

**4.461: Building
Technology 1**

FALL TERM 2004

SCHOOL OF ARCHITECTURE AND PLANNING: MIT

Professor John E. Fernandez

Sustainable Design

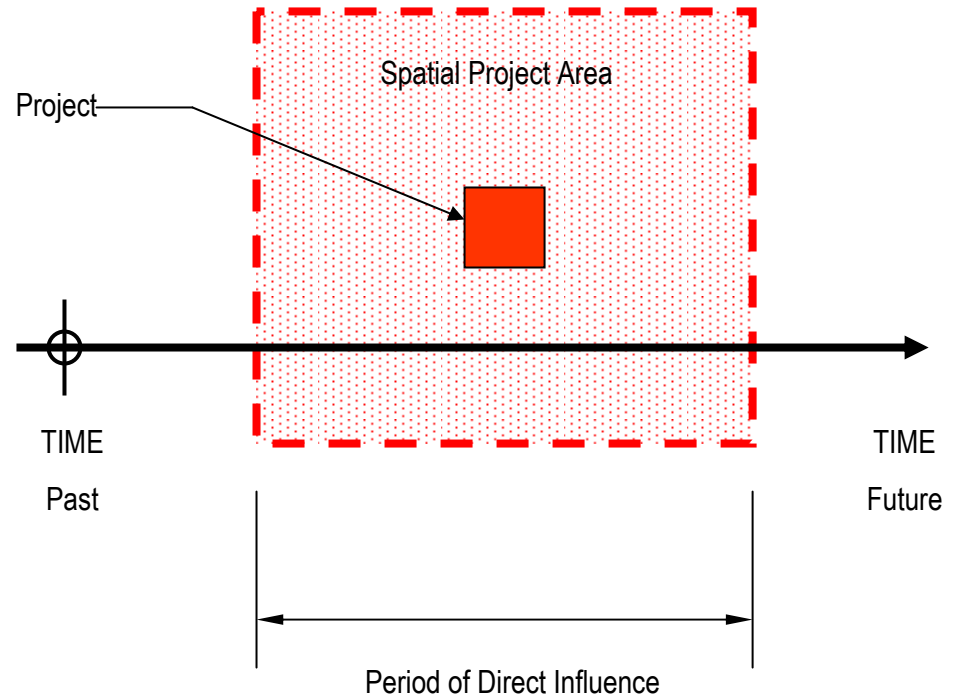
Part I: Sustainable Design

Part II: Case Study

Part III: Architecture

Part I: Sustainable Design

- **Context: Space and Time**
Boundaries are drawn such that one captures adequate time and space to allow for a net positive effect from the process and product of the built project.
- **Priority: Dual Beneficiaries**
Design within these time and space boundaries fulfills the needs of both the present and future generations.



Part I: Sustainable Design

Context

Space

Sustainable design requires a reconsideration of the spatial boundaries (and scales) that one addresses in assessing the impact of the work. Consideration is given to the ecology and environment of each:

- Global
- Regional
- Urban
- Building



Image courtesy of NASA



Image courtesy of MassGIS.

