sector averages, so that individual building results can be compared to typical results. This will create a framework for performance targets or benchmarks, rather like the “% of daily allowance” on nutrition labels.

Comparing EBDs?

There are so many variables involved in an LCA study that apples-to-apples comparisons between two different sets of results can be difficult. It takes a careful eye and a good understanding of basic LCA concepts to know if two studies are comparable. This is definitely an issue right now in the early stages of EPDs, but should be resolved over time with a combination of education and further standardization. Meanwhile, as we produce more EBDs at the Athena Institute, we're working on a methodology for comparability.

Why Create An EBD?

Athena's first three EPDs were created for building owners that partnered with us to set an example of transparent performance reporting and show some real leadership: Enermodal [now MMM Group] for their head office in Kitchener, Lafarge for an R&D building in Edmonton, and the Province of BC for the Wood Innovation and Design Centre in Prince George. At the Athena Institute, we think the market is ready for this as part of the next generation of green. An EBD adds an advanced quantitative complement to whatever other sustainability demonstrations a project team may be implementing like green building certification.

This is a differentiator. And it's easy to do if a design team is already going for the new LCA credit in LEED v4¹. But the real reason to do it is to make a statement about accountability for performance, and to acknowledge the large but usually ignored embodied footprint of new construction [see the figure].

¹MR CREDIT “BUILDING LIFE CYCLE IMPACT REDUCTION,” OPTION 4. WORTH UP TO FIVE POINTS IN CANADA.

Doing an EBD creates an internal benchmark – can your next building beat it? And it helps us create a building database so that we can eventually compare a building's LCA result to an average.

How to Get an EBD?

While the Athena Institute has developed a cost-effective method to produce EBDs, essentially any LCA practitioner can prepare something similar. The key factor, in our opinion, is that publicly-declared whole-building LCA results must follow the standard EN 15978. We are looking into ways to enable non-LCA practitioners such as architects and engineers to produce their own quality EBDs, including updating our free Impact Estimator for Buildings software tool for this purpose.

For more information:

Read technical details about the Athena Institute EBDs and see examples at www.athenasmi.org ◀

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THE HEAD OFFICE OF ENERMODAL [NOW MMM GROUP] IN KITCHENER, AND THE PROVINCE OF BC FOR THE WOOD INNOVATION AND DESIGN CENTRE IN PRINCE GEORGE, WERE AMONG THE FIRST TO RECEIVE AN EBD [1 AND 2].

