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Brian Smith, CEO
Ecolite Concrete USA, Inc.
2091 Las Palmas Drive, #E
Carlsbad, CA 92011

September 1, 2006

Subject: **Environmental Sustainability of Ecolite Concrete Walls**

Dear Mr. Smith,

This letter is in response to your request for an assessment of Ecolite Concrete walls for use in environmentally sustainable construction. The North American construction industry has not yet developed standards that could enable us to definitively rate the environmental sustainability of a wall system or directly compare one wall system to another. Instead, each construction project requires a thoughtful analysis of all the factors that affect the environmental impact of the proposed materials and building system.

With that in mind, I offer the following comments identifying factors that a designer or builder may consider when evaluating the environmental impacts of your products:

PART ONE – LIFE CYCLE CONSIDERATIONS

MANUFACTURE

Raw Materials: Ecolite walls are produced with a relatively small number of raw materials. The environmental impacts associated with these materials are fairly well understood. They are listed below in order according to the approximate weight of each ingredient or component in your wall system:

1. Fly Ash: Fly ash is a pre-consumer (post-industrial) waste product of coal-fired electric power generation. Finding commercial usage of the material reduces the amount that must be disposed of in landfill. It can be sourced locally in most of the country and can be shipped via rail – a means of transportation with relatively low environmental impact – to other areas.

2. Portland Cement: Production of portland cement is an energy intensive process. While the environmental impact of the energy production is beyond the scope of this topic, it should be noted that the cement industry is improving its overall performance in this regard. However, portland cement's energy use is implicated as a major source of carbon dioxide, a greenhouse gas.

   I have attached a spreadsheet comparing the quantity of cement in your product with that in standard concrete. The results show that 2 inches of cellular concrete in an Ecolite wall uses less portland cement than does 4 inches of conventional concrete. This indicates that Ecolite walls are associated with a lower level of CO_2 than that associated with most existing forms of concrete walls.

Portland cement can be sourced locally in most of the country and is shipped by rail or barge to the rest of the country.

3. Water: Most of the water used in your process is incorporated directly into the product for cement hydration. The remaining water is used to clean casting beds or tables and equipment and is not a significant quantity. The small quantity of run-off can be collected on site for evaporation with any residues disposed of in accordance with local regulations.

4. Steel: The North American steel industry's output has an average of 25% recycled content; foreign sources may have lower recycled content. Individual mills can provide much higher levels of recycled content; sheet steel produced with the electric arc furnace process can contain almost 100% recycled content. Steel can be endlessly recycled without loss of its structural value and with relatively low energy inputs; the industry estimates that 64 percent of scrap and waste steel is recycled.

   When steel with high recycled content is specified, Ecolite should be able to demonstrate the chain of custody for the material from the mill to the project walls.

   Environmental impacts of steel utilization include the energy consumed and pollution produced during extraction of raw materials, refining, and production into sheet. Steel production is increasingly regional due to the growing use of mini-mills using recycled materials. However, most steel is still transported by sea, train or truck and you should consider the energy and pollution impacts associated with your purchasing decisions. It is our understanding that you will be purchasing pre-slit coil and using automated roll-forming equipment; this will minimize scrap associated with your operations. A ready market exists to buy back any scrap materials that are produced during Ecolite fabrication.

5. Foaming Agent: It is our understanding that the primary components in the foaming agent are agricultural by-products.

6. Zinc (Galvanized Coating): While the recycled content of is low, the coating accounts for only 3 percent of the weight of galvanized steel. Environmental impacts of zinc utilization include the energy consumed and pollution produced during extraction of raw materials, refining, ingot production, and hot dip galvanizing.

7. Admixtures: Admixtures used are common products in the concrete industry; no adverse consequences have been identified.

8. Form Release Compounds: Bio-based release agents are available and should be considered for your operations instead of petroleum-based products to avoid pollution associated with VOCs, overspray, and run-off.

The environmental impact of related materials, such as finishes and joint sealants, should be considered on a project-by-project basis.

Manufacturing Energy Usage: The energy used in your process consists primarily of electrical power used for material handling, roll-forming, and concrete mixers and pumps. High-efficiency motors should be used where practical. In most parts of the country, no energy is required for curing; cold regions may require space heating. Ecolite should consider purchasing power from renewable sources and operating during off-peak hours of power demand.

The other primary energy requirement for manufacturing is fuel for fork-lifts and trucks. Equipment should be selected, operated and maintained with consideration for fuel economy and pollution reduction.

Manufacturing Waste or Pollutants: The Ecolite process produces very little waste or pollution. Materials are produced only as required and in the sizes and quantities required and do not produce significant pollutants. Care should be exercised to control nuisance dust from handling powered cement and fly ash or from cutting operations.

Packaging: Ecolite walls will typically be transported on slanted easels or stacked with finished faces against finished faces; packaging materials will be minimal to protect against abrasion of finished surfaces. Packing materials should either be returned to factory for future reuse or should be of type compatible with project waste recycling system. If shipments require wrapping, reusable tarps should be used in lieu of single use wrapping materials.

Other Environmental Considerations: Ecolite should exercise best industry environmental practices with regards to operations of its offices and facilities, recycling of scrap and packaging, travel, and other aspects of its business.

