

INTRODUCTION

The purpose of this project was to conduct necessary sustainability research in the early design phase and serve as a starting off point for all future projects. There are many ways in which a building can cause harm to the environment, and my job was to specifically look into the effects of carbon emissions and Red List chemicals in Bassetti's standard materials, in combination with proposed alternatives.

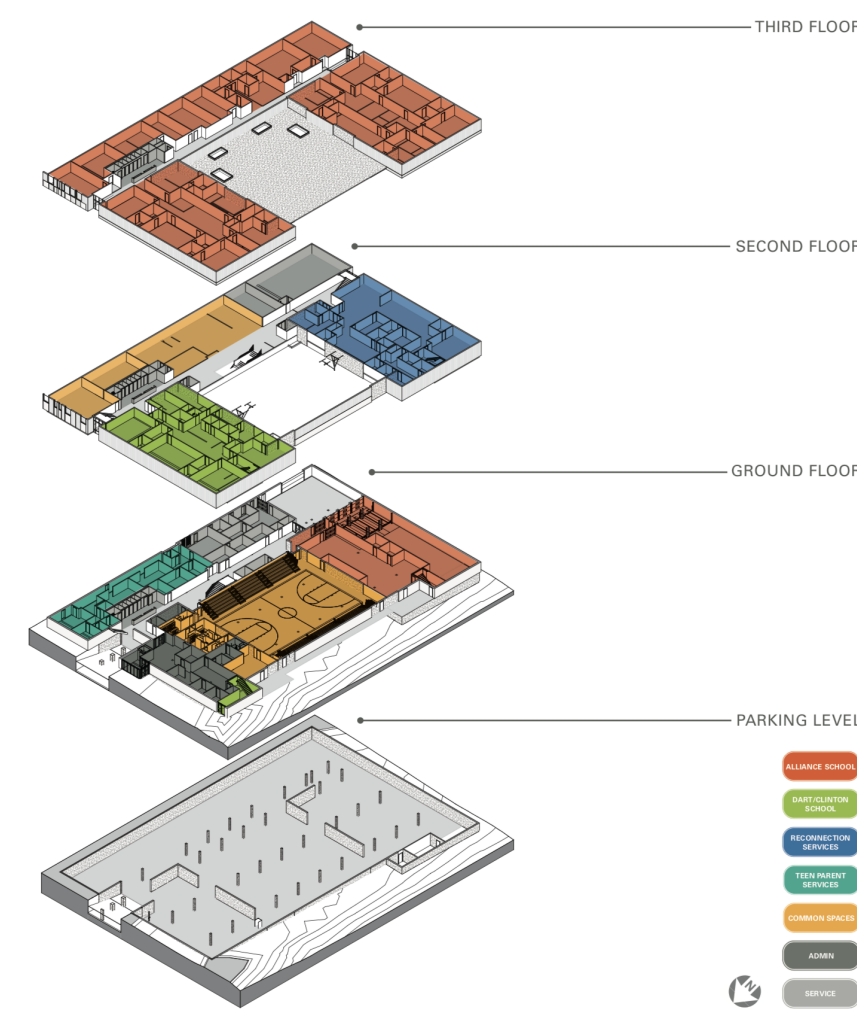
The specific area of focus for this research are four different wall assemblies that are often used in Bassetti's projects. Although these wall assemblies may be studied individually for carbon impact and Red List materials, the time had not yet been dedicated towards comparing them to each other.

The process of my work began by looking for Red List chemicals in the standard materials that hadn't yet been researched in terms of sustainability. Having been given the name of a specific product and it's manufacturing, I needed to obtain Declare Labels, HPDs, or EPDs through the company's website, or other times, through databases that carry these documents for many popular products. HPDs and EPDs showed me in all aspects how sustainable a product was, while Declare Labels could specifically tell me if a product was Red List free or not.

In researching for carbon emissions, my work was done through the use of Tally. With the use of a 10' x 10' model of a single exterior wall for each assembly, I began my analysis on the global warming potential by division of each assembly. After determining which division caused the most problems, I could then take a deeper look into the carbon content of the individual materials in that division, in order to form a lower carbon wall assembly of my own.

