

# Civil Engineering and Sustainable Materials

## Concrete

### STRENGTHS

- Concrete is sustainable due to its low maintenance requirements and durability.
- It is a mixture of both organic and manmade materials such as cement mix and other materials.
- Green materials used in the production of concrete will lower the greenhouse gases (GHG) emitted by the resource and use less energy.

### WEAKNESSES

- Concrete industries often fail to mention the impact of its CO<sub>2</sub> and other greenhouse gas emissions on the environment.
- The dwindling supply of limestone used in the mixing of cement has also affected the sustainability of concrete.
- If the geographical supply of good quality limestone continues to decrease in a region, the employment rate in the fields associated with concrete construction will also decrease.



## Steel

### STRENGTHS

- Structural steel has an average recycled content of 93.3%, the highest of any building framing material, and a recycling rate of 98%—also the highest of any building framing material.
- Has a high strength-to-weight ratio compared with other framing materials.
- Other products can only be recycled into a lower-quality product (downcycled), steel can be recycled over and over again (multicycled) and remade into new members without any loss of quality.

### WEAKNESSES

- Steel is marketed as a recyclable resource with less of an impact on the environment than concrete but constructional engineers must still consider the use of the materials design quality and the carbon footprint (CO<sub>2</sub> emissions) it leaves due to its electricity usage, according to a study conducted by the Leadership in and Environmental Design (LEED).



## Wood

### STRENGTH

- According to the scientific journal of "Structural Wood Research Needs", "Wood is a major renewable resource in the United States. It accounts for more than 25% of the value among the major industrial raw materials and over 13 billion cu ft. of wood is consumed annually by the various segments of the industry."
- The renewability of wood is akin to the recyclability of steel and concrete; it can be easily replenished if its resources are preserved.
- Its annual production exceeds the weight for all other materials used in construction each year and most of this resource appears in the form of plywood and timber.
- Wood constructs are often versatile, durable, and effective materials used in the construction and insulation of buildings. Its organic nature also makes it an effective green material in the construction industry.

### WEAKNESSES

- Wood receives considerably less attention in the engineering and construction sciences than other non-renewable resources.
- Over foresting and the transition from durable raw materials to younger grown commercial species and their byproducts also present a challenge to engineers who seek to use wood as sustainable resource.



Dikerius Blevins