Part I: Sustainable Design

Context

Time

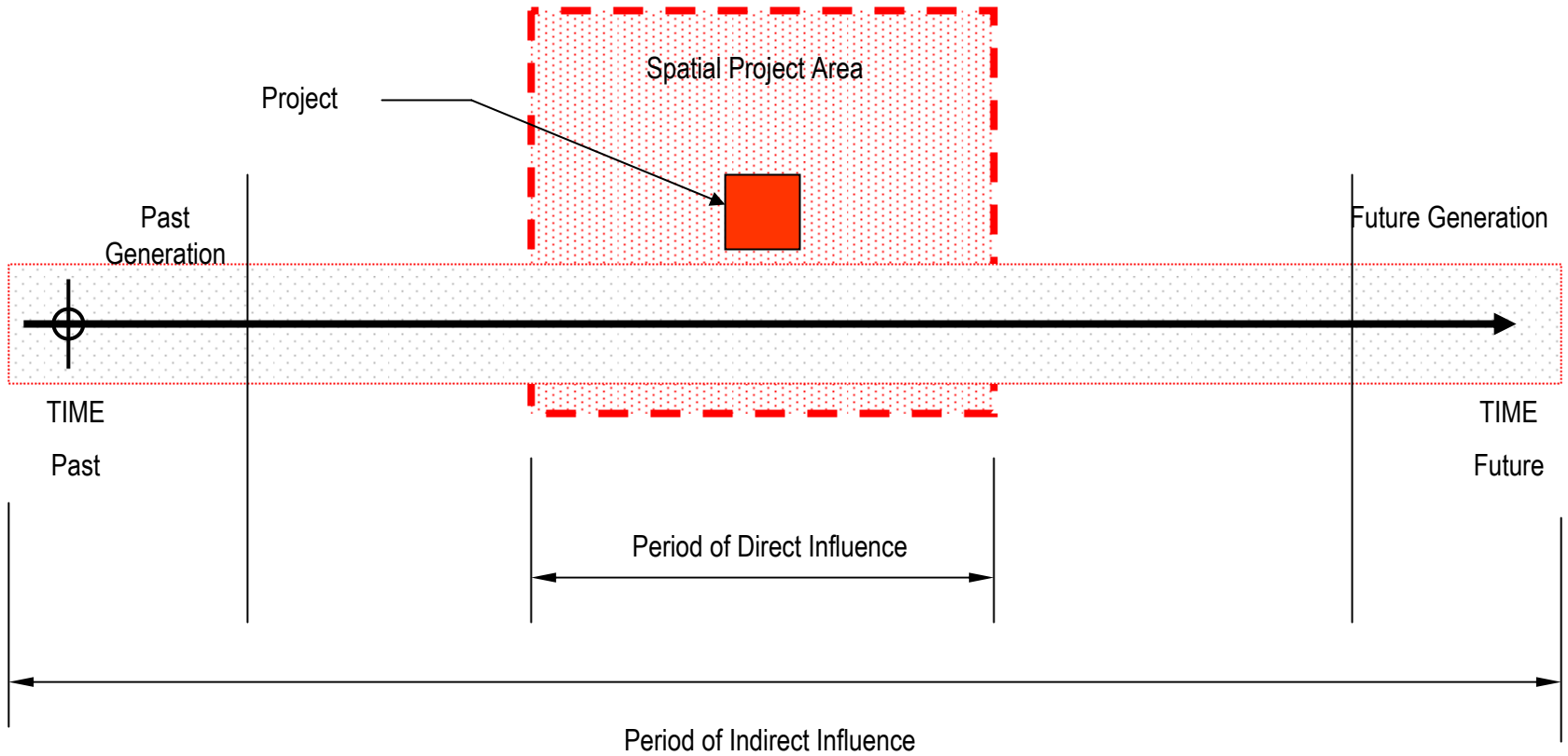
Sustainable design requires the reconsideration of the span of time in which one is assessing the impact of the work.

Building Lifetime: 50 years

- Life Cycle Assessment (LCA)

Site Lifetime: eternal

Part I: Sustainable Design



Part II: Case Study

Using LCA, the following is a comparison of structural materials for on-site construction of an assembly.

Construction energy and greenhouse gas emissions were examined in five general categories:

1. Transportation of the construction crew to and from the site.
2. Transportation of materials to the site
3. Transportation of equipment to and from the site.
4. Use of on-site equipment.
5. Supporting processes, such as from-work and temporary heating.

