

Sustainable Space Transformation:

Comparison of Allsteel's Architectural Products vs. Traditional Construction Materials

Allsteel's Beyond system was developed to build dynamic environments that can quickly respond to evolving organization needs, offering our clients a more future-proof alternative to traditional construction methods. Beyond features unitized panels with a patent-protected leveling mechanism that significantly reduces installation time and eliminates the need for the dust and noise associated with demolition and re-construction.

In addition to the improved workplace agility, change management, and lower lifetime costs¹, the reusability of the Beyond system also offers a more sustainable alternative to conventional construction – an industry that is a leading contributor of both national waste and greenhouse gas emissions. The EPA reports that 600 million tons of construction & demolition (C&D) debris were generated in the United States in 2018, which is more than twice the amount of generated municipal solid waste (general trash or garbage)². In addition to the waste impact, buildings contribute around 40% of greenhouse gas (GHG) emissions worldwide, with 11% from materials and construction³. In an effort to better understand the cumulative environmental impact of the Beyond system vs. conventional construction over the lifetime of a commercial office building, Allsteel commissioned Foresight Management, a Michigan-based engineering consulting firm with an expertise in sustainability and energy management, to complete a comparative life cycle assessment (LCA).

Background

Life cycle assessment (LCA) is a comprehensive evaluation of the environmental impacts over the entire life cycle of a product, material, process or other measurable activity. LCA models the environmental consequences of material inputs and outputs and the interacting systems involved in industrial production and helps to quantify the environmental impacts.

LCA's are critical to understanding many environmental burdens, including the embodied carbon in our products. Embodied carbon refers to the total amount of carbon dioxide (CO₂) emissions generated during the entire lifecycle of a product or material. This includes emissions from the extraction of raw materials, manufacturing, transportation, installation, maintenance, and disposal. Essentially, it accounts for all the greenhouse gases released from the production and processing of a material or product, excluding the operational emissions (those generated during the use phase). Identifying and understanding embodied carbon is crucial in efforts to reduce the overall carbon footprint of buildings, infrastructure, and products.

In addition to embodied carbon, life cycle analysis also assesses solid waste management options. In this study, solid waste refers to any discarded material generated during disassembly and deconstruction. It is important to note that material



¹ Beyond Cost Benefit of Change Presentation (cloudinary.com)

² Sustainable Management of Construction and Demolition Materials | US EPA

³ Embodied Carbon - World Green Building Council (worldgbc.org)

efficiency was not evaluated in this study, thus waste associated with the manufacturing of the product(s) or installation of the product(s) was not considered. To identify the environmental impact of the Beyond system vs. conventional construction, solid waste was measured in kilograms (kg) and embodied carbon was measured by global warming potential (kgCO₂e).

Process

In order to complete this study, two Beyond applications were considered. The "Day 1" application is six 6'-6" x 6'-6" enclosed rooms that could function as a micro-office or phone room (see figure 1 at right). The "Day 2" application is two 6'-6" x 6'-6" enclosed rooms as well as one 13'-3" x 13'-3" room that could function as a project room or small conference room (see figure 2 at right). These applications are the same applications as those used in the Beyond Cost Benefit of Change study, so that the results from each study can be directly compared. Additionally, these applications intentionally feature a variety of the different materials and options Beyond offers (i.e. glass, aluminum, markerboards, power, fabric) to ensure that the results were not limited to a narrow set of materials or applications. Furniture was not considered and is shown in the renderings for visual purposes only.

For this study, the following assumptions were applied:

- During each reconfiguration, the application was alternating between "Day 1" and "Day 2."
- For both the Beyond and conventional materials, only additional materials required to reconfigure were added as new materials.
- Beyond materials removed from the reconfiguration were saved for future reconfigurations and conventional materials unable to be salvaged or reused, were disposed of based on typical conventional construction end of life behaviors (see figure 3 below).
- For comparison purposes, Foresight specified identical applications using materials traditionally used in conventional construction, including gypsum, steel, storefront glass, wood framing, and aluminum.

The comparison study simulated the environmental impacts of both the Beyond and conventional construction methods, measured by global warming potential (kgCO₂e) and solid waste disposed (kg). The comparison simulated the impacts upon initial installation as well as following 1 to 30 reconfigurations to help clients translate the results to their intended use of the product, whether they plan to reconfigure or not.

