Team 04: The Redesign of the Calvin Baseball Stadium

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Introduction

As Calvin looks to renovate its outdoor athletic facilities, one of the projects on the docket is to upgrade the existing Calvin Baseball Stadium. The original goal was to determine if it was more environmentally friendly to keep the baseball field at its current location or to move it to the Gainey Athletic Complex on East Paris. After consulting with the architect of the project and the head athletic director Dr. James Timmer, it was decided the baseball stadium should stay at its current location. Team Four then pivoted to create a three-stage plan which can be implemented over the course of the construction process.

As Christian engineers, the team recognized construction currently degrades much of the environment. To uphold Calvin's mission statement, the team looked to develop new techniques for the construction industry to use when designing future projects which takes the carbon footprint into consideration. Therefore, the team developed a "Carbon Emissions Calculator" to track the carbon emissions associated with the construction process of athletic fields. In addition, Team Four's goal was for Calvin to be able to use this tool to track the carbon footprint of all future construction projects.

Objectives

Athletic Field Requirements

- ADA Accessible Bleachers
- New parking lot and ADA access point
- Public Restrooms
- College Caliber Field

Carbon Emissions Calculator

- User friendly
- Applicable to any future construction process on Calvin's campus

Design

Figure 1: *Final Redesign of Calvin Baseball Stadium*

Athletic Field

Stage I ~ Improve the Dugouts and Bleachers

The customer requested bleacher like seats with ADA accessible ramps. The bleachers will be moved 10 feet forward to decrease the distance between home plate and the backstop. A bathroom will be attached to the back of the bleachers with a composting toilet.

Stage II ~ Install Turf

To increase the length of the outdoor baseball season, the customer desired a turf field. Team Four analyzed the carbon footprint of installing turf and compared it to the carbon footprint of maintaining a natural turf over the next twenty-five years.

Stage III ~ Add Student Section and Players' Lounge

The last stage includes adding a student section along the right field foul line as well as a players lounge behind the home dugout for team events. These additions will be constructed if funds allow.

Carbon Emissions Calculator

The carbon footprint of the project can be divided into three parts. This is depicted in Figure 2.

Figure 2: *Project Carbon Footprint*

An Excel workbook was created to track the carbon footprint of each step. Embodied carbon includes the amount of carbon emitted beginning with the extraction of a raw material and ending when it leaves the factory gate ready for installation. Onsite includes the carbon emitted transporting materials and machines to and from the work site as well as using machines on the construction site. The Use of Field section encompasses the carbon footprint when the field is in use.

Since the project is still in the theoretical stage, and there isn't an extensive materials list, it was difficult to produce an embodied carbon footprint calculation. Instead, the Onsite and Use of Field sections were the focus. The team decided to use the calculator to analyze the onsite carbon footprint for installing the new turf field and compare it to the carbon footprint of using a grass field.

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Carbon Footprint Analysis

Figure 3 shows that after five years the turf field will start to emit less carbon than natural grass even with reinstallation of the artificial turf every 12 years as suggested by the manufacturer. However, the analysis only includes the one necessary maintenance tasks that the artificial field will require over its lifespan.

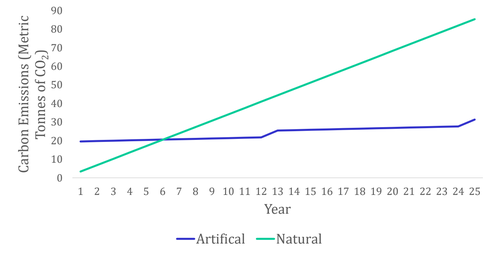

Figure 3: *Carbon Footprint of Installing Artificial Turf and the Maintenance of Natural Grass Over 25 Year Lifespan*

The group recommends that Calvin investigate the embodied carbon emission as well as update the data for the maintenance of artificial fields to determine more accurately the carbon footprint of a turfed baseball field.

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