Thesis Portfolio

Reston Site Redevelopment Project
(Technical Project)

Morally Imagining Implications Induced on Forests by Mass Timber Construction
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
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Michael Peyton Rice
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Department of Engineering Systems and Environment

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Sociotechnical Synthesis

The Reston Site Redevelopment Project is an open-ended and collaborative effort by my capstone team. Located in an urban northern Virginia site linked to the DC WMATA Metro Silver Line, the project's intent is to redesign the property so that it can match the surrounding area's densification trends due to economic incentive for the developer. The required components of the project consist of a site concept plan including storm water, utility, circulation, and landscape considerations, an architecture model which was used to draft floor plans, elevations, and renderings, and construction documents outlining the project costs and phasing plan. Comprehensive in nature, this project requires consistent forethought and reflection of all design decisions in order to address the complexities stemming from project criteria, such as LEED certification and an emphasis on transit-oriented development to name a few. The technical report in this portfolio, deemed a project narrative by the team's faculty and industry advisors, details the capstone project's final plans and analysis.

The research paper within this portfolio serves as a baseline explanation of mass timber construction and an analysis of this green technology's failure to be implemented sustainably in the United States due to a lapse in understanding between the A/E/C industry and forestry. Through moral imagination, a holistic analysis behind the life cycle of engineered wood products contributes to increased effectiveness of mass timber construction as a sustainable market in America. This paper discusses why the public is wrong to believe that net forest growth is a good measure of the health of the natural environment. Moreover, the proper proportioning of plantation forests and natural forests is emphasized as an important factor in the mass timber industry.

While the application of mass timber construction was not explored extensively in my technical project, several aspects of biophilic design, rooted in my analysis of engineered wood products, were implemented in order to approach sustainable measures. As the reader will come to learn in the technical report within this portfolio, various studies around the world have shown that humans who interact with physical spaces featuring organic material, such as timber, reap health benefits from occupying these environments. Whether it be increased levels of productivity and happiness due to better mental health or long-term financial health savings due to decreased levels of blood pressure, the advantages of creating spaces that encourage human interaction with nature are concrete and efficacious. Due to the societal health considerations generated by the built environment, my capstone group decided to invest sustainably into the facades of the project's residential and commercial towers. Building skins are the largest differentiator in project cost, all else being equal, so the decision to pursue a more expensive option should be well justified. Exterior Insulation and Finish System (EIFS) is commonly used for building facades because its performance, economy, and visual similarities to stucco. Despite an upfront cost increase, my capstone group selected an EIFS with timber graining in order to achieve the aesthetic quality of wood with the intention of creating a healthier environment for apartment and office tenants. Furthermore, my capstone group inserted several other biophilic features for the same purpose. All of the residential towers and one of the commercial towers have green roofs that can be accessed by terraces. These spaces advocate for interaction with flora that can be enjoyed by all tenants. Additionally, the pop-up retail shops and green amphitheater in the central plaza as well as ample and diverse tree coverage throughout the site bolster the project's sustainability efforts.