

NRMCA/State Affiliate Strategies for Leveraging MIT LCA Research Results

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Background:

The MIT Concrete Sustainability Hub is conducting research to determine the life cycle impact of concrete buildings and roadways. The proposed research seeks a quantitative approach to material flows, embodied and operational energies and life-cycle assessments that will allow the identification of the ecological and economical advantage of concrete compared to other materials for pavements and buildings. The focus of the proposed research is to develop a rigorous basis for identifying and quantifying the ecological and economic performance of concrete.

There are two main projects:

1) A life cycle assessment (LCA) of concrete buildings, including both embodied energy and operating energy: The thermal mass of concrete buildings can provide significant energy savings over building lifetimes. This study will carry out a life cycle assessment (LCA) of concrete buildings to quantify such savings for four representative North American climatic regions. As a basis of comparison, typical concrete building types will be analyzed together with steel and timber buildings for both residential and commercial construction, with an emphasis on concrete wall systems. Conventional studies have focused primarily on the embodied energy of concrete buildings and have neglected the potential savings in operating energy, which can lead to lower life cycle energy consumption. The life cycle assessment (LCA) methodology is used to identify both the life cycle environmental impacts, as well as the life cycle costs associated with these building technologies. This study is expected to deliver a new metric system (equivalent to “mileage of a building”) for the operating energy of buildings and to illustrate the role of concrete in the life cycle performance of the North American building stock.

The study will specifically consider the following:

- A variety of different concrete wall systems, including Insulated Concrete Forms (ICF), Concrete Masonry Units and Tilt-up;
- Thermal performance of concrete assemblies, using data from real buildings where possible;
- For the commercial segment, “small space” commercial buildings such as hotels, hospitals, and office buildings will be considered;
- The acoustical performance and indoor air quality will be compared across building types, with data from existing buildings;
- The heat island effect will be considered according to the reflectivity of different materials; and
- The LCA will consider both the sequestration potential of growing forests as well as the potential of CO₂ absorption in concrete.

2) A life cycle assessment (LCA) of concrete paving versus asphalt for highway construction:

Concrete pavements can offer reductions in environmental impact, transportation spending, and fossil fuel consumption. To quantify these potential savings, a life cycle assessment of concrete paving will be compared to asphalt highway construction. In particular, greenhouse gas emissions and embodied energy will be quantified per mile of highway. The “operating energy” of the highway can be determined according to the fuel efficiencies achieved by vehicles on different paving surfaces, and will consider both passenger vehicles as well as semi-trucks. The impact of maintenance work on traffic emissions will be considered as an additional input in the LCA, including both highway traffic and fuel requirements by

the construction crews. In addition, the reflectivity of the materials and their relative contributions to the heat island effect will be considered. As part of the LCA study, the source of required fossil fuels will be identified and quantified for both concrete and asphalt. Taken together, this will provide a new understanding of the life cycle costs and associated energy consumption for concrete pavement. The life cycle assessment (LCA) methodology provides a rigorous framework for quantifying both the economic costs and the cumulative environmental impacts; and should be helpful for decision makers to objectively decide on construction alternatives. The study will also try to evaluate the potential impact on the labor force of such alternatives, in order to obtain a holistic picture of the role of concrete in the US highway system.

The first phase of these research projects will be completed by August 31, 2009. In order to take advantage of the research results, both NRMCA and State Affiliates should consider working together to make concrete the sustainable design material of choice for government, design professionals, contractors, and students/professors through education, promotion, technical advancement and advocacy. This document outlines proposed goals, strategies and tactics for leveraging the MIT LCA research results in order to make concrete the material of choice for houses, commercial buildings, and roadways.

Goal:

Make concrete the sustainable design material of choice for government, design professionals, contractors, and students/professors through education, promotion, technical advancement and advocacy by leveraging the MIT LCA research results.

Strategy 1 – Education

Educate government officials, design professionals, contractors, and concrete industry professionals on the life cycle benefits of concrete based on MIT LCA research results

Tactics	Timeframe	Responsible
1.1. NRMCA: Develop and deliver an online course on life cycle assessment of concrete structures for <u>design professionals</u> (including MIT LCA research results). State Affiliate: Encourage design professionals in the state to attend the course.	September 2010, March 2011, twice annually	Ashley, Lemay, O’Neill
1.2. NRMCA: Develop and deliver an online course on life cycle assessment of concrete structures for concrete industry professionals (including MIT LCA research results). Offer State Affiliates deep discounts for staff and members. State Affiliate: Encourage state affiliate staff and member to attend the course.	September 2010, March 2011, twice annually	Ashley, Lemay, O’Neill
1.3. NRMCA: Develop and deliver a free webinar on leveraging MIT LCA research results to influence <u>design professionals</u> for concrete promoters. State Affiliate: Encourage state affiliate staff and members to attend the webinar.	February 2011, others as required	Ochsenreiter, Ashley, Lemay, Leininger, Carr-Smith

1.4. NRMCA: Develop and deliver a free webinar on leveraging MIT LCA research results to influence <u>government officials</u> to adopt LCA in state building codes for concrete promoters. State Affiliate: State affiliate staff and members to attend the webinar.	February 2011, others as required	Ochsenreiter, Ashley, Lemay, Leininger, Carr-Smith
1.5. NRMCA: Organize a Sustainability Summit at ConcreteWorks that includes all relevant NRMCA committees to discuss leveraging the MIT LCA research results. State Affiliate: State affiliate staff and members participate in Sustainability Summit.	October 2010, ongoing	Lemay, Sustainability Committee
1.6. NRMCA: Educate NRMCA state affiliates regarding opportunities and tools available from NRMCA to leverage MIT LCA research results at NRMCA regional work plan meetings. State Affiliate: Staff and members attend the NRMCA regional work plan meetings.	Ongoing	Garbini, Maher
1.7. NRMCA: Provide an engineering expert in LCA and sustainability to help state affiliates provide to educate <u>design professionals</u> on the life cycle benefits of concrete. State Affiliate: Provide an engineering expert in LCA and sustainability to provide education to <u>design professionals</u> (or utilize NRMCA staff as appropriate).	Ongoing	Lemay, Ashley
1.8. NRMCA: Develop PPT presentations and handout materials for education programs targeting <u>design professionals</u> and delivered by state affiliates. State Affiliate: Deliver education programs to <u>design professionals</u> .	March 2011	Lemay, Ashley

