Research Facility Core and Shell| Southern California

THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF ARCHITECTURAL ENGINEERING

Research Facility Core and Shell- Prefabrication of Exterior Façade, Solar Panel Implementation, and Integration of Mobile Technology in Construction

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Abstract

This report details three technical analysis areas that investigate the means and methods of construction utilized for the construction of the facility titled "Research Facility Core and Shell (RFCS)" which is located in Southern California. The building is a 130,000 SF, 4-story with underground parking garage, mixed use laboratory and office space. The three areas of analysis aim to provide a better final product by decreasing cost and schedule duration, increasing sustainable solutions, and utilizing technology to save time and increase construction quality.

Technical Analysis 1: Application of Prefabricated Wall Panels with Detailed Sequencing

The original exterior façade of RFCS utilizes stick-built construction where the walls are constructed in place. In this analysis two forms of prefabrication techniques are investigated in the effort to decrease cost and schedule of the exterior facade. These two forms of prefabrication include a fully prefabricated Clark Pacific architectural precast concrete panel system and a partially prefabricated system where the metal studs and sheathing are built on site as panels, raised into place, and then completed as if stick-built. After cost, schedule, constructability concerns, and project requirements were addressed; the system chosen was the partially prefabricated system. When compared to the original stick-built construction, this system saves $5,953 in costs and reduces the overall project schedule by three weeks.

Accompanying this analysis is a detailed schedule report demonstrating the specifics of the modularization breakdown, the panel construction, and the erection sequence of the panels. Diagrams and virtual mockups are provided to help demonstrate this process.

Technical Analysis 2: Solar Panel Installation at Roof Level

Owner interest in installing solar panels at the roof level of RFCS to achieve LEED Gold Certification drove the analysis and design of this 47,000 kWh, 143 module, TrinaSolar array system. This system has an initial direct cost of $180,534 and a lifecycle payback term of 14 years once incentives and annual energy cost gains were accumulated. Installation of this system is scheduled to take approximately four weeks if implemented.

Technical Analysis 3: Mobile Technology Integration- Tablet Computers

Tablet computer technology is beginning to provide a platform which enables processes required for construction management to be made more efficient. This analysis examines case studies of mobile technology integration on various projects in an effort to apply the appropriate implementation to RFCS. The uses of mobile technology appropriate to RFCS are: accessibility to drawings in the field, coordination in the field, documenting field issues, email and correspondence, safety evaluations, and daily forms and checklists. Based on the case studies and rates specific to RFCS, the project stands to save $1,668 per week or $116,272 over the span of the entire project in on-site management costs while increasing quality, efficiency and customer service.