

Development of an Entirely Wood Floor System Designed for Biogenic Carbon Storage, Adaptability, and End of Life De/Re/Construction

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LIFE CYCLE ASSESSMENT

Life cycle assessment (LCA) evaluation of the potential environmental impacts of the entirely wood floor system, All-wood mass timber building and steel/concrete building.

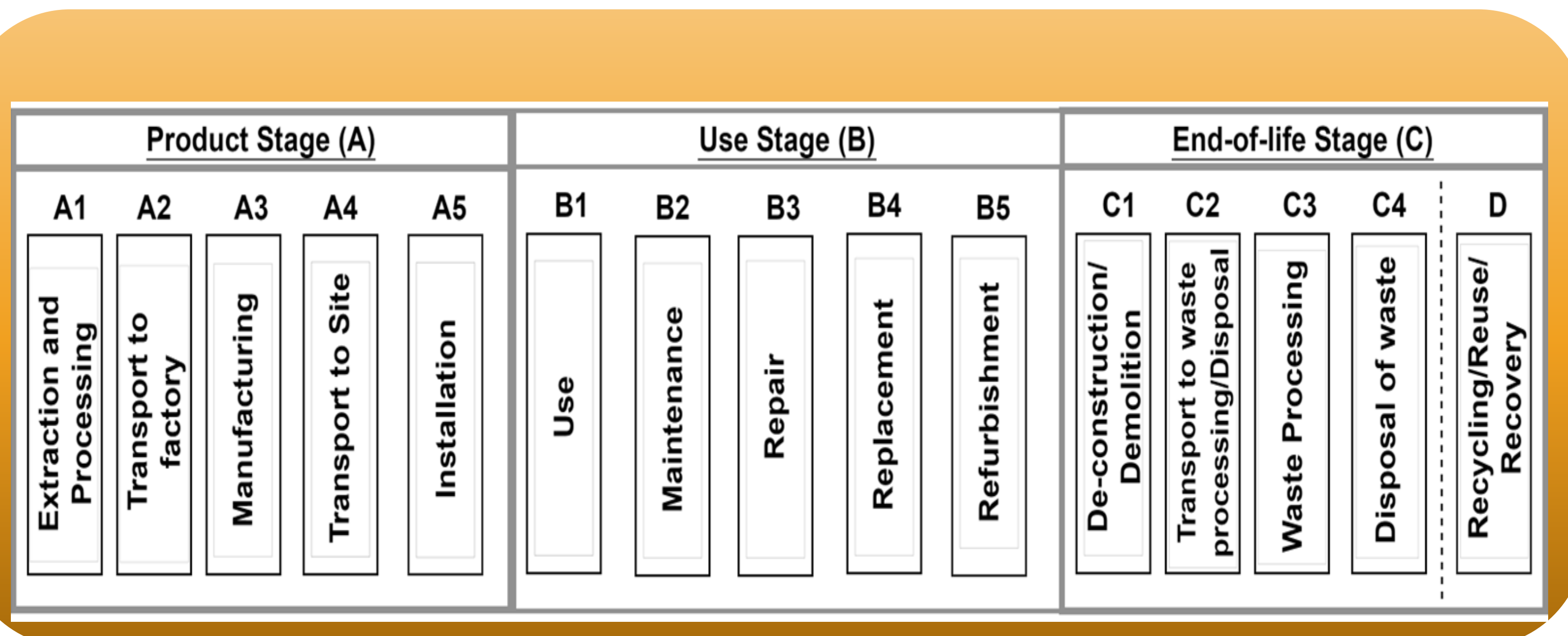
Impacts Categories

- Global Warming Potential (GWP)
- Cumulative Energy Demand (CED)

