



Executive Summary

Prefabrication Depth

The major theme of my thesis will be prefabrication and the building façade. I intend to perform detailed research to investigate its current state in the modern day industry. Prefabricated systems have been around for a while, but I feel that many groups are unsure of how to utilize them to their utmost advantage. By looking at case studies, peer reviewed articles, and industry opinions I will determine some of the best applications of prefabricated brick systems as well as shed light on some cutting edge technologies that have not yet reached the masses.

Analysis 1: Precast Panel Implementation

As part of my prefabrication research I will redesign the façade of Wisconsin Place Residential to be a prefabricated brick enclosure. The reasons for doing this include the site congestion, coordination issues, and schedule constraints. My prefabrication research should help me select the optimum choice for the building. Embedded in this area is my structural breadth. The connection details for the precast panels to the post-tensioned slab will be designed and methods to improve the moisture resistive and thermal characteristics of the envelope were investigated, as these are areas of concern with prefabricated materials. A schedule and budget review will determine the feasibility of construction. All of these results will be processed to make a final recommendation of changing to precast.

Analysis 2: Photovoltaic Glass Replacement

A class about building envelopes brought me to the idea of using photovoltaic glass as a way to convert solar energy from the sun into electrical energy for the building. Yes, this solar cell glass is more costly than regular, but its benefits can greatly pay off over time. This analysis will look at the energy benefits to utilizing PV cell panels in a functional manner as windows. The idea is to replace all of the foot-level glass panels with PV glass since they will not obstruct the view from the apartments. As my mechanical breadth, I will use the software program Energy10 to determine the energy savings per year from adding these PV panels to the façade. The cost of implementing the PV panels will be considered. After taking all of these factors into consideration, I will make a final decision and recommendation for the energy-saving system.



Wisconsin Place Residential
Chevy Chase, MD

Jenna Marcolina
Dr. Horman

Construction Management
Advisor

Breadth Studies

Breadth 1: Precast Façade Structural/Thermal Analysis

I am proposing to change the façade of Wisconsin Place from stick built to precast panels in an attempt to reduce the schedule time and site congestion. The panels must tie into the post-tensioned slab, so I will be designing all of those connections. In addition, I will design a typical bolt and angle connection. I also will perform thermal calculations to determine the R-value of my proposed panels versus the original stick-built system. I then will calculate the summer cooling and winter heating loads. As my construction analysis, I will look at the cost and schedule impacts of changing the structural system.

Breadth 2: PV Glass Mechanical/ Life Cycle Cost Analysis

I am proposing to replace the glass curtain wall glass with photovoltaic glass, silicon-coated panels that convert solar energy from the sun into electrical energy that can then be used to power the apartment building. I will calculate the cost of both regular and PV glass from its initial purchase to its removal to determine the most cost effective choice. I will calculate the amount of energy savings per year achieved by using PV glass instead of regular glass. To relate back to my overall theme of prefabrication, I will determine whether the PV glass exterior is better constructed stick built or prefabricated into a window frame. I will determine the cost and schedule issues associated with each method.