

South Halls Renovation: Ewing-Cross

University Park, PA



Penn State Architectural Engineering Senior Capstone Project
 Quaid Spearing | Construction Option
 Advisor: Dr. Anumba



BUILDING STATISTICS

- Size:** 71,002 GSF
- Stories:** Four plus Basement
- Function:** Residential & Assembly
- Construction Dates:** May 2013 - Dec 2013
- Delivery Method:** Design-Build
- Project Cost:** \$15.2M
- Total Project Cost:** \$94.1M GMP



THESIS OVERVIEW

- Focus on schedule acceleration through offsite construction to promote a safer jobsite and higher quality project.
- Ewing-Cross is one of four identical dormitory renovations, meaning that analyses can be applied to all, multiplying savings.

MODULAR BATHROOMS

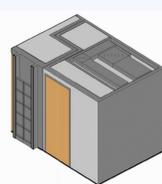
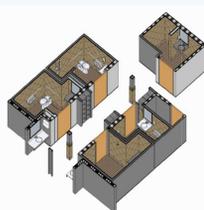
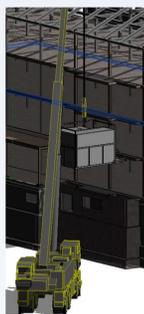
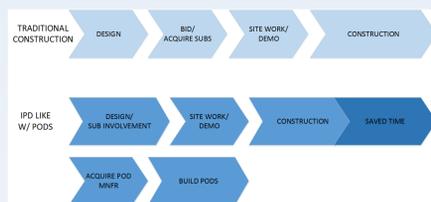
Goal: Improve quality of bathrooms through modularization, while also reducing construction schedule.
Planning & Procurement: Would acquire services of bathroom pod manufacturer to build bathrooms offsite.

Design Evaluation: Reduce number of layouts to increase fabrication productivity and drive down design fees.

- Reduced pod layouts from 10 down to 6
- Maintain ADA code compliance

Results:

- Contractor can complete punchlist sooner, while increasing quality
- Safer work environment
- Moving bathroom construction offsite would save \$122,000
- Accelerate bathroom construction by 4 weeks

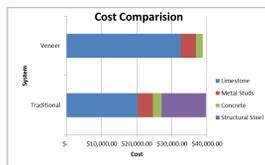


Construction Method	7/29	8/5	8/12	8/19	8/26	9/2	9/9	9/16	9/23	9/30	10/7	10/14	10/21	10/28	11/4
Stick-Built															
Modular Pod Cross															
Modular Pod Ewing															

PREFABRICATION OF LIMESTONE FACADE

Goal: Compare the cost and installation time of traditional limestone to the Stonepanel system, and then analyze the potential to move the construction of the limestone wall assembly offsite.

Wall Selection: Ultimately, the Stonepanel was cheaper, due to the lower structural requirements for installation.



Prefabrication Process

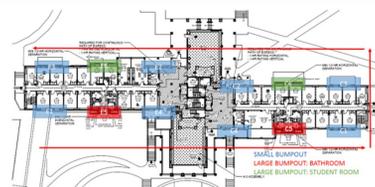
The Limestone bumpouts were then designed as modules for efficient fabrication

An offsite warehouse was selected for the fabrication, and a SIPS was developed for the offsite construction.



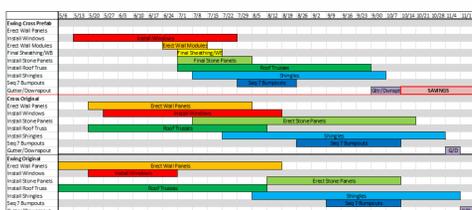
Installation

- A new sequence plan was developed for the installation of the wall modules
- Module details were developed in CAD to fully understand how vapor and thermal barriers would be installed.



Results

- Prefabrication would accelerate the enclosure schedule by 26 days
- A total savings of \$175,000 is possible through prefabrication, mainly due to increased productivity.

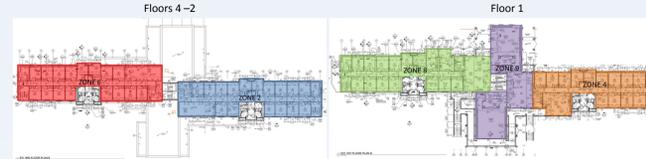


SIPS FOR STUDENT ROOMS

Goal: Implement Short Interval Production Schedule for Student Rooms in an effort to promote earlier turnover to owner.

Approach

- Divided building into 9 zones (5600 SF each); would follow a top-down sequence.



SIPS

- Adjusted Crew Sizes to achieve 5 day duration; with Saturday serving as catchup day
- Parallel production of Ewing and Cross

Results

- No additional costs incurred b/c manhours remained equal
- 10 day schedule acceleration
- Allow owner to begin FF&E sooner, simplifying turnover by reducing time that owner & contractor occupy same space.

Area	2013																							
	June			July			August			September			October			November			December					
Zone 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Zone 9	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

- Layout and Top Track
- Perim. Bedroom Piping
- Finish GWB
- FCU & Mech Trim Out
- Final Paint
- Final Clean & Punchlist
- Owner FF&E

MASTER PHASE RESEQUENCING

Goal: Renovate multiple buildings at once to accelerate schedule and allow owner to move in sooner

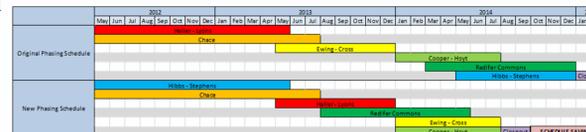
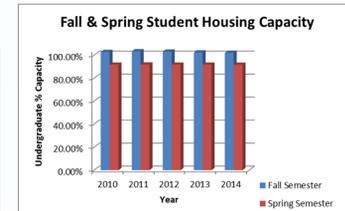
Process

- Analyzed Penn State Capacity to take down two 2 dorm buildings
- Determined Spring is best time to do so (1000-1200 fewer students)
- Increased project management staff to handle two renovations simultaneously

New Phasing

- Left to Right flow, with Ewing-Cross and Cooper-Hoyt renovated together
- Redifer would serve as a buffer for P2 construction
- Eliminate temporary landscaping between Haller-Lyons and Hibbs-Stephens

Current Phase 2 Staffing	Proposed Phase 2 Staffing
Project Director	Project Director
Project Manager	Project Manager
Project Engineer	Senior Project Engineer
Senior Superintendent	Project Engineer
Project Technician	Senior Superintendent
Intern	Field Superintendent
-	Field Superintendent
-	Project Technician
-	Intern
-	Intern



Results

- 5 month schedule acceleration
- Would add \$31K to General Conditions; but PSU can generate \$1.3M in Revenue