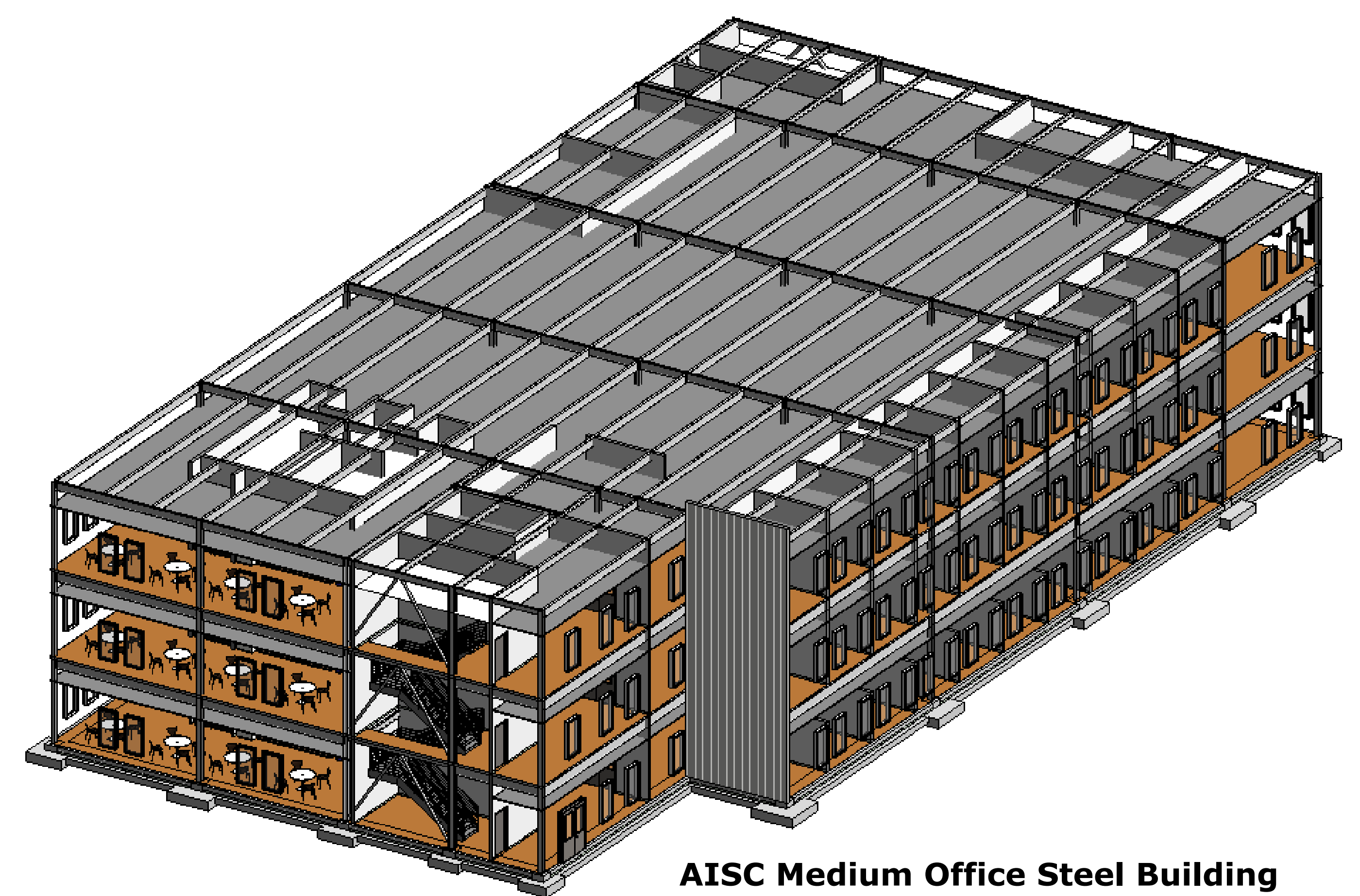
Scope of the LCA

- Whole Building LCA - Comparison of steel/concrete building and entirely wood floor system mass timber building.
- Strong emphasise on mass timber construction phase
- End-of-life LCA - Deconstruction and demolition scenarios impacts

