Onward and Upward
Case Study of a Hospital Vertical Expansion Project

Tuesday, October 2, 2012
11:15 AM – 12:45 PM

Learning Objectives

1. Explanation of analysis of Vertical versus Horizontal Expansion and how project was conceived.
2. Discussion of unique solutions created by design team to counter challenges of vertical expansion.
3. Discussion on unique challenges faced by the construction team in building vertically over an active hospital.

Presenters

Nick Slater
Principal, MSKTD & Associates, Inc.
Project Architect during project

Patti Hays
Senior VP, Lutheran Health Network
Acting COO during project

Mary J. Schafer
Nurse Consultant
MSKTD & Associates, Inc.

Michael Bluhm
Weigand Construction Company, Inc.
Project/Construction Manager

Lutheran Hospital of Indiana

- Constructed in 1904
- Replacement hospital opened in 1991
- Tertiary care facility serving Northeastern Indiana, Northwestern Ohio and Southern Michigan
- Bed Count: Approx. 400
- Level II Trauma Center
- Only Heart transplant center in region.
Lutheran Hospital of Indiana [expansions over time]
1. Medical Office Building 1
2. Medical Office Building 2
3. Cancer Center
4. Heart Pavilion
5. Orthopedic Hospital
6. Neurospine building
7. South Parking Structure
8. North Parking Structure
9. ER Expansion
10. Numerous Medical Office Buildings

Original Project Goals [original study]
Primary:
Initial expansion of bed count will give “breathing room” and allow future conversion to all private rooms on lower floors.

Secondary:
Review options to provide 100+ new private monitored beds to expand cardiac services.

Options Considered
Option 1 – Vertical Expansion
- 5th Floor – 60,000 sq. ft. – 96 Patient Rooms
- 6th Floor – 71,600 sq. ft. – 48 Patient Rooms + Shell

Option 2 – Horizontal Expansion
- 1st Floor – 31,600 sq. ft. – Shell space
- 2nd Floor – 38,000 sq. ft. – 48 Private patient rooms
- 3rd floor – 38,000 sq. ft. – 48 private patient rooms
- 4th floor – 38,000 sq. ft. – 48 private patient rooms. (2 units)

Option 1 [advantages] vertical
- Wayfinding/Circulation
- Image/Identification of Hospital on campus
- Preserve existing helipad location
- Staff Efficiency
- Good stewardship of campus for future growth.

[Estimated construction Cost: $25-42 million]
Option 1
[disadvantages] vertical
- Structural Issues with current Seismic Requirements
- Existing building disturbance during construction, shut downs, patient and staff inconvenience
- Limitations with existing building footprint
- Difficulty to locate multiple tower cranes without blocking entry points.

[Estimated construction Cost: $25-42 million]

Option 2
[advantages] horizontal
- Potential for branding service line
- Less disruption during construction
- Overall constructability.
- Construction Schedule
- Potential for improved patient room layouts
- First floor space gained.
- Utilities?

[Estimated construction Cost: $40 million]

Option 2
[disadvantages] horizontal
- Campus Clutter – visibility of hospital on campus.
- Wayfinding - yet another hospital entrance
- Increased parking requirement
- Paying for First Floor space not needed
- Difficult to connect to existing tower
- Emergency Department/Helipad Disruption
- Obscured visual access adjacent bldgs.
- Potential loss of efficiency for Nursing/Support Staff.

[Estimated construction Cost: $40 million]

Chosen Solution: Option 1

Modifications:
- All brick façade
- 5th floor only
- Added Interstitial Space
**Design Phase - Scope Overview**

- 58,700 sq. ft.
- 72 monitored beds
- 24 Cardiac Intensive Care Rooms
- $25 Million Construction Budget
- $45 Million Total Project Budget
- 24 Month total design/construction schedule.

**Vertical Expansion – Unique Design Challenges**

1. Minimize shutdowns of existing services during construction.
2. Allow use of 6 elevators at all times.
3. Meet current seismic requirements
4. Improve room layout given footprint limitations.

**Design Challenge 1:**
Minimize Shutdowns on Fourth Floor

**Solution:**
Create Interstitial Space between roof and new floor structure for utilities.

**Design Challenge 2:**
Allow use of 6 elevators at all times.

**Solution:**
Build new elevated machine rooms prior to beginning elevator shutdowns.
Design Challenge 3:
Meet current seismic requirements
**Solution:**
Reinforce bays in lower section of existing building to improve lateral resistance prior to construction.

Design Challenge 4:
Improve room layout given footprint limitations. Provide 24 bed patient units on each pod.
**Solution:**
Develop new floorplan to maximize room sizes and improve standardization.

**Vertical Expansion – Unique Construction Challenges**
1. Safety and Logistics
2. Minimize disruptions caused by cranes.
3. Allow use of 6 elevators at all times.
4. Erect new steel while maintaining water tight envelope.
5. Install new brick elevated façade
6. Transport personnel and supplies to elevated jobsite without disrupting hospital
7. Construct new helipad because of crane conflict.
8. Maintain existing HVAC function.

**Vertical Expansion - Construction Overview**
Overview

Construction Challenge 1

Safety and Logistics
1. Implement an infection control and interim life safety program that takes into account all aspects of patient care
2. Alter patient and staff access to facility
3. Create safe passage for ambulance traffic and Lutheran Air service
4. Moisture infiltration prevention
5. Fire protection
6. Material hoisting
7. Sound control

Site Logistics
Construction Challenge 2:
Minimize disruptions caused by cranes.

Solution:
Remove existing stairway and install tower crane in existing central shaft.

Crane Pics

Crane Tie In and Removal

Construction Photo
Construction Challenge 3:
Maintain use of 6 elevators at all times by facility.
Solution:
Build new elevated machine rooms prior to beginning elevator shut downs and phase elevator installation.

Elevator Extension Progress Photos

Construction Challenge 4:
Maintain waterproof building envelope during steel erection.
Solution:
Temporarily flash/boot each new column as it was welded in place.

Water Infiltration
**Water Infiltration**

**Construction Challenge 5:**
Install brick veneer on elevated façade.

**Solution:**
Use Hydraulic Lift system mounted to temporary steel cantilevered from new structure.

---

**Hydromobile Scaffolding**

**Construction Challenge 6:**
Transport personnel and supplies to elevated site without disrupting hospital.

**Solution:**
Install temporary exterior stairs and material lifts to supplement tower crane.
Construction Challenge 7:
Relocate Helipad because of conflict with tower crane.
Solution:
Build “temporary” helipad in hospital parking lot and certify with FAA/INDOT.

Construction Challenge 8:
Maintain hospital Exhaust system while building expansion.
Solution:
Construct new mechanical rooms and reconnect exhaust prior to demo of old mechanical rooms.

Mechanical Rooms

Process Photos
Process Photos

Questions???