Fall 2017

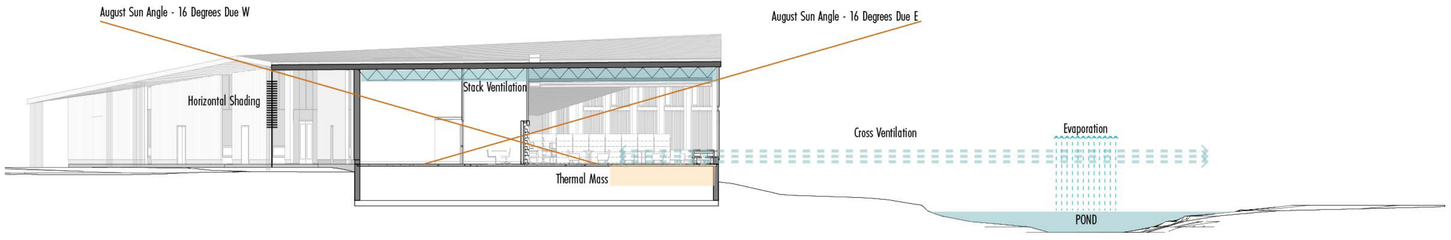
Hacker Passive Cooling Design

Portland State University. School of Architecture

HACKER

PORTLAND STATE UNIVERSITY :: SCHOOL OF ARCHITECTURE

Passive Cooling Design



Project Goals

We initially started this project with the sole mission of analysing the total greenhouse gas emissions of the new library using the Greenhouse Gas Emissions Analysis Calculator (or GGEA) developed by PAE. During our first visit with PAE, we were informed of the exponential effect refrigerants have on ozone depletion. Some having a global warming potential factor of more than 1800 times that of CO2.

This prompted us to make Passive Cooling and eliminating refrigerants our number one goal for this project. From this analysis we were able to discover the EUI and the carbon footprint for Code, Better, and Best options for the project.

Project Overview

The Ledding Library project was initially a renovation and expansion project for an existing Library for the City of Milwaukie, Oregon. After an existing building assessment showed all major systems were nearing there end of useful life, including the building's structure, the project was amended to a full tear down. This became an opportunity to create an entirely new 20,000 square foot library for the city.

One of the greatest challenges was that the library is bordered by two environmental protection zones. The architects at Hacker have had to very meticulously determine the available footprint of the new building. The program of the new library will include children's, teens, and adult areas, a large community space, and an administrative core.

The City of Milwaukie is concerned with the building conforming to the city's new sustainability goals, acting as a showpiece of civic architecture. Hacker wants a library that conforms to the need of the clients while still expressing the design concept developed for the project. They are also enrolled in Energy Trust of Oregon's path to net zero, which opens up enhanced financial incentives for the project from the ETO to cover bother design and Construction costs.

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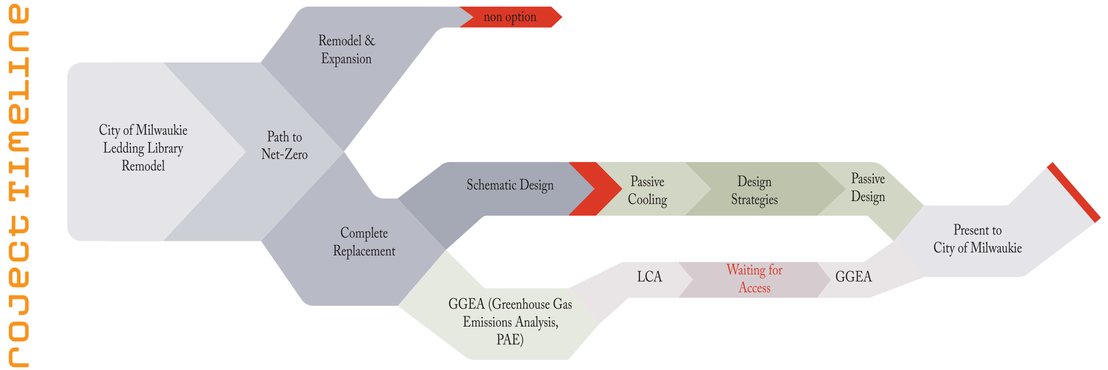
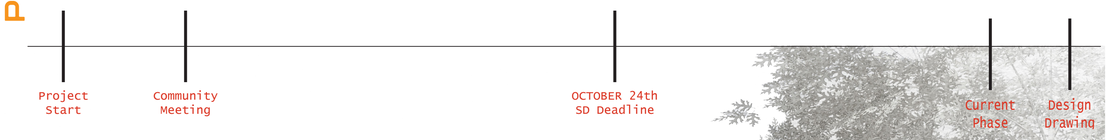
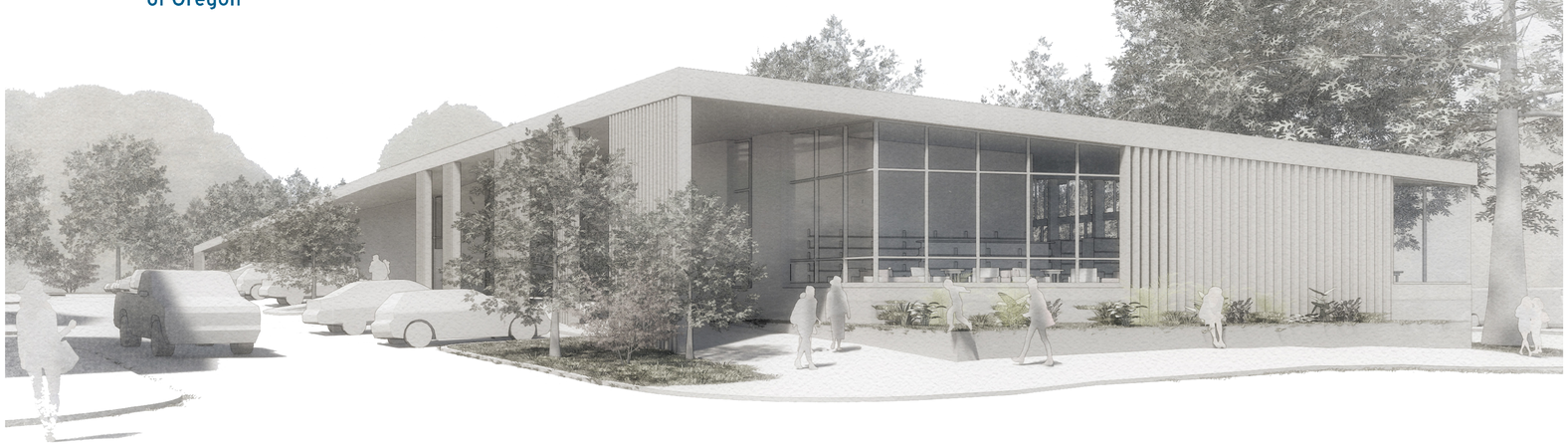
Sophia Alberts-Willis + Kagan Reardon