Building Life Cycle Based on ISO 14044: EN 15804

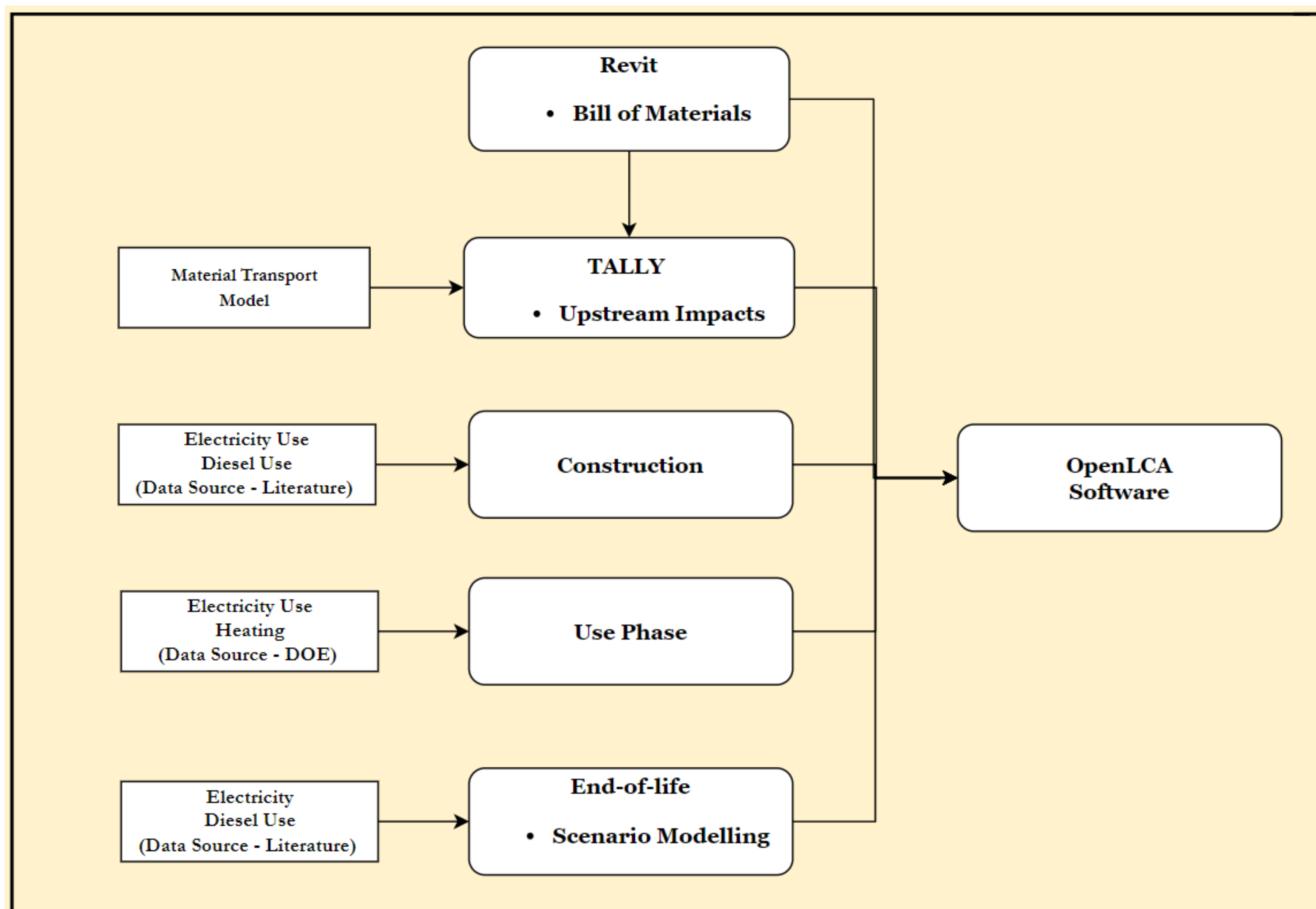


Steel Building

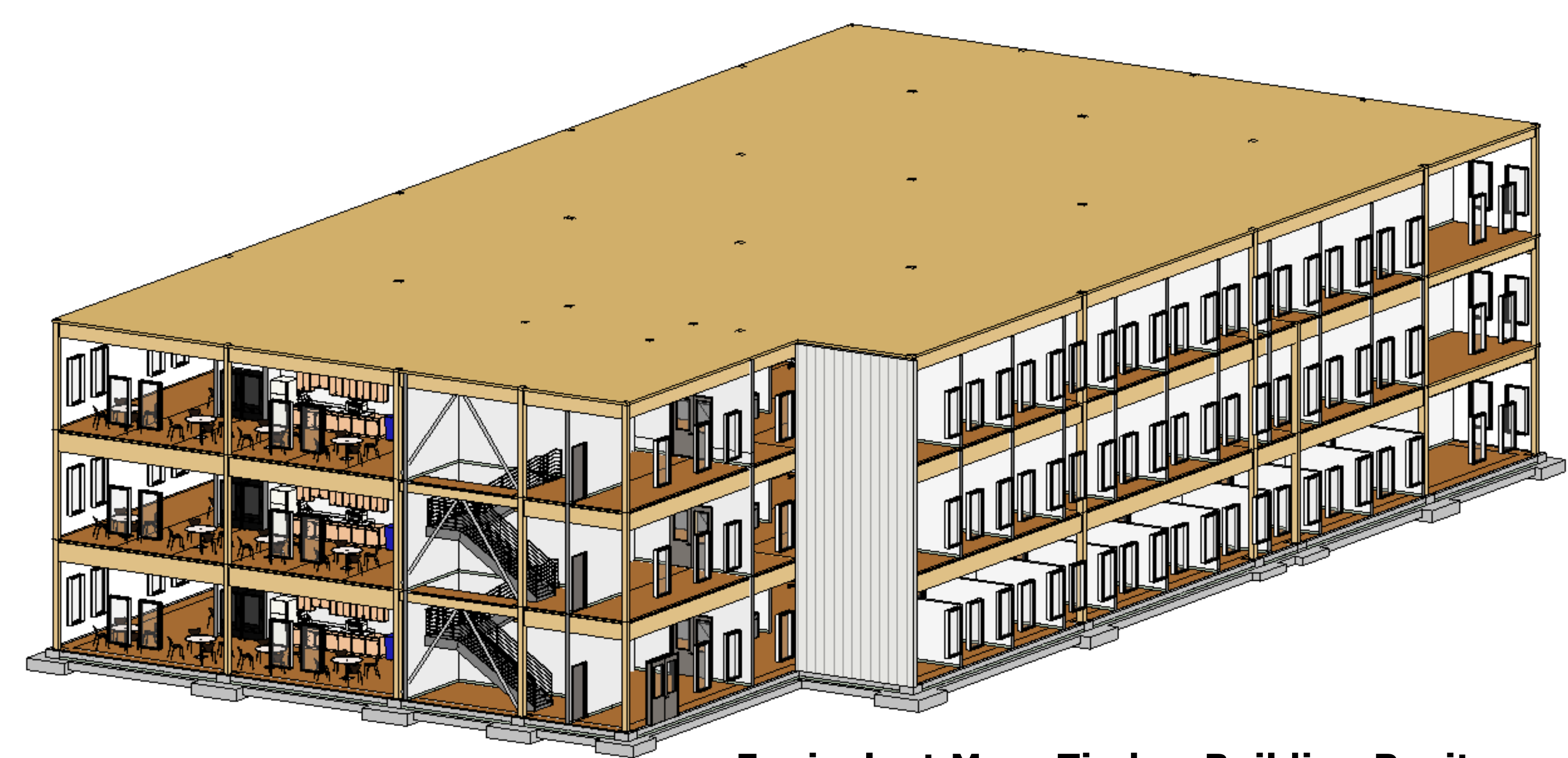


AISC Medium Office Steel Building (Incumbent) Prototype Revit Model

Mass Timber and Steel Building's LCA Model



Mass Timber Building

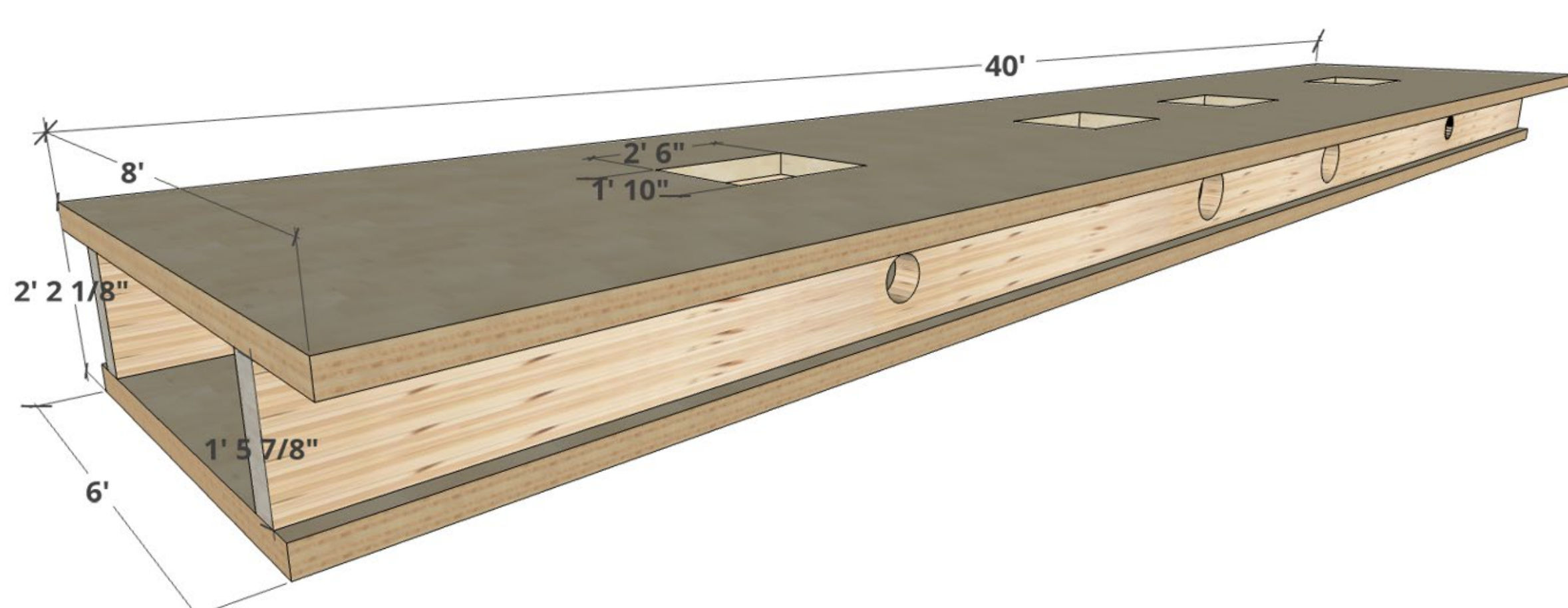


Equivalent Mass Timber Building Revit Prototype Model

Wood Floor System Assembly LCA

Connections LCA

- Different connection types were considered for the entirely wood floor system assembly.
- The environmental impact of each connection type was evaluated using OpenLCA.



Assembly Design: Isometric view

Connection Types LCA Result: Per Assembly

Connection Types	Descriptions (8'/40')	Per Assembly (8'/40') (kgCO2 eq)	Per SF (kgCO2 eq)
Inclined Screw	188 Inclined Screws + 44 Short Screws	124.24	0.388
Sharp Metal	460 Structural Screws + 234' Sharp Metal + 460 Washer	191.56	0.599
Coupler + Bolt	200 Bolts + 400 Coupler + 32 Short Screws	533.22	1.666
Screw + Adhesive	252 Short Screws + 53 oz Adhesive	79.34	0.248
Tube + Screw	292 Tube + 15 Short Screws	90.16	0.282

- Background Data: EPD
- Transportation to site: within 50 km
- Transportation Methods: Diesel Truck