Transition from Construction to Maintenance: A Case Study of Building a Survey Ready Hospital

University of Texas Medical Branch (UTMB), Galveston, Texas
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UTMB Jennie Sealy Hospital Project Team
The Transition from Construction to Maintenance

A Case Study of Building a Survey-Ready Hospital

Dennis Ford has served in Health Care Facilities Engineering for over 20 yrs. He received his degree in Civil Engineering through the Air Force ROTC program and started his career at Eglin AFB Regional Hospital as a Clinical Engineer. While in the Air Force, Dennis served in facility management roles and also at Headquarters where he led the development of a Computerized Maintenance Management System (CMMS) currently used at all military hospitals (DMLSS-FM). Before arriving at UTMB in Galveston, TX, Dennis served as Director of Facilities at Baptist Health System in San Antonio and had previously served as a healthcare facilities management consultant. Today, Dennis is managing the healthcare facilities program at UTMB Health, which is expanding from 2 MIL SF to 4 MIL SF as new hospitals and clinics are built and activated.
Audience – Who are you?

- Facilities Management (owners)
- Hospital Administration (owners)
- General Contractors
- Architectural/Engineering (A/E) Firms
- Software Firms
- Consultants (LSC, EOC, FM…)

AGENDA

- University of Texas Medical Branch: Who & where we are
- Building two new hospitals
- New buildings to be “Survey Ready Day One”
- Survey Ready Requirements
- How we got started
- Justification
- Bringing it all together – A General Contractor perspective
- Processes, protocols, formats
- Commissioning
- Handoff to Maintenance
Who and where we are:

The University of Texas System

Who we are: UTMB Health

- Established 1891
  - First Medical School West of the Mississippi

- Primary Mission
  - Health Sciences Education
  - Medical Research
  - Health Care Services

- Patient Services
  - 5 Hospitals (2 of which are under construction)
  - 62 Clinics
  - 481 staffed beds (plus 271 beds under const.)
  - UTMB Medical Center (Galveston)
  - Texas Department of Criminal Justice (TDCJ)
  - UTMB Angleton Danbury Campus (ADC)
  - UTMB League City Campus (LCC)
  - Jennie Sealy Hospital (Under Construction)

12,126 employees
Where is UTMB Health Located?

Galveston, TX

Major Projects in Progress

<table>
<thead>
<tr>
<th>Project</th>
<th>Budgeted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jennie Sealy Hospital</td>
<td>$438 million</td>
</tr>
<tr>
<td>Clinical Service Wing</td>
<td>$128 million</td>
</tr>
<tr>
<td>District Heating &amp; Cooling</td>
<td>$289 million</td>
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</tbody>
</table>

Total Budgeted Cost: $1 billion
Jennie Sealy Hospital and Clinical Services Wing (CSW) -- $566 MIL

1 Million SF

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UTMB Health League City Campus Hospital & Modular Central Plant

Major Projects in Progress

<table>
<thead>
<tr>
<th>Total Budgeted</th>
<th>$ 90 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victory Lakes Clinic Expansion</td>
<td>$ 82 million</td>
</tr>
<tr>
<td>Central Utility Plant</td>
<td>$ 8 million</td>
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</tbody>
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TAHFM
New Buildings to be “Survey Ready Day One”

- UTMB Owner Requirement
- Pertains to The Joint Commission (TJC) Environment of Care (EOC) Standards
- Includes Emergency Management and Life Safety
- If TJC showed up on the first day the new hospital sees a patient, what would they look for under the EOC standards?
  - Safety and Security
  - Hazardous Materials and Waste
  - Fire Safety and Life Safety
  - Medical Equipment
  - Utilities → Main focus of presentation
  - Emergency Management
"Survey Ready" Requirements

- Review EOC Management Plans to understand how the owner manages to the EOC requirements, i.e., how they conduct business
  - Safety Management Plan
  - Security Management Plan
  - Medical Equipment Management Plan
  - Utilities Management Plan
  - Life Safety Management Plan
  - Written Fire Response Plan
  - Fire Drill Policy and Evaluation Plan
  - Emergency Operations Plan (EOP)
  - Internet Communications Failure Plan
  - Telecommunications Failure Plan
  - Hazardous Materials and Waste Management Plan
  - Spill Prevention Control and Countermeasures Plan
  - Normal Power Failure Plan
  - Emergency Power Failure Plan
  - Boiler/Steam Failure Plan
  - Water Failure Plan
  - Sewer Failure Plan
  - Medical Gas Failure Plan

- What NFPA version has the site adopted and/or building to?
  - UTMB adopted the 2012 version of NFPA 101

"Survey Ready" Requirements

- Conduct a Pre-Construction Risk Assessment (PCRA)
  - Completed during the planning phase and revisited as the project progresses
  - The PCRA identifies hazards that could potentially compromise patient care and/or place others at risk including the following areas:

- Develop a Clean Construction Site Protocol
  (More on this later)

