



environmental design + construction

Objective: Net-Zero Energy

MAKING HIGH-PERFORMANCE BUILDINGS A REALITY WITH SUSTAINABLE CONSTRUCTION MATERIALS.

By Kevin Cail and Constant van Aerschot



NEWCEM SLAG CEMENT IN THE CONCRETE OF THE TWO LIBERTY CENTER OFFICE BUILDING (ARLINGTON, VA.) IMPROVES EFFICIENCY AND BUILDING PERFORMANCE.

Detailed analysis shows that building energy efficiency is one of the most cost-effective ways to achieve needed energy reductions and that there is a path to achieving net-zero energy high-performance buildings. Although the knowledge and technology available today could achieve

- THE EEB PROJECT AIMS TO TRANSFORM THE WAY BUILDINGS ARE CONCEIVED, CONSTRUCTED, OPERATED AND DISMANTLED IN AN EFFORT TO
- ACHIEVE ENERGY SELF-SUFFICIENCY IN BUILDINGS BY 2050.

dramatic reductions in building energy consumption, barriers are preventing the progress that is

both necessary and possible. Under the auspices of the World Business Council for



THE LEED GOLD VANCOUVER OLYMPIC VILLAGE USED LAFARGE'S FLY ASH IN THE CONCRETE TO HELP IT ACHIEVE HIGH STANDARDS OF ENVIRONMENTAL DESIGN.

Sustainable Development, leading companies in the construction and energy industries launched the Energy Efficiency in Buildings (EEB) project in 2006 to identify ways to remove these barriers. The EEB project aims to transform the way buildings are conceived, constructed, operated and dismantled in an effort to achieve energy self-sufficiency in buildings by 2050. Its primary goal is to map out the necessary market transformation in which buildings consume net-zero energy. In other words, that the energy consumed by a building is equal to or less than the energy it produces.

Working in collaboration with architects, engineers, builders, regulators, suppliers, utilities and developers, the EEB initiative looked at all

aspects along the life cycle of new and existing buildings in an effort to promote a more-sustainable approach to construction. However, such profound change can only be achieved through a detailed understanding of the complex factors that determine energy use in buildings. As such, the EEB project established a four-step process on how to transform the building industry:

- 1 Gather key facts and trends;
- 2 Identify what needs to change at each stage of the value chain;
- 3 Develop a road map; and
- 4 Deliver a call for action to achieve a world where buildings consume net-zero energy.

In 2007, the EEB project published “Energy Efficiency in Buildings: Business Realities and Opportunities.” This first report established a baseline of current facts and trends for use in assessing and prioritizing the needed actions for change. A key finding was that building professionals misjudge the cost and benefits of energy-efficient buildings. They seriously overestimate the cost of achieving energy efficiency and underestimate the building’s contribution to greenhouse gas emissions.

Based on existing research and stakeholder dialogues during workshops and forums, along with a breakthrough study that measured perceptions, the report concluded that there was a clear lack of leadership, information and know-how on energy-efficient buildings. Significant progress will depend on people being aware of the importance of the issue and then being able and willing to act on it.

Overcoming the Barriers

Progress can begin immediately because knowledge and technology exist to slash energy usage while improving comfort levels. Behavioral, organizational and financial barriers stand in the way of immediate action. Three approaches can help overcome these barriers:

- *A holistic design approach* — to encourage interdependence and shared responsibility among the many players in the building value chain early in the design process to optimize the building’s performance rather than single components only.
- *The right financial mechanisms and relationships* — to make energy more valued by those involved in the development, operation and use of buildings.
- *Behavioral changes as part of wider social development* — to achieve action on energy efficiency by building professionals and building users.

These business levers, supported by an appropriate policy framework, can change perceptions on the value and urgency for energy efficiency in buildings.

Transforming the Market

To achieve an energy-efficient world, it is clear that barriers must be overcome for individuals, governments and businesses to aggressively adopt energy-saving measures. Based on extensive research over four years, the EEB project developed recommendations and an actionable road map to transform the building sector. The report “Transforming the Market: Energy Efficiency in Buildings” was released in 2009.