MPG BUILDING

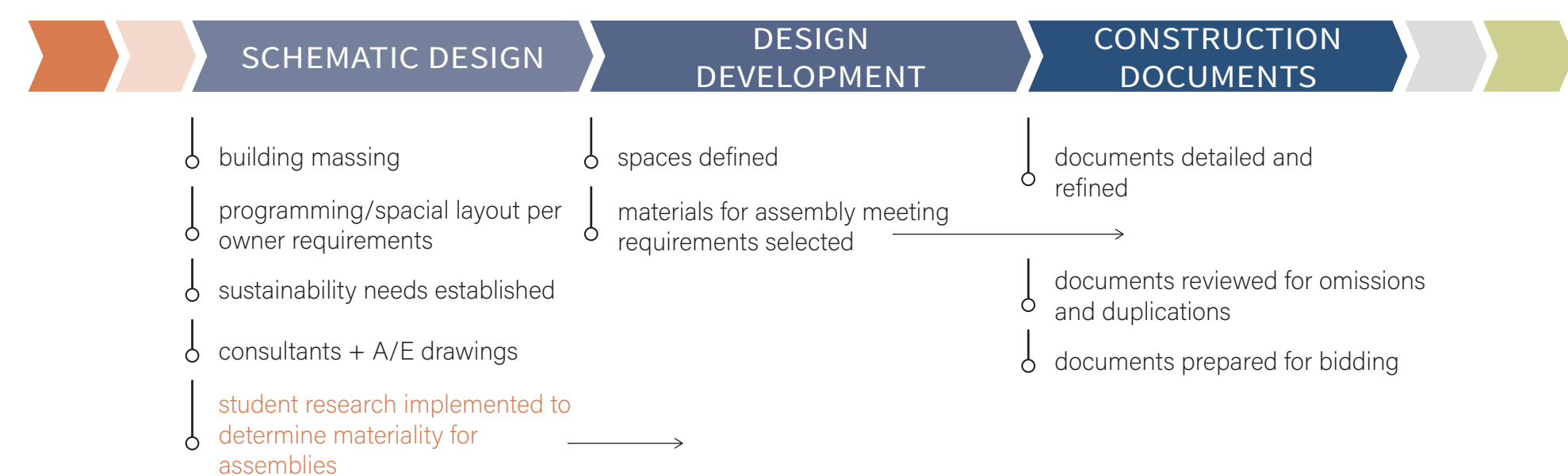
Location: 546 NE 12th Ave, Portland, OR
Square Footage: 80,000 ft²



The Multiple Pathways to Graduation (MPG) building is a spin-off project of the renovation of Benson Polytechnic High School. There are currently three buildings that make up MPG, and the idea is to combine it all into one 80,000 ft² building. The goal of sustainability for this project is to achieve a LEED Gold certification, so the selection of materials becomes very crucial.

As the project is near the end of its schematic design phase, the material make up for this building is fairly set in place. However, this research can also be used to help determine whether or not the currently selected materials have put them on the right track to avoid creating something that would otherwise be harmful to the environment.

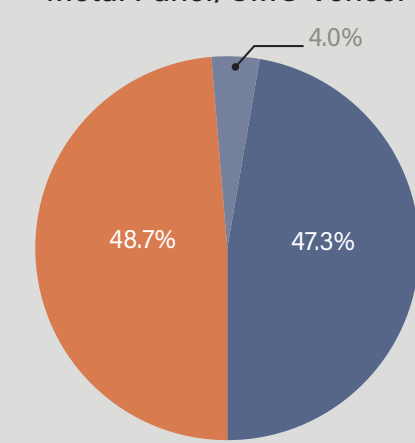
TIMELINE



WALL ASSEMBLIES

Global Warming Potential Per Division

Metal Panel/CMU Veneer

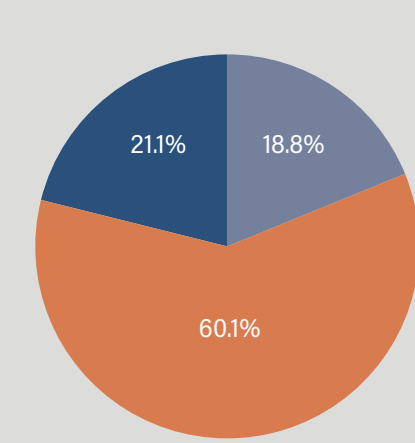


| Material | Thickness (in.) | CO2 (per SF of wall) |
|-----------------------------|-----------------|----------------------|
| Metal Panel | 1 1/2 | 1.39 |
| Metal Furring, Mineral-Wool | 5 1/2 | 1.93 |
| Concrete Masonry Unit | 7 5/8 | 2.98 |
| Total- | | 6.3 |

Red List Free Products:

- Metal Panel- AEP Span Prestige Series Metal Sales Manufacturing Corp. TL Series
- Metal Furring- CL-Talon Sustainable and Thermally Efficient Cladding Support System
- Mineral Wool- Thermafiber* FireSpan* - Foil Faced -FF
- Concrete Masonry Unit- Firth Concrete Masonry Blocks