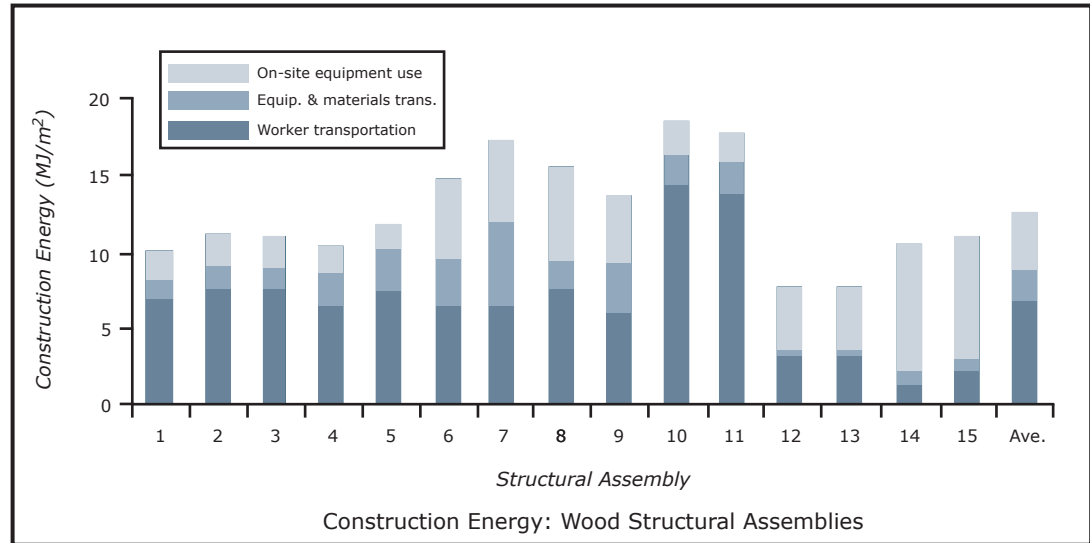


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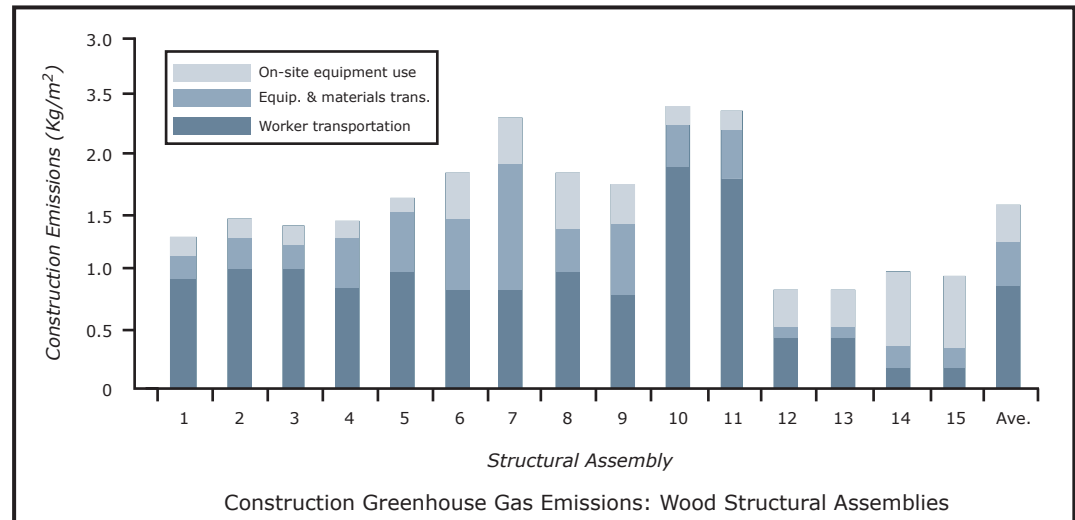
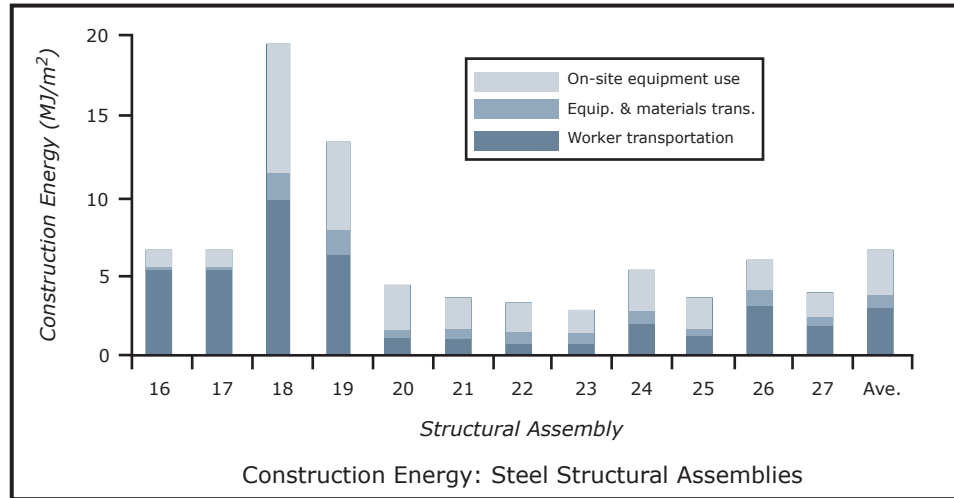