DESIGN AND CONSTRUCTION

Structural Economy: The relative light weight of Ecolite walls reduces the dead loads imposed by the system upon the superstructure and foundations; this may reduce the quantity of structural material required for the project.

Delivery, Storage, Handling: In general, transportation and handling energy and environmental impacts associated with Ecolite are minimized in comparison with other concrete products due to the relatively light weight of the Ecolite products. Unusual sizes and shapes of wall panels, however, may limit the number of panels that can be loaded on a truck and reduce transportation efficiency. Transportation impact also depends on the distance from the point of manufacture to the point of installation; when required, walls can be produced on or near a site. Under most circumstances, materials can be stored outdoors and installed in non-conditioned spaces.

On-Site Waste: Due to prefabrication, installation of Ecolite walls produces an insignificant amount of construction waste.

OCCUPANCY

Energy: Ecolite walls have been tested with a gypsum board interior finish and found to provide R=4 thermal insulation. While the thermal insulation of Ecolite concrete is modest in comparison with insulation materials, its cellular concrete is superior to many other wall cladding materials in this regard. The cellular concrete also provides a modest thermal inertia effect that can be used to mitigate against wide swings in temperature. In tests performed to date, the product does not appear prone to interior condensation. The stud cavity provides depth for the installation of additional insulation materials.

Maintenance: The concrete and the galvanized steel used in Ecolite walls should be maintenance free unless damaged or abused. The only identified maintenance-related environmental impacts have to do with maintenance of finishes and joint sealants.

Durability: The product is predicted to have exceptional durability – a fundamental consideration in environmental life-cycle assessment. It is resistant to decay, corrosion, mold and fungus, vermin, fire, and deterioration.

DECOMMISIONING

Recovery for Reuse on Other Projects: Prefabricated Ecolite walls can be disassembled for transport to and use on another project. When this is anticipated, installation details and methods should be used that will facilitate future disassembly.

Demolition, Debris Separation, and Recycling: While the cellular concrete and steel in an Ecolite wall appear able to cling together tenaciously during ordinary construction use, they can be readily separated during demotion activities using either manual method such as sledge hammering and prying or by rough handling with demolition equipment. A ready market exists for the steel components. The crushed cellular concrete is of low value but should be adequate for many types of engineered-base material or as a lightweight filler in concrete and other materials.

PART TWO – LEED ASSESSMENT

Ecolite walls can also be used to help qualify a project for the following perquisites and credits under the US Green Building Council's Leadership in Energy and Environmental Design (LEED) program. The following credits are discussed with reference to LEED Version NC 2.2:

<u>EA Prerequisite 1 and Credit 2 - Energy Performance</u>:

R-Value: Cellular concrete has better thermal resistance than many types of wall cladding. Additional insulation materials can be installed within the stud spaces.

Air Infiltration: Ecolite wall sections are monolithic and have minimal or no cracks. More, they can be prefabricated into very large sections that further reduce the quantity of joints compared to other types of construction. These factors can minimize air infiltration through the wall.

Thermal Mass: The thermal mass of Ecolite concrete can be used to reduce temperature fluctuations.

MR Credits 2.1 and 2.2 – Construction Waste Management: Ecolite members are prefabricated to minimize jobsite waste. Waste, if any, will generally be limited to walls that are damaged beyond repair during construction and to cuts made to accommodate field conditions that were not included in the prefabrication design.

MR Credits 4.1 and 4.2 - Recycled Content: Ecolite concrete contains up to 50 percent fly ash recycled from pre-consumer sources. Steel for framing members and expanded metal lath can contain high levels of recycled content from pre- and post-consumer sources.

MR Credits 5.1 and 5.2 – Regional Materials: Ecolite walls can help qualify for these credits if they are fabricated close to the project location using raw materials from local sources.

Ecolite concrete may also contribute to LEED Innovation credits.

SUMMARY

Ecolite walls appear to be a viable solution for sustainable construction. Their design, manufacture, and life-cycle performance appear to be consistent with the dictum, “Do More with Less” and to advance the state-of-the-art of “green” construction.

With this in mind, Ecolite’s suitability for particular projects must still be assessed and compared, when appropriate, to other viable wall systems. Design drawings and specifications must indicate the parameters that are important to the unique environmental goals of the project.

Please feel free to contact me if I can be of further assistance.

Cordially,

Michael Chusid

Michael Chusid, RA, FCSI, CCS
Principal

Attachment: Spreadsheet

Carbon Dioxide Emissions Associated with Conventional and Ecolite Concretes

Type of Concrete Wall	Conventional	Ecolite
Aggregate, by volume	67%	0%
Water, by volume	16%	20%
Air, by volume	6%	40%
Cementitious materials, by volume	11%	40%
PC as percent of cementitious materials	100%	50%
PC as percent of concrete, by volume	11%	20%
Thickness of Concrete, Inches	4	2
PC Content "Index"	0.44	0.40
Portland Cement in Ecolite / Portland Cement in Conventional Concrete Wall		91%
Reduction in CO2 emissions with Ecolite instead of conventional concrete walls.		9%

Illustration below, from Portland Cement Association, shows typical ingredients of regular concrete by volume.