Fiber Cement/Metal Panel

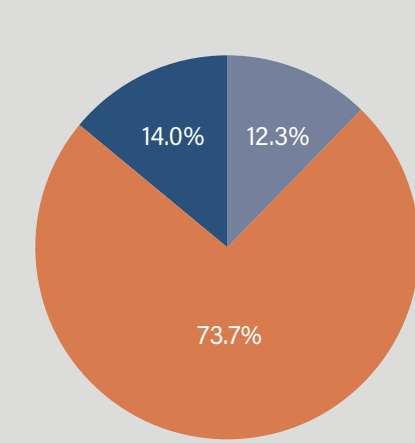


| Material | Thickness (in.) | CO2 (per SF of wall) |
|-----------------------------|-----------------|----------------------|
| Fiber Cement Panel | 5/16 | 2.82 |
| Air Space | 1 | 0 |
| Metal Furring, Mineral-Wool | 3 1/2 | 1.29 |
| Gypsum Sheathing | 5/8 | 0.62 |
| Metal Stud, Batt Insulation | 6 | 0.84 |
| Interior Gypsum Wall Board | 5/8 | 0.7 |
| Total- | | 6.27 |

Red List Free Products:

- Gypsum- USG Sheetrock* Brand EcoSmart Panels Firecode* X
- Batt Insulation- EcoBatt QuietTherm Insulation Unfaced EcoTouch* Insulation

Fiber Cement Panel

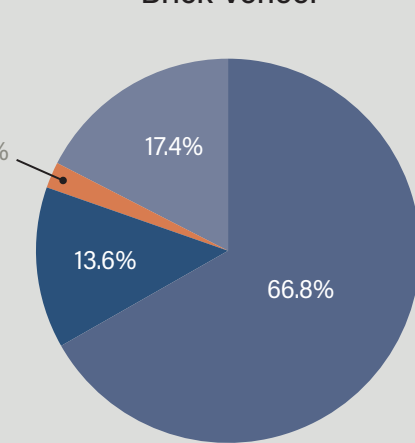


| Material | Thickness (in.) | CO2 (per SF of wall) |
|-----------------------------|-----------------|----------------------|
| Fiber Cement Panel | 1/2 | 3.68 |
| Metal Furring, Mineral-Wool | 6 7/8 | 3.12 |
| Vapor Retarder | 0 | 0 |
| Gypsum Sheathing | 5/8 | 0.62 |
| Metal Stud, Batt Insulation | 6 | 0.84 |
| Interior Gypsum Wall Board | 5/8 | 0.7 |
| Total- | | 8.96 |

Red List Free Products:

- Vapor Retarder- INTELLO Plus
- Metal Stud- R-stud Slotted Steel Framing

Brick Veneer



| Material | Thickness (in.) | CO2 (per SF of wall) |
|-----------------------------|-----------------|----------------------|
| Brick Veneer | 3 5/8 | 5.07 |
| Air Space | 2 | 0 |
| Spray Foam Insulation | 2 | 0.17 |
| Gypsum Sheathing | 5/8 | 0.62 |
| Metal Stud, Batt Insulation | 8 | 1.03 |
| Interior Gypsum Wall Board | 5/8 | 0.7 |
| Total- | | 7.59 |

Red List Free Products:

- Brick Veneer- Nubrik - Traditional and Artisan Ranges POROTHERM R25 Th+
- Spray Foam- Knauf Insulation Jetspray™ ACFoam* and EnergyShield* Polyiso Insulation

FINDINGS

- The thermal and moisture protection division consists of the highest CO₂ emissions.
 - In Brick Veneer, however, the exterior insulation is ranked lowest in its division.
- In the assemblies that use masonry, the emissions per division are nearly as high as thermal protection.
- When comparing each assembly's CO₂ per SF of wall, the fiber cement/metal panel wall performed best overall.
- Although some assemblies may contain some of the same layers, it's the thickness of the material that can add to a higher result.