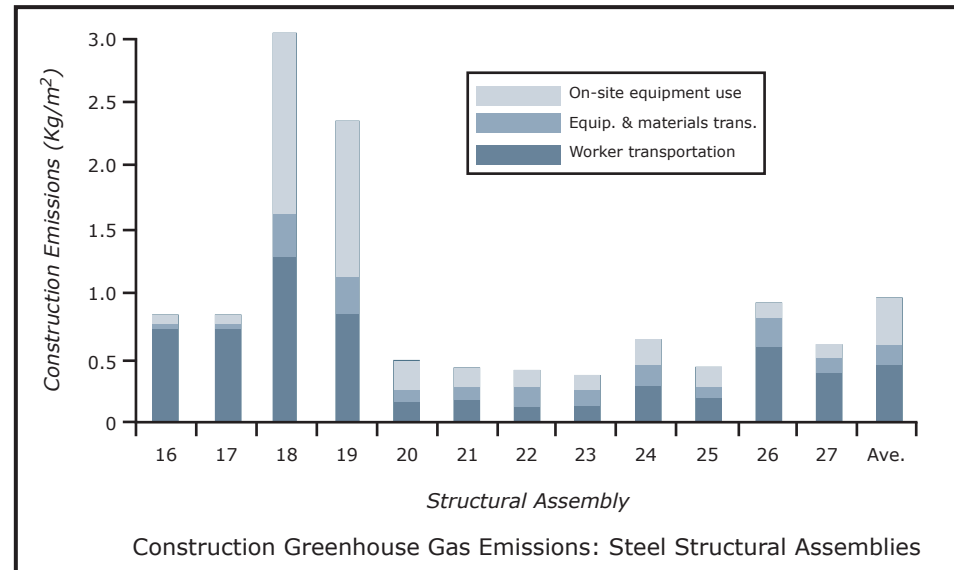
Image by MIT OCW.

Case Study



Construction Energy: Steel Structural Assemblies

Image by MIT OCW.



Construction Greenhouse Gas Emissions: Steel Structural Assemblies

Image by MIT OCW.