Figure 1: Day 1 Application

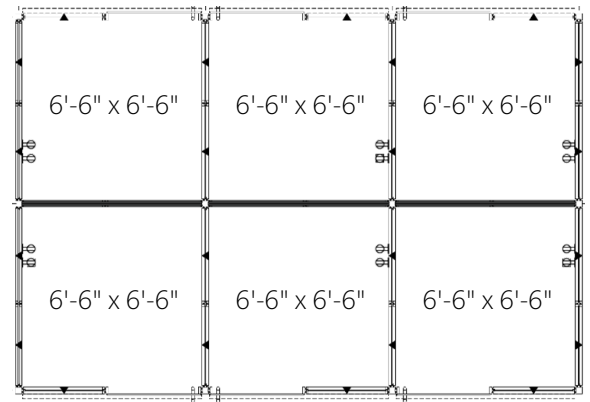
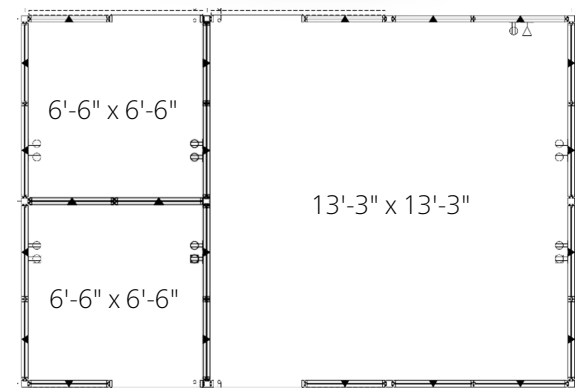


Figure 2: Day 2 Application





**Figure 3: Conventional Construction
End of Life Disposal Based on Material**

Material	Recycle Rate	Landfill Rate	Incineration Rate
Aluminum	95%	5%	0%
Structural Steel	97%	3%	0%
Steel Rebar	59%	41%	0%
All Other Metals	74%	26%	0%
Other Materials	0%	100%	0%

Results

The results of this comparative LCA found that upon initial installation and following reconfigurations, these Allsteel Beyond walls applications showed reduced environmental impacts compared to conventional construction materials. This means that, even if our clients never plan to move their Beyond walls, the Beyond solution can offer a lower carbon and waste impact (56% less carbon) compared to a solution using conventional materials. If a client anticipates they will move their product 5 times, this increases to 68% global warming potential carbon savings and 64% solid waste savings compared to conventional materials. Moreover, if a client chooses to reconfigure Beyond as part of renovations to their space, the impact increases as a result of the ability to reuse the same product in the layout changes as opposed to the demolition and re-construction required for conventional materials. Please see figure 4 for a summary of these findings.

Figure 4: Number of Product Configurations and Impact on Global Warming Potential and Solid Waste Disposed

Number of Configurations	Global Warming Potential % Reduced Impact	Solid Waste Disposed % Reduced Impact
Initial Install	-56%	0%
1	-48%	-29%
2	-54%	-38%
3	-60%	-52%
4	-60%	-56%
5	-68%	-64%
6	-67%	-66%
10	-76%	-77%
12	-79%	-80%
15	-83%	-84%
20	-86%	-87%
30	-90%	-91%

A 50% reduction in global warming potential is equal to the impact of driving

104,000
Miles

in a gasoline powered vehicle.

Over 85,000
Pounds

of solid waste diverted from landfill with 5 Beyond reconfigurations.

Conclusion

The results of this study conclude that Allsteel Beyond offers environmental benefits over traditional construction materials upon initial installation, with the benefit increasing if the client reconfigures multiple times.

In addition to the environmental benefits of the Beyond system in comparison to conventional construction, Beyond also meets the following environmental standards & criteria:

- Declare® Label
- BIFMA Level 3 Certification
- SCS Indoor Advantage Gold
- FSC Wood Options
- Environmental Product Declaration

For the most up-to-date list of Beyond product certifications and other information on Beyond, please visit the Beyond product page on the Allsteel website.

Van Valkenburg, B. & Akolawala, S. (2024). *Comparison of Allsteel's Architectural Products vs Traditional Construction Materials*. Foresight Management.



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