PROPOSED ASSEMBLY

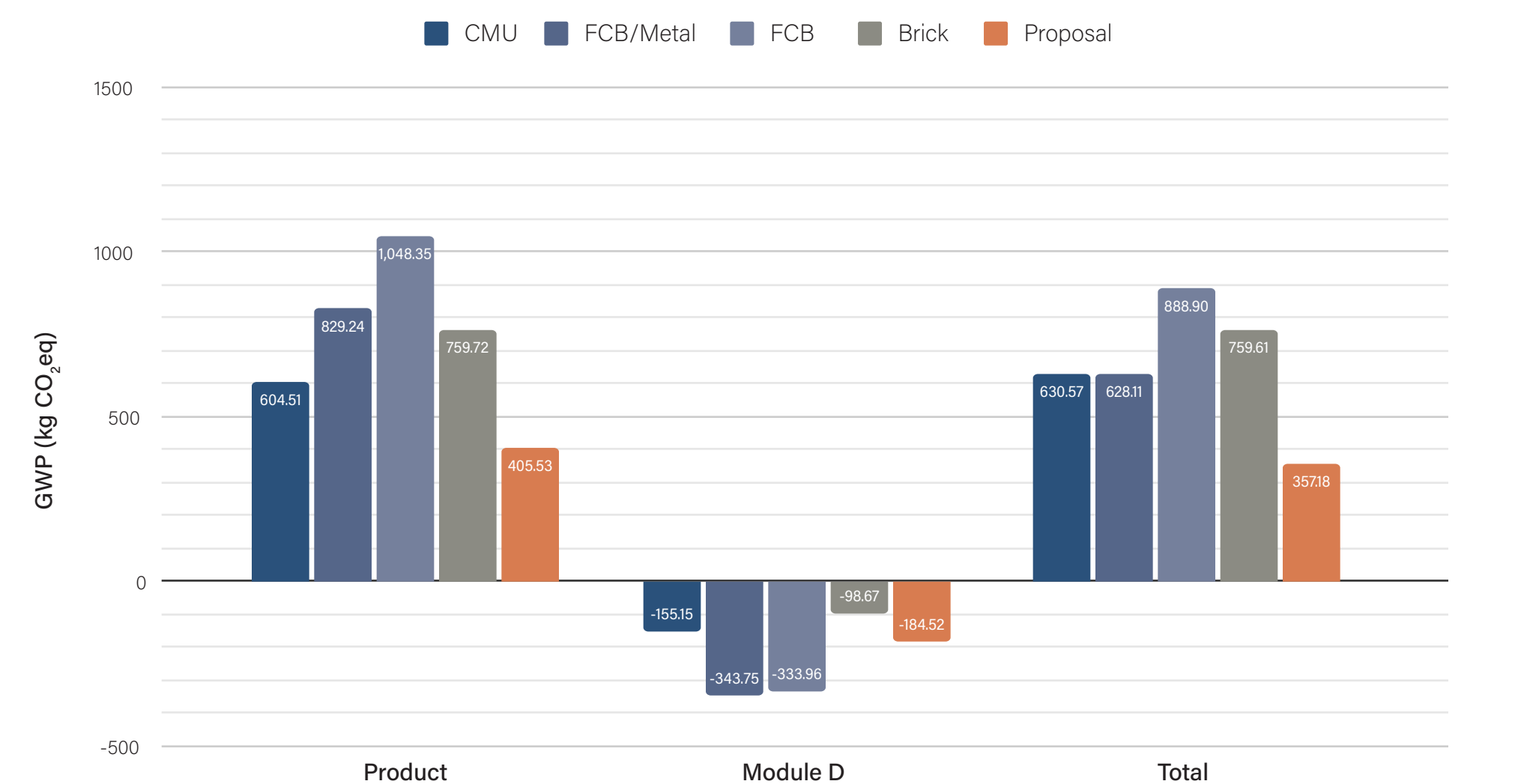
Using the makeup of materials that performed best in all assemblies, I've formed an alternative assembly, which is an aluminum siding wall. The siding is followed by steel furring with spray polyurethane, gypsum sheathing, steel stud framing with unfaced batt insulation, and finished off with gypsum wall board.

| Material | Thickness (in.) | CO2 (per SF of wall) |
|-----------------------------|-----------------|----------------------|
| Aluminum Siding | 1 1/2 | 0.99 |
| Air Space | 1 1/2 | 0 |
| Metal Furring, Spray Foam | 3 1/2 | 0.42 |
| Gypsum Sheathing | 5/8 | 0.62 |
| Metal Stud, Batt Insulation | 6 | 0.84 |
| Interior Gypsum Wall Board | 5/8 | 0.7 |
| Total- | | 3.57 |

Red List Free Products:

- Metal Panel- AEP Span Prestige Series Metal Sales Manufacturing Corp. TL Series
- Metal Furring- CL-Talon Sustainable and Thermally Efficient
- Spray Foam- Knauf Insulation Jetspray™ ACFoam* and EnergyShield* Polyiso Insulation
- Gypsum- USG Sheetrock* Brand EcoSmart Panels Firecode* X
- Metal Stud- R-stud Slotted Steel Framing
- Batt Insulation- EcoBatt QuietTherm Insulation Unfaced EcoTouch* Insulation

Global Warming Potential Per Stage



RESULTS

It's clear a majority of the carbon emissions in wall assemblies come from the thermal division. The aluminum siding assembly resulted in half the amount of CO₂ as the others, mostly due to it using an exterior insulation with much lower emissions. The research has shown the type of exterior insulation is critical, especially if the building will include a higher contributor, such as masonry. Because cladding can also be a bigger contributor, choosing less harmful hardware to pair with the cladding can provide better results.

LIMITATIONS

- For various materials, Tally must also analyze the hardware used within that material.
- Tally generated data from a 10' x 10' model, not an entire building made up of the assembly.
- In finding Red List chemicals, not many products have been verified, which is currently the only way for others to determine if the product is safe.
- The choice of material is also based on factors such as R-value, so having the lowest CO₂ wall may not be very functional.