Project Timeline



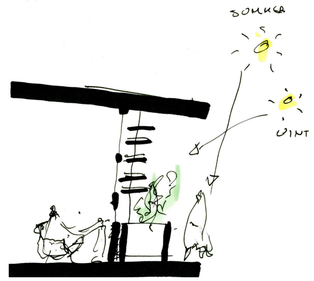


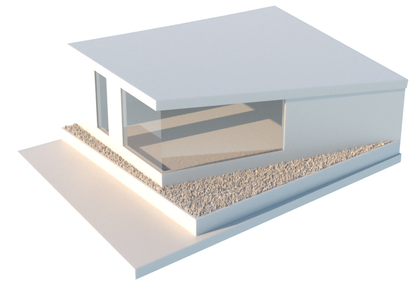


SW Shading Study

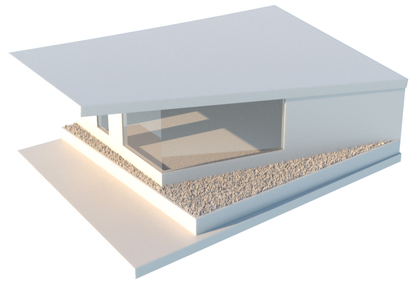
From our analysis, we concluded that resolving the SW corner, which receives the most direct sunlight as well as serves as the first pedestrian interaction with the library, was crucial.

We started by taking a step back to Hacker's original design without shading and then iterated through a few options, arriving at the conclusion that v shading would be most effective

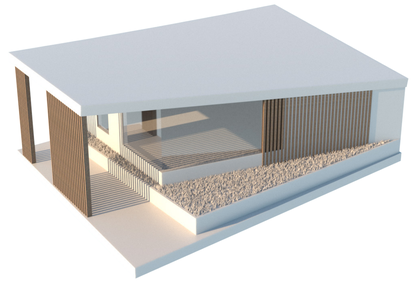




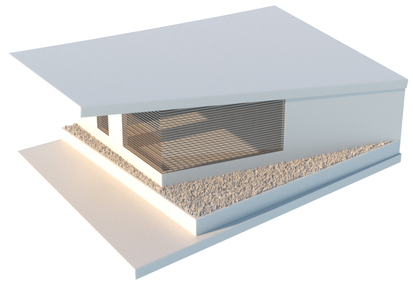
No Shading



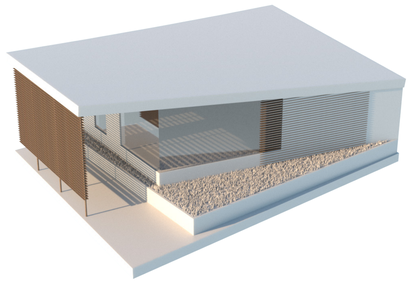
Roof Shading



Roof + Vertical External Shading



Roof + Horizontal Internal Shading



Roof + Horizontal External Shading