- Review the following:
  - Roof access and fall prevention requirements/policy
  - Smoking policy (non-smoking campus – Everyone)
  - Confined space inventory and entry requirements/policy
  - Security and Safety Risk Assessments
  - Hazardous Materials Inventory and Policies
  - MRI/Radiation Safety Policies & Energy Sources Procedures
“Survey Ready” Requirements

• Review Hazard Vulnerability Analysis (HVA)
  - The organization identifies potential emergencies and the direct and indirect effects that these emergencies may have on its ability to provide services.
  - The organization determines what its role will be, if any, in the community response plan.
  - The organization defines emergency mitigation activities.
  - The organization will have a plan to maintain services during an emergency without community support for a period of 96 hrs (Emergency Operations Plan)
    - Communications
    - Security and Safety

• UTMB Health Galveston Campus HVA
  - Hurricanes (high winds and flooding)
  - Cut off from local community (one main bridge onto/off of Galveston Island)
  - Loss of utilities (electricity, natural gas, domestic water, waste water)

“Survey Ready” Requirements

• What project requirements are related to the UTMB Health Galveston Campus HVA?
  - All occupancies and utilities at or above 25 feet Mean Sea Level (MSL)
  - All exterior walls, doors, and windows rated above 140 mph wind loads
  - Exterior features to be salt water weather proof (longer life and reliability)
  - N + 1 Redundancy in Emergency Power Generators
  - Quick Connects to maintain N + 1 when generator issues are experienced
  - Campus requirement for at least 8 hrs day tank run time
    - NFPA limits fuel within a building to 660 gallons *provides less than 2 hr run time*
    - Need redundancies in fuel supply, i.e., extra external storage and/or fuel lines/pumps
  - Connections for external domestic water (activation of near by water tank)
  - Stringent water filtration requirements (lessons learn from hurricane Ike flooding – Sep 08)
  - Redundant utility feeds to the building (central loop with multiple central plants)
  - Connections and location for portable backup liquid oxygen (specific to building)
“Survey Ready” Requirements

- Identify systems that can create an Immediate Threat to Health or Safety (ITHS) and perform Risk Assessments of these systems
  - Fire alarm system, sprinkler system, compromised exits
  - Emergency power supply system
  - Medical gas system and master alarm panel
- Cut Fire and Smoke Doors correctly
- Life Safety Code Drawings
  - Occupancy types
  - Smoke barriers/compartments
  - Required exits
  - Protected vertical chases
- Map of Utility Systems (to include shut off valves and areas served)
  - Mechanical/Electrical/Plumbing systems (i.e., one-lines)
  - Medical Gas systems
  - Fire Protection systems

“Survey Ready” Requirements

- Standardize Nomenclature for Required Equipment Inventories
  - Mechanical/Electrical/Plumbing systems equipment
  - Medical Gas systems equipment and devices
  - Fire Protection systems equipment and devices
  - Medical equipment and devices
- Utilities Equipment Inventories (M/E/P)
  - Inventory all equipment, systems and components
  - Follow owner supplied nomenclature for naming and numbering equipment
  - Understand the impact of failure of the equipment – needed for risk assessment
  - Identify redundancies or mitigation for equipment with high impact upon failure
  - Identify and protect equipment service areas (maintenance access to equipment)
  - Find out what Computerized Maintenance Management System (CMMS) the owner is using (or wants to use)
  - Define and establish a protocol for transferring equipment data captured by the project to the owners CMMS
  - Also, identify equipment that could be hard to replace in the future
“Survey Ready” Requirements

- Utilities Equipment Start-Up
  - Need facilities personnel to witness
  - Need ability to record and track issues
- Equipment Commissioning and Acceptance
  - Need facilities personnel to witness
  - Need ability to record and track issues
- Manufactures Suggested Preventative Maintenance (PM) tasks and schedules
  - Need to establish a maintenance baseline
  - Need to load PM tasks and schedules into owners CMMS
- Operations and Maintenance Manuals and Training
  - Need to provide manuals to maintenance, preferred to be linked to CMMS
  - Need to provide and store training videos
- These are some of the requirements provided to the Team.....

Data/Information Management Premise and Objectives

**Premise:**
- BIM is in common use by A/Es and contractors for large project design and documentation
- The information and data potential of BIM has expanded and can be included in the project deliverable documents
- UTMB and General Contractor can benefit from capturing additional information

**Objectives:**
- Achieve a basic understanding of the potential of BIM to benefit UTMB
- Focus on highest priority, easiest developmental path and least cost for this benefit
- Establish a data record that can be utilized and expanded with technological advances
- Redefine the contract as-built project deliverables
- Define BIM Requirements
- What is BIM?
What is BIM to UTMB?

- Building Information Management (BIM)
  - Standardize data nomenclature
  - Team is viewing same information; General Contractor brings subs together
  - Clash detection is available  \{(Revit (A/E) to Navisworks (GC)\}

- Owner defines the requirements!