Case Study

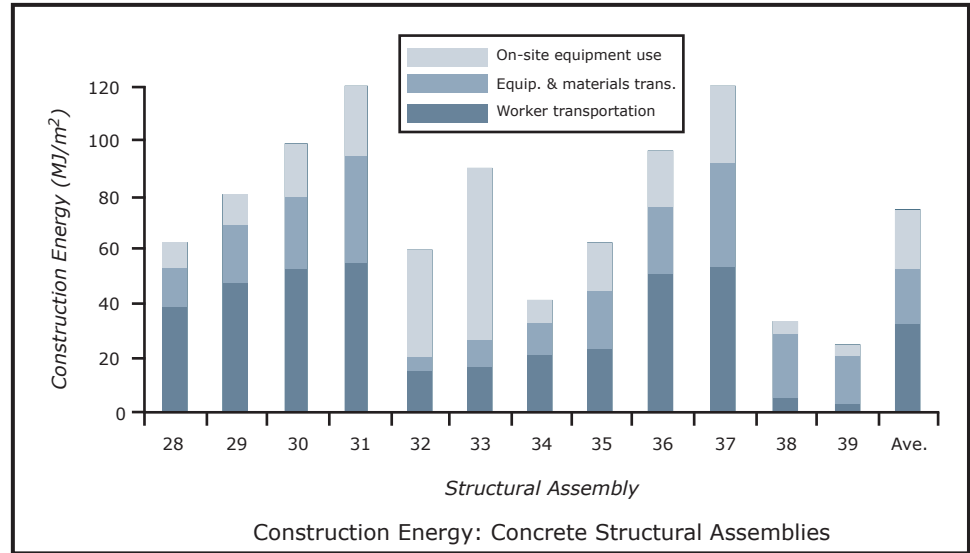


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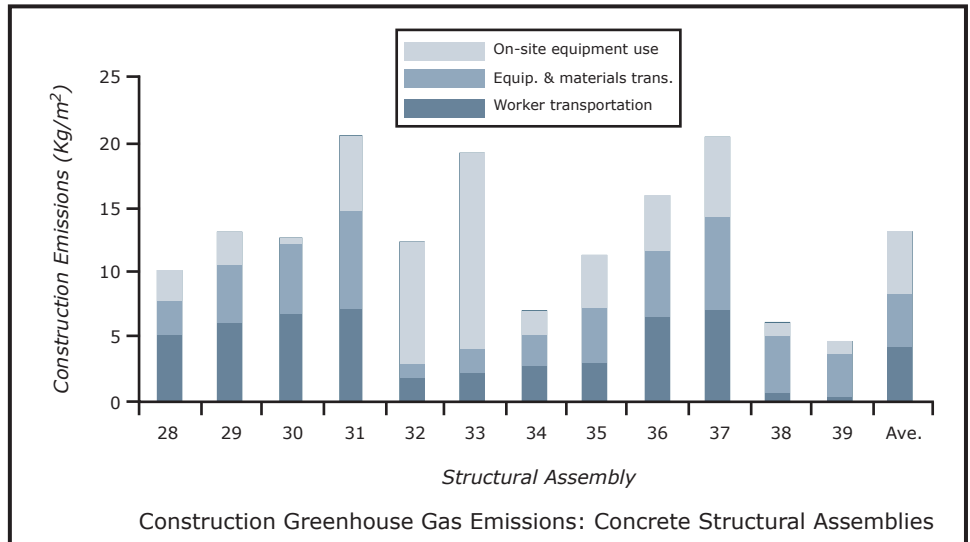


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Case Study

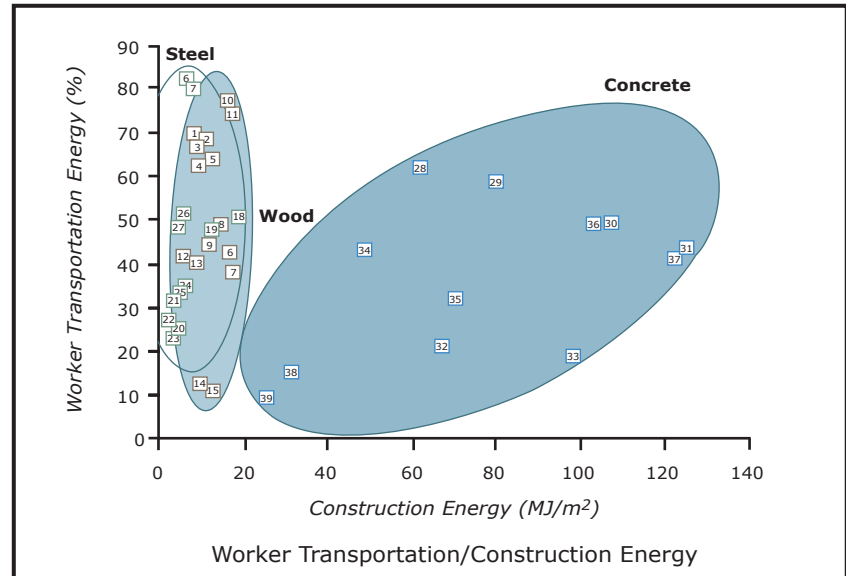


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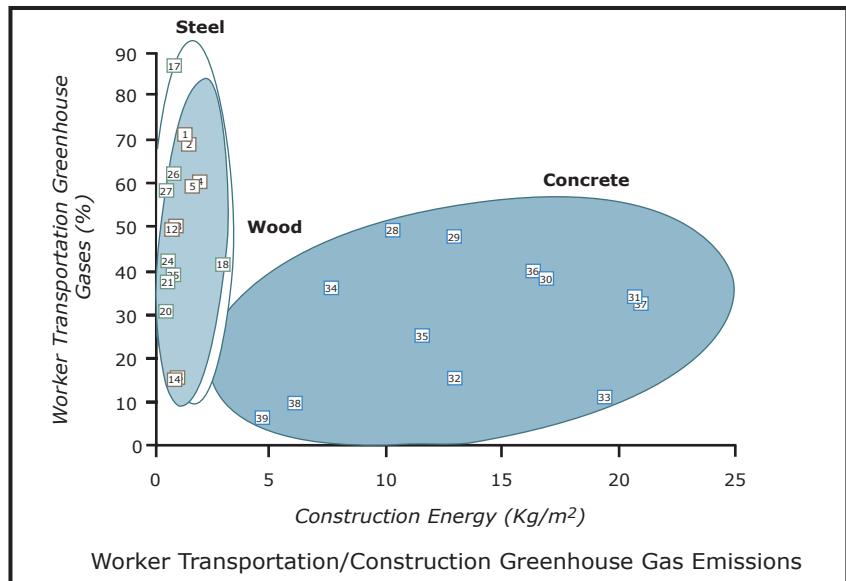