The EEB project’s modeling and analysis clearly shows the scale of the challenge and the impossibility of meeting the target at current rates of progress. The necessary transformation requires immediate and substantive action. Enormous energy savings are possible, but current policies, financial instruments and behaviors will not provoke the necessary decisions by businesses and individuals. Businesses will make progress but not the necessary transformation without stronger market signals and regulatory change.

Road Map for Change

The project’s report proposes six actions to stimulate the demand for energy efficiency:

- Strengthen building codes and energy labeling for increased transparency;
- Use subsidies and price signals to incentivize energy-efficient investments;
- Encourage integrated design approaches and innovations;
- Develop and use advanced technology to enable energy-saving behavior;
- Develop workforce capacity for energy saving; and
- Mobilize for an energy-aware culture.

CONCRETE: PARTNERSHIPS FOR SUSTAINABLE CONSTRUCTION

Due to many of its desirable environmental and performance qualities, concrete has several attributes that help it meet the needs of sustainable construction. A natural, inert material, concrete can be produced from recycled materials, is 100 percent recyclable and is often produced locally, resulting in limited greenhouse gas emissions from transport. Beyond these qualities, the building’s life-cycle analysis makes concrete a responsible choice for sustainable development.

Reinforcing Energy Efficiency


Concrete’s exceptional thermal inertia properties enable it to absorb heat during the day, store it, and release it at night, making for substantial savings in terms of heating and air conditioning. In addition, as concrete is a highly resistant and airtight material, it can be used with other materials to provide optimum insulation. It also enables compact buildings for denser and more environmentally friendly towns.

Innovation and Collaboration Are Key

The use of other supplementary cementitious materials and high-performance blended cements, such as NewCem slag cements, are contributing a sustainable component to other LEED-certified buildings throughout the country.

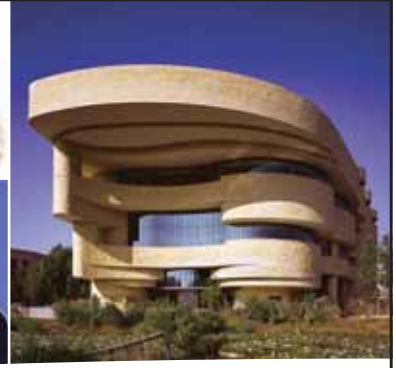
Meeting the challenges of sustainable construction in the 21st century requires a collaborative response to improve the design, construction, operation and recycling of buildings. In this context, Lafarge has collaborated with leading architects to promote sustainable construction methods. One such partnership with Jacques Ferrier led to the development of the “Hypergreen” concept. This multiuse tower building, designed for the world’s megacities, is highly energy efficient due to the use of the latest construction practices and technologies.

Energy efficiency can also be considerably improved by eliminating thermal bridges at the junction of two walls or between two materials with different thermal resistance or conductivity. To counteract this phenomenon, Lafarge has partnered with others in the industry to develop a thermal solution based on ultrahigh-performance concrete and insulation, which enables a reduction of up to 70 percent of thermal bridges.

This call to action is at the core to substantially reducing energy consumption and carbon emissions. Based on these recommendations, transformation will require integrated actions across the industry, from developers and building owners to governments and policymakers. For a more complete, detailed road map on the EEB project’s proposed market response, supplemented by government action, visit www.wbcscd.org. 

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Sustainability by Lafarge



As a world leader in building materials, Lafarge has promoted sustainable construction and energy efficiency for years. We devote more than 50 percent of our R&D investments to sustainable construction.

Our research center - the world's first laboratory for building materials - works to improve existing products and develop new products that are even more effective and environment friendly.

In collaboration with leading universities, research centers, and industry and environmental organizations, Lafarge people are striving to make sustainable construction a reality. Together, we can make a difference.

To learn more about the complete line of Lafarge cements, visit us at www.lafarge-na.com



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