Strategy 2 – Promotion

Develop promotion tools for members and state affiliate promoters that promote the life cycle benefits of concrete based on MIT LCA research results

Tactics	Timeframe	Responsible
2.1. NRMCA: Develop a PowerPoint presentation highlighting the life cycle benefits of concrete building targeting <u>design professionals</u> . State Affiliate: Deliver presentations to <u>design professionals</u> highlighting the life cycle benefits of concrete buildings.	April 2011	O’Neill, Lemay and Ashley
2.2. NRMCA: Develop a PowerPoint presentation highlighting the life cycle benefits of concrete roadways targeting <u>design professionals</u> . State Affiliate: Deliver presentations to <u>design professionals</u> highlighting the life cycle benefits of concrete roadways.	April 2011	O’Neill, Lemay and Ashley

2.3. NRMCA: Develop a PowerPoint presentation highlighting the life cycle benefits of concrete building targeting <u>government officials</u> . State Affiliate: Deliver presentations to <u>government officials</u> highlighting the life cycle benefits of concrete buildings.	April 2011	O'Neill, Lemay and Ashley
2.4. NRMCA: Develop a PowerPoint presentation highlighting the life cycle benefits of concrete roadways targeting <u>government officials</u> . State Affiliate: Deliver presentations to <u>government officials</u> highlighting the life cycle benefits of concrete roadways.	April 2011	O'Neill, Lemay and Ashley
2.5. NRMCA: Deliver presentations via a dedicated web page at www.concretepromotion.org . State Affiliate: View and download promotion tools from www.concretepromotion.org .	February 2011	Lemay, Ochsenreiter

Strategy 3 – Technical Advancement

Disseminate MIT LCA research results for to design professionals and academics.

Tactics	Timeframe	Responsible
3.1. NRMCA: Publish a Concrete Sustainability Report article on the life cycle benefits of concrete buildings targeting <u>design professionals</u> . State Affiliate: Distribute Concrete Sustainability Reports on life cycle benefits of concrete buildings to <u>design professionals</u> .	May 2011	Ashley
3.2. NRMCA: Publish a Concrete Sustainability Report article on the life cycle benefits of concrete roadways targeting <u>design professionals</u> . State Affiliates: Distribute Concrete Sustainability Reports on life cycle benefits of concrete roadways to <u>design professionals</u> .	February 2011	Lemay
3.3. NRMCA: Publish a web page dedicated to disseminating information on the life cycle benefits of concrete State Affiliate: Direct <u>design professionals</u> to the web site.	March 2011	Lemay, Ashley, etc.
3.4. NRMCA: Publish a database of life cycle assessment (and general sustainability) papers and reports for access on the web for use by <u>design professionals</u> and <u>researchers</u> . State Affiliate: Direct <u>design professionals</u> and <u>researchers</u> to the web site.	August 2011	Lemay, Ashley, etc.

Strategy 4 – Advocacy

Develop tools and programs to assist state affiliates modify state and local laws that would leverage the life cycle benefits of concrete based on MIT LCA research results.

Tactics	Timeframe	Responsible
<p>4.1. NRMCA: Where appropriate, incorporate LCA into national building codes and standards (IgCC, LEED). State Affiliate: Encourage <u>state and local governments</u> to adopt the latest model building codes that incorporate LCA.</p>	Ongoing	Ashley, Lemay, etc.
<p>4.2. NRMCA: Develop proposed changes to state and local building codes to adopt LCA, high albedo pavements, pervious pavements, energy efficiency, etc. State Affiliate: Lobby <u>state and local governments</u> to adopt changes to building codes.</p>	Ongoing	Leininger, Walgenbach, Ashley, Lemay
<p>4.3. NRMCA: Provide technical support in the form of a building code expert to assist state affiliates with building codes changes favoring LCA and other sustainable practices at the <u>state and local government</u> level. State Affiliate: Utilize the services of NRMCA building code expert to prepare proposed changes to building codes at the <u>state and local government</u> level favoring LCA and other sustainable practices.</p>	Ongoing	Lemay, Ashley
<p>4.4. NRMCA: Develop template letters targeting <u>state and local government</u> officials for NRMCA members and state affiliates supporting LCA in building codes and road building standards. State Affiliate: Encourage members to write and meet with <u>state and local government</u> officials to support LCA in the building codes and road building standards.</p>	Ongoing	Leininger, Walgenbach
<p>4.5. NRMCA: Develop concrete industry position statements on LCA, sustainability and the building codes targeting <u>state and local government</u> officials. State Affiliate: Distribute concrete industry position statements on LCA, sustainability and the building codes to <u>state and local government</u> officials.</p>	March 2011	Leininger, Walgenbach
<p>4.6. NRMCA: Develop a briefing document that explains the life cycle benefits of concrete targeting <u>state and local government</u> officials. State Affiliate: Distribute a briefing document that explains the life cycle benefits of concrete to <u>state and local government</u> officials.</p>	March 2011	Leininger, Walgenbach