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Case Study

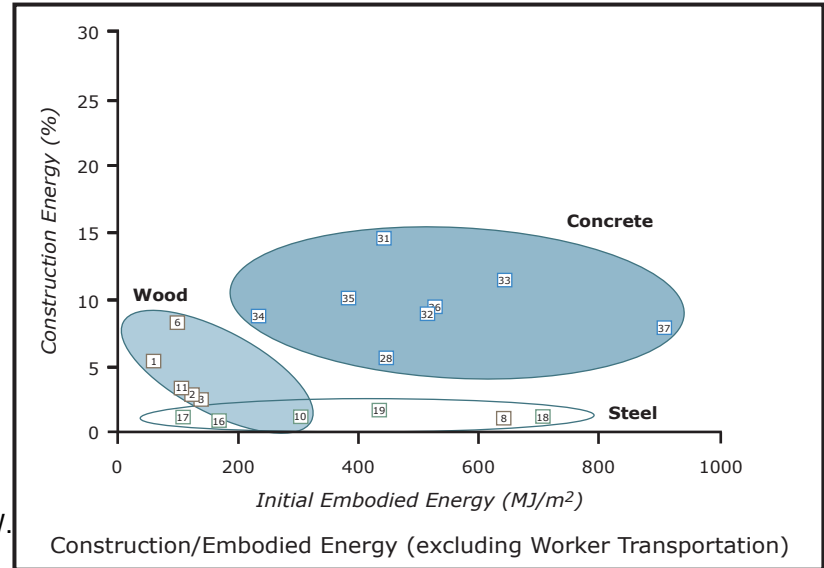


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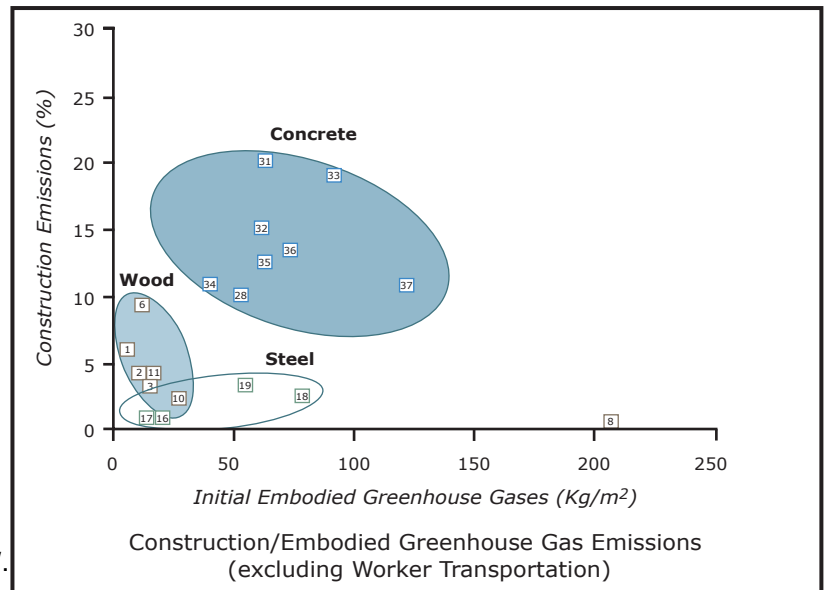


