

# SUSTAINABILITY IN INTERIOR ENVIRONMENTS



. LEED Building Credits

. Embodied Energy

. Sustainable Mechanical/Electrical/Plumbing Systems



# LEED ENERGY CREDITS

- **Leadership in Energy and the Environment Design**

- LEED is the most used green building rating system in the world.
- It provides a “framework” for creating healthy, highly efficient, and cost saving green buildings.
- LEED works for all building types anywhere.
- These buildings save energy, water, and resources.
- LEED building also generate less waste and support human health.
- They can also attract more customers, cost less to operate, and boost employment.

- **Requirements to be a LEED certified building**

- Step 1: Register the project
- Step 2: Provide data and receive a Performance Score of at least 4.0
- Step 3: Complete all prerequisites
- Prerequisites:
  - Input data in five categories: energy, water, waste, transportation, and human experience

- **Ways to ensure this project could be LEED certified**

- Reusing the materials that are already in the building
- Making sure the water and waste are handled in a green way.
- Cutting some of the transportation of materials from other places by using the local market to find materials.

## LEED Credit Categories



## LEED CERTIFICATION REQUIREMENTS

In order to achieve LEED certification, projects must earn points in these categories:

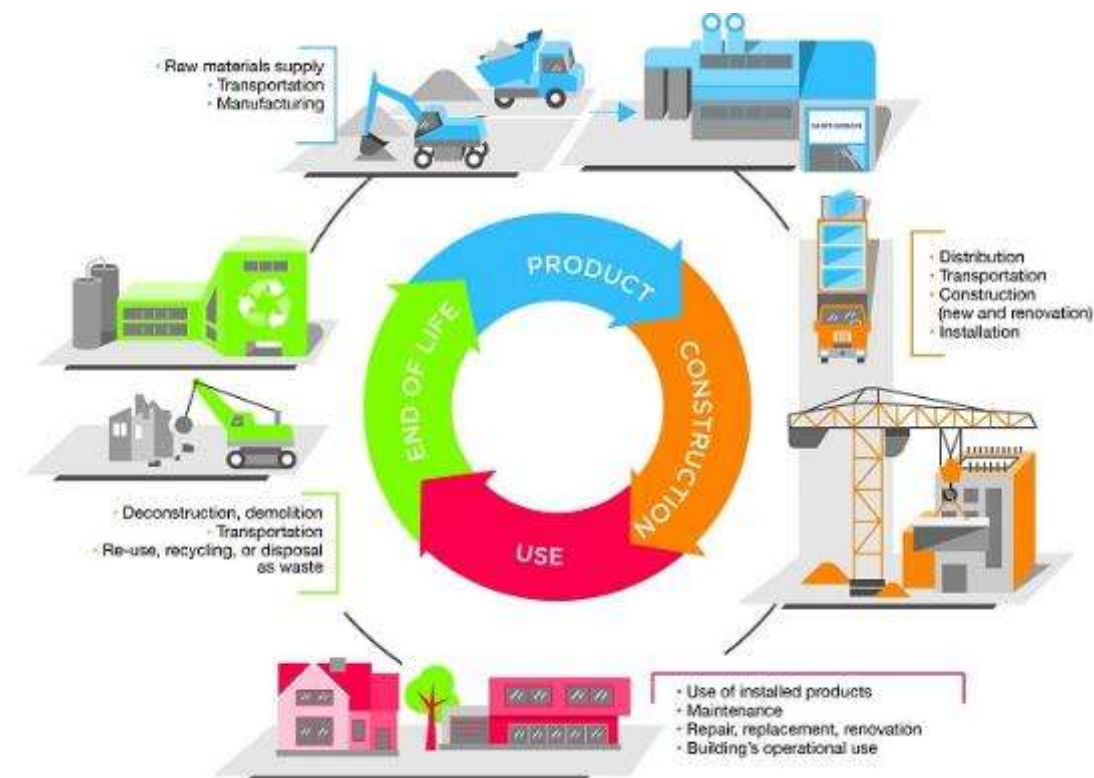


Source: [www.usgbc.org](http://www.usgbc.org)



# EMBODIED ENERGY

- The total energy used by all of the processes related to the production of a building
- Processes include extraction and processing of natural resources, manufacturing, transport, and product delivery
- Does not include the operation and disposal of the building, which would be part of the building's life cycle
- **Types of Embodied Energy**
  - Initial Embodied Energy: the nonrenewable energy used in the purchase of raw materials, their processing, manufacturing, transportation to site, and construction. It has 2 elements:
    - Direct Energy: energy used to transport building products to the site, and then to construct the building
    - Indirect Energy: energy used to acquire, process, and manufacture the building materials, including any transportation related to these activities
  - Recurring Embodied Energy: the nonrenewable energy consumed to maintain, repair, restore, refurbish or replace materials, components, or systems during the life of the building
- **Gross Energy Requirement (GER) is a measure of the true embodied energy of a material.**
  - Energy used to transport materials and workers to building site
  - All materials used to complete the building
    - Bathroom/kitchen fittings, driveways, outdoor paving
  - Upstream energy input in making the materials
    - Energy used making/maintaining machines that make the materials
  - Embodied energy of urban infrastructure
    - Roads, drains, water, energy supply
- **Factors Affecting Embodied Energy**
  - Different products and materials used
  - Efficiency of the individual manufacturing process
  - Fuels used in the manufacture of materials
  - Distances materials are transported
  - Amount of recycled product used
- **Reducing Embodied Energy**
  - Use current structure instead of demolishing and starting over
  - Design a long life, durable, and adaptable building
  - Recycle materials that cannot be used from existing building



# SUSTAINABLE MECHANICAL/ELECTRICAL/PLUMBING

## Appliances → Energy Star:

- Energy Star is a labeling program managed by the U.S. EPA
  - Recognizes most eco-friendly products for humans to use for the environment
  - Labeled items save the user money and extends the life of the product
  - Catered to those who use and abundance of appliances for long periods of time (restaurant owners)
- **Energy Star approved kitchen appliances**
  - Refrigerator/Freezer
    - Improved insulation through high-efficiency compressors, coil design and lighting
    - Energy Star Refrigerators/Freezers save \$90 for electricity annually & \$2,000-\$4,3000 over the products lifetime
  - Ice Makers
    - Batch style → 23% more water efficient (uses large amounts of water rather than a little at a time)
    - High efficiency water pumps, air cooling and compressors to help cool
    - Save 125% electric annually & \$1,300 over the product's lifetime
  - Dishwashers
    - Hold more dishes and use less water
    - Extremely high temperatures to sanitize faster, making the cycle quicker
    - Cut down on "run" time
    - Save over 150,000 gallons of water annually

## Plumbing

- Keep grease traps up to date and clear → avoids backup in pipes, resulting in wasteful water
- Apply leak detectors to all faucets
- Fuel-efficient/low-flow toilets

## Lighting

- Motion censored lights in bathrooms, freezers, areas that are not used often
- Use LED bulbs in areas where light is
- Suggested to have reading areas near large windows so natural light can make up for where artificial light might be needed