Contractual Deliverables at Start

- Before “BIM,” Close Out Documentation was this:
  - Record Drawings – PDF and AutoCAD format
  - Record Specifications – PDF format
  - Supporting Documentation – PDF format:
    - O&M Manuals
    - Approved Submittals
    - Cx Documentation
    - Warranties
    - Certifications
    - Test Reports
How UTMB was Managing Data

- Independent Information Systems
  - Electronic Document Management System (EDMS)
  - Paper Drawings and Mark-ups
  - Space Survey and Management (Archibus)
  - Computerized Maintenance Management System (Maximo)

- Populating Information Systems manually after substantial completion creates additional cost and delay in accessing of information by facilities management.

Where do we want to go?

Options Analyzed:

- Maintain status quo - PDF’s and AutoCAD as-built drawings
- Develop receivable of editable as-built Revit model for all disciplines
- Utilize contractor-provided data to integrate into existing information systems
How do we get there?

• Focus on MEP elements that are currently scheduled on the construction drawings (air handlers, terminal units, pumps, fans, chillers, generators, automatic transfer switches, med gas equipment, etc.)

• Track building life safety systems, including fire protection, fire detection, fire barrier and egress systems.

• Utilize BIM software to provide a link between drawings and typical equipment submittal and O&M information with existing UTMB software systems.

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Virtual Design and Construction (VDC) – GC
Benchmark – Comparing projects
Kaiser Permanente Anaheim (2012)

• Decrease need for on-site workforce
• Improved safety performance
• Improved project schedule
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Uses for BIM/VDC
Streamlining construction
3D modeling

- Fab and pre-fab
- Layout and installation discipline
- Minimize changes

Space coordination
Clash detection
Sequencing

Do it once, do it right

GC Response to specific project needs:

- Level of Detail
- Maintenance Zones
- Collaborative Debriefs
NOW - Take it to the next level

- Define Owner’s desired data and format
  - Project Team’s PEP responds to
  - Owner’s ILM plan
- Select software solutions which respond to Owner needs
- Define information gathering and transfer plan
  - Start with the end in mind: Survey Ready

Track and Document QC Testing - Veo
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Track and Document Punch list – BIM 360

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BIM 360 – Construction Management Tool
Labeling and Power Source of Equipment

All equipment has a designated smart label on the conduit to determine circuit and panel feeding equipment.

Capture of Data in the Field – BIM 360
Protocols, Processes, and Formats

- Facilities Guidelines
- Integrated Lifecycle Management Protocol
- Clean Construction Protocol
- ASHE Commissioning Process

2010 FGI design guidelines used to establish Basis of Design

- Written specifically for Healthcare
- Establishes baselines and best practices while providing a good general overview
- Highly recognized by the Healthcare industry
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UTMB Integrated Lifecycle Management (ILM) Protocol

Integrated Lifecycle Management Objectives:

- Developed Pilot Program by establishing:
  - Roles and Responsibilities of Owner, Architect and Contractor
  - Scope of the pilot program including which equipment items and types of data is needed by Owner
  - Method of data collection and integration with Vela/BIM 360 Field, Maximo and Electronic Data Management Systems (EDMS)
  - Contract as-built project deliverables format with end user group input
- Issue BIM Protocol document
- Identify additional efforts that may be of benefit to UTMB
- Focus on highest priority, easiest developmental path and least cost for this benefit received
Integrated Lifecycle Management:

- Utilize the existing contractual receivables from the architect and construction managers of 2D as-built drawings
- Add the usage of a new database software system for integration of data into current CMMS and space management systems
- Improve access to operational and maintenance information
- Integrate information systems so that information is available immediately
- Decrease work order response time and increase efficiency
- Consolidate building life safety system components information in one database
- Improve client satisfaction by using readily available data in communications regarding facility

Clean Construction Protocol:

A Simple Checklist in BIM360 Field

- Infection Control Verification for the Construction process based on 2010 FGI
- Follows materials from factory to point of installation
- Elevated Level of Awareness for the design and construction teams
- Promotes increased safety through better housekeeping
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- ASHE Health Facility Commissioning Guidelines

- Transition to Operational Sustainability
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Data tracked and managed in BIM 360

Integrated Lifecycle Management:
- Roadmap to success for data transfer.
- Enter data into BIM360 Field including attachments
- Export data to CoBie format file
- Import to CMMS (Maximo)
- It took a lot of team effort and collaboration!
- It really works!
- Next slide is a process map……
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What Does the Handoff to Maintenance Look Like?
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Maybe not exactly like that!

**TIPS:**
1. Define requirements (*do not let “BIM” define you*)
2. Map out current processes (“As-Is”)
3. Review current processes for waste
4. Define future state (“To-Be”)
5. Define resources needed to obtain future state
6. Pick solutions that meet your requirements
7. Do not pick a solution, then change to meet the solution!
Any Questions?

Thank you for your time and your commitment to ensuring a smooth transition from new healthcare construction to operations and Maintenance with “Survey Ready” focus!