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Case Study

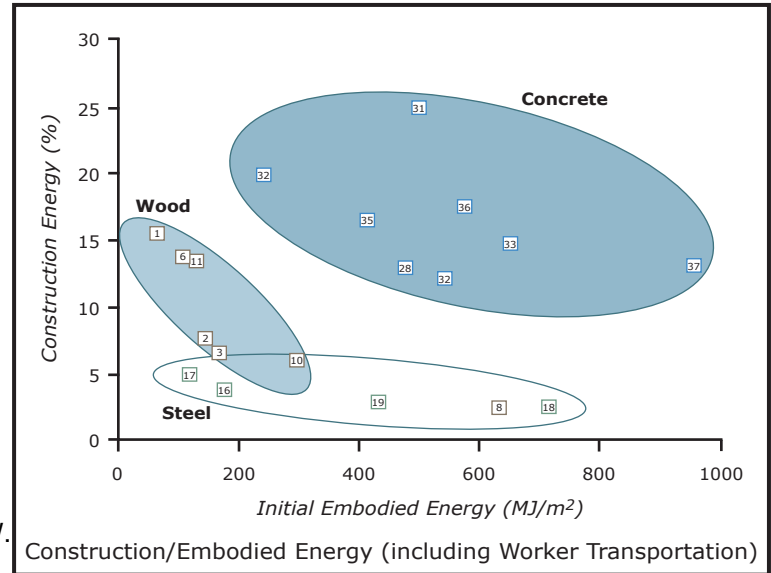


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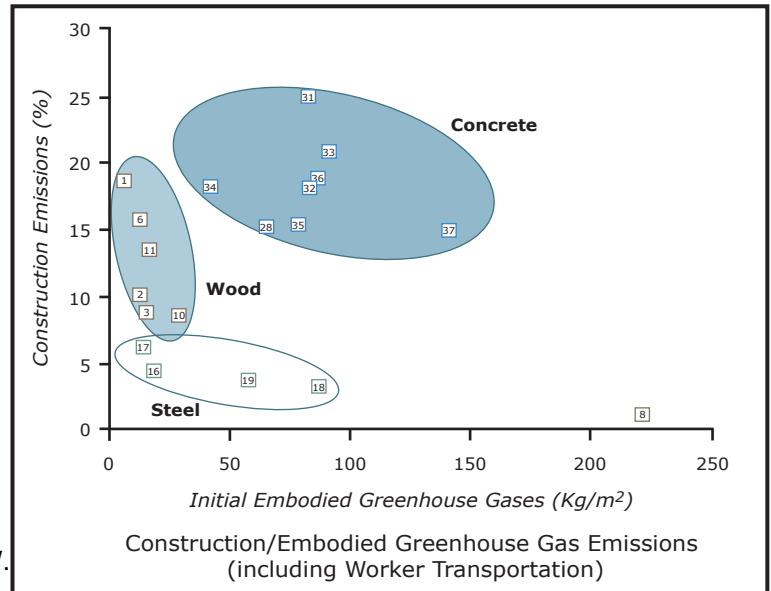


Image by MIT OCW.

Case Study

Transportation - of workers and equipment - to and from the site represents the largest proportion of construction energy use for every material.

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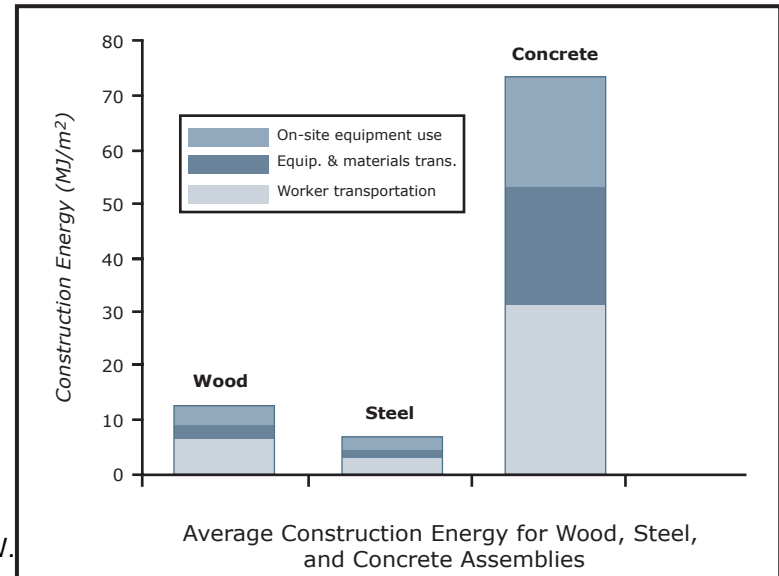


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