Structural Contributions to LEED®

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As owners and developers become more energy and environmentally conscious, design teams are required to carefully implement sustainable design principles. The building's structure has a significant impact on the building's embodied energy and the ability to achieve LEED® points. Embodied energy is defined as the available energy used in the work of constructing a building. A knowledgeable LEED AP structural engineer on your project can assist with sound sustainable design principles that can significantly reduce the building's embodied energy.

The four most common structural materials are steel, concrete, masonry and wood. Each material has a unique set of attributes and properties. Structural engineers should be careful when specifying the structural components of a building in order to capture all of the available LEED points and minimize the building's embodied energy. Here are a few ways the structural engineer can help achieve LEED points.

Steel

- Materials and Resources credit 1 (MR 1) – Existing steel frame structures are easily reinforced so the original structure can be reused.
- Credit MR 2 and MR 3 – Steel is the most recycled material in the world. Virtually any steel on a construction site can be recycled or re-fabricated and reused.
- Credit MR 4.1 and MR4.2 – Most structural steel shapes are made from 97% recycled material. Recycled content in steel plate is about 65%. HSS sections are typically not made with recycled steel and should be avoided on LEED projects. The Steel Recycling Institute reports the post-consumer recycled content is about 64% and post-industrial recycled content is about 30%.
- Credit MR 5 – Steel is usually manufactured locally but locally, extracted materials are not always available.

Concrete

- Credit MR 1 – Existing concrete buildings are often reinforced and reused.
- Credit MR 2 – Concrete can be crushed and reused as fill material. Steel rebar can be recycled.
- Credit MR 4.1 and MR4.2 – Rebar is made with recycled steel. Cement increases CO_2 emissions. Pozzolans such as fly ash (High Volume Fly Ash Concrete – HVFA) and ground granulated blast furnace slag can reduce the cement content by more than 50%.
- Credit MR 5 – Locally manufactured and extracted materials are commonly available.

Masonry

- Sustainable Sites credit 6 and 7 (SS 6 and SS 7) – Permeable concrete or masonry pavements, or open cell concrete masonry pavers, can improve stormwater management and reduce non-roof heat island effects.
- Credit MR 1 – Existing masonry buildings are often reinforced and reused.
- Credit MR 2 – Masonry can be crushed and reused as fill material. Steel rebar can be recycled.
- Credit MR 4.1 and MR 4.2 – Rebar is made with recycled steel. Concrete masonry units and grout can be made with HVFA. Clay brick is often made with recycled brick, ground and used as grog. The grog can qualify as post-consumer recycled content. Other common recycled content in masonry is bottom ash, fly ash, sludge, and even contaminated soil.
- Credit MR 5 – Locally manufactured and extracted materials are commonly available.

Wood

- Credit MR 2 – Wood is easily recyclable and reused.
- Credit MR 5 – Locally manufactured and extracted materials can be available for some projects.
- Credit MR 6 – Wood is an entirely renewable material.
- Credit MR 7 – Sustainable material suppliers with FSC-certified wood products are readily available.
- Indoor Environmental Quality credit 4 (EQ 4) – Specify adhesives used in composite wood, engineered lumber, and agrifiber to comply with South Coast Rule #1168 and Green Seal GS-36. Also specify the material to not contain added urea-formaldehyde resins.

The building's structure has a significant impact on the building's embodied energy and the ability to achieve LEED points. An astute LEED AP structural engineer is a valuable design team member to help implement sustainable design principles.▪

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