



National Ready Mixed Concrete Association Position Statement on Life Cycle Assessment

What is a Life Cycle Assessment?

Life Cycle Assessment (LCA) is a technique to assess the environmental aspects and potential impacts associated with a product, process, or service. This is achieved by compiling an inventory of relevant energy and material inputs and environmental releases, evaluating the potential environmental impacts associated with identified inputs and releases and interpreting the results to help make a more informed decision.

How is LCA used?

LCAs have been used increasingly by industry to help reduce the overall environmental burdens across the whole life cycle of various materials, buildings, or products. LCA is used to improve the competitiveness of the company's products and in communication with governmental bodies or customers. LCA is used in decision making as a tool to improve product design, for example the choice of materials, the selection of technologies, specific design criteria and when considering recycling. The benefit of LCA is that it provides a single tool that is able to provide insights into upstream and downstream trade-offs associated with environmental pressures, human health, and the consumption of resources.

NRMCA encourages adoption of LCA into building codes and legislation/regulation affecting the built environment.

The built environment plays a significant role in environmental health, human welfare, and the economic stability of the U.S. Building operation accounts for 40% of U.S. energy consumption and the waste from construction debris makes up over 35% of all non-industrial waste. Building operations alone contribute over 38% of the U.S.'s carbon dioxide emissions and over 12% of its water consumption. The use of concrete in the built environment can aid in the reduction of energy consumption, carbon dioxide emissions and construction waste of buildings. LCA allows for building owners and designers to make the most informed choice when it comes to choosing the building materials that will have the least environmental impact over the full life of the building.

What is the current state of research on LCA of concrete?

The Massachusetts Institute of Technology Concrete Sustainability Hub was established in late 2009 to better understand the sustainable attributes of concrete and the areas where they can be improved and develop scientific breakthroughs at the atomic level to make cement and concrete even more sustainable into the future. The Hub is organized into three research platforms: Concrete Science, Building Technology, and Econometrics. More information on their current research projects can be found at: <http://web.mit.edu/cshub/>

About NRMCA

Founded in 1930, the National Ready Mixed Concrete Association is the leading industry advocate. Our mission is to provide exceptional value for our members by responsibly representing and serving the entire ready mixed concrete through leadership, promotion, education, and partnering to ensure ready mixed concrete is the building material of choice.

A model LCA bill is attached. This model could be used by NRMCA Affiliates, NRMCA members, or others interested in supporting sustainable green building practices. For additional information on

concrete's role in sustainability visit www.nrmca.org or contact Tiffany Reed-Villarreal, P.E., Director, Sustainability Codes and Standards at 817-771-3595 or reedvillarreal@nrmca.org.

NOTES: The following is a model life cycle assessment bill that supports the concept of a state or local jurisdiction adopting an option for life cycle assessment for purposes of minimizing the environmental impacts of buildings. This model law should be incorporated into an existing code or standard. This is simply one model. State or local legislatures would need to add particular clauses dealing with enforcement and administration, but this language could form the framework for a state or jurisdiction law.

STATE/CITY/JURISDICTION
OF _____ ACT NO.
XXX

AN ACT TO ADOPT LIFE CYCLE ASSESSMENT
FOR BUILDING CONSTRUCTION IN THE STATE/CITY/JURISDICTION OF

_____ DO ORDAIN AS FOLLOWS:

Section 1. Purpose

For the purpose of requiring certain non-residential buildings and certain multi-family residential buildings to achieve certain standards for energy efficiency and environmental design through life cycle assessment; requiring certain regulations to implement these requirements; defining certain terms; providing for a special effective date; and generally relating to the construction of buildings.

The use of life cycle assessment to measure environmental performance of buildings applied to the design and construction of buildings would achieve the following goals:

1. To encourage resource conservation;
2. To reduce the waste generated by construction projects;
3. To increase energy efficiency; and
4. To promote the health and productivity of residents, workers, and visitors to the State/City/Jurisdiction.

Section 2. Life Cycle Assessment

Definitions:

Life Cycle Assessment (LCA): Compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle.

Primary Energy: The total fuel-cycle energy embedded within building materials and all forms of energy required for building operation. Units of energy are reported in total Btu's for building materials and total Btu's per unit of energy consumed in the operation of building mechanical systems throughout a building's operation.

Applicability:

The provisions of this Act are applicable in all zoning designations throughout the state/city/jurisdiction, except they shall not apply in R1 and R2, to newly constructed buildings and to replacement or repair of greater than 50% by area of existing roofs after the effective date of this Act. The following are exempted from the requirements of this Act:

Requirements:

1. A LCA shall be performed in accordance with the ISO Standard 14044 as compared to a referenced building of a similar useable floor area, function and configuration that meets the minimum energy and

- structural requirements of the current version of the International Building Code [or currently adopted building code of this state/city/jurisdiction].
2. The building chosen for the project shall show a 10% improvement over the reference building assessed in the LCA in primary energy use and a minimum of two of the impact categories listed below:
 1. global warming potential (GWP)
 2. land use
 3. resource use
 4. climate change
 5. ozone layer depletion
 6. human health effects
 7. ecotoxicity
 8. acidification
 9. eutrophication
 3. The reference and project buildings shall utilize the same life cycle assessment tool.
 4. Building operational energy shall be included in the assessment.
 5. Building process loads shall be permitted to be included.
 6. The service life of the building shall not be less than 75 years and the building components shall meet the design life requirements in the table below.

Component	Design Service Life
Structural elements and concealed materials and assemblies	75
Materials and assemblies where replacement is cost prohibitive or impractical	75
Major materials and assemblies that are replaceable	40
Roof coverings	20
Mechanical, electrical, and plumbing equipment and systems	25
Site hardscape	30

7. The full life cycle, from resource extraction to demolition and disposal, including but not limited to, on-site construction, maintenance and replacement, and material and product embodied acquisition, process, and transportation energy, shall be assessed.
8. The complete building envelope, structural elements, inclusive of footings and foundations, and interior walls, floors, and ceilings, including interior and exterior finishes, shall be assessed to the extent that data is available for the materials being analyzed in the selected life cycle assessment tool.
9. Mechanical, electrical, and plumbing components and specialty items shall not be included in this calculation.
10. The LCA shall include the following four steps.
 1. Perform a life cycle inventory (LCI). The LCI accounts for all individual environmental flows to and from the material components in a building throughout its life cycle.
 2. The impact indicator method and impact categories used.
 3. The results of the LCA indicating a minimum of 10% improvement of the proposed building compared to the referenced building for a minimum of two impact categories and global warming potential, including an explanation of the rationale for the weighting and averaging of the impacts.
 4. Conduct a critical review by an external expert independent of those who performed the LCA.
11. The following information shall be reported to the Authority Having Jurisdiction (AHJ).
 1. The LCA Report
 2. The documentation of critical peer review by a third party including the results from the review and the reviewer's name and contact information.

Section 3. If any section, part of section, paragraph, clause, phrase or word of this Act is declared invalid, the remaining provisions of this Act shall not be affected.

Section 4. This Act shall become effective thirty (30) days after approval its adoption and signature of the Governor/Mayor/Council.

Signed