

2008 FIATECH CETI AWARDS

PROJECTS AS LABORATORIES:

Early Results from Sutter's \$320M Hospital Replacement Project in Castro Valley

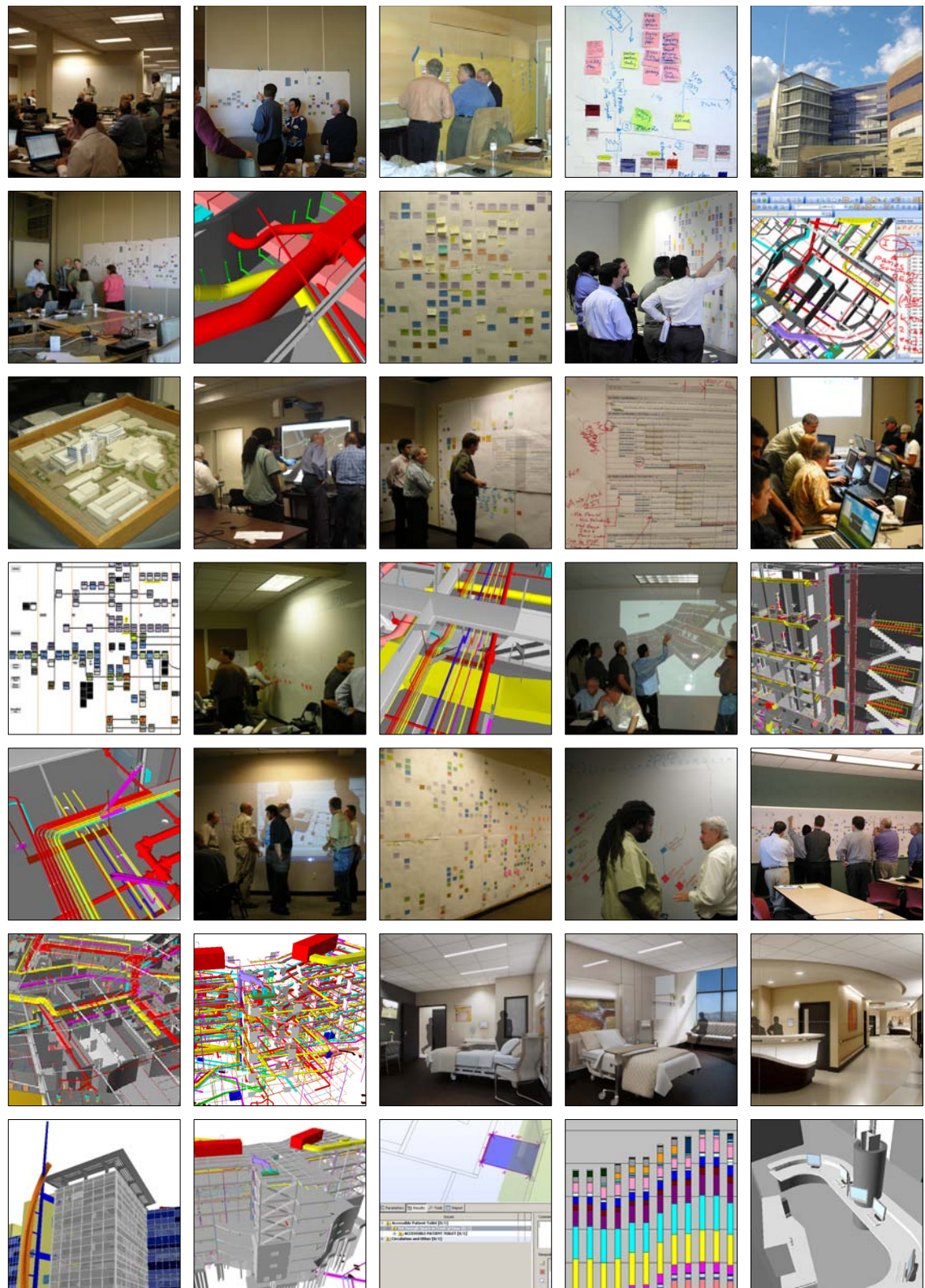
CETI ENTRY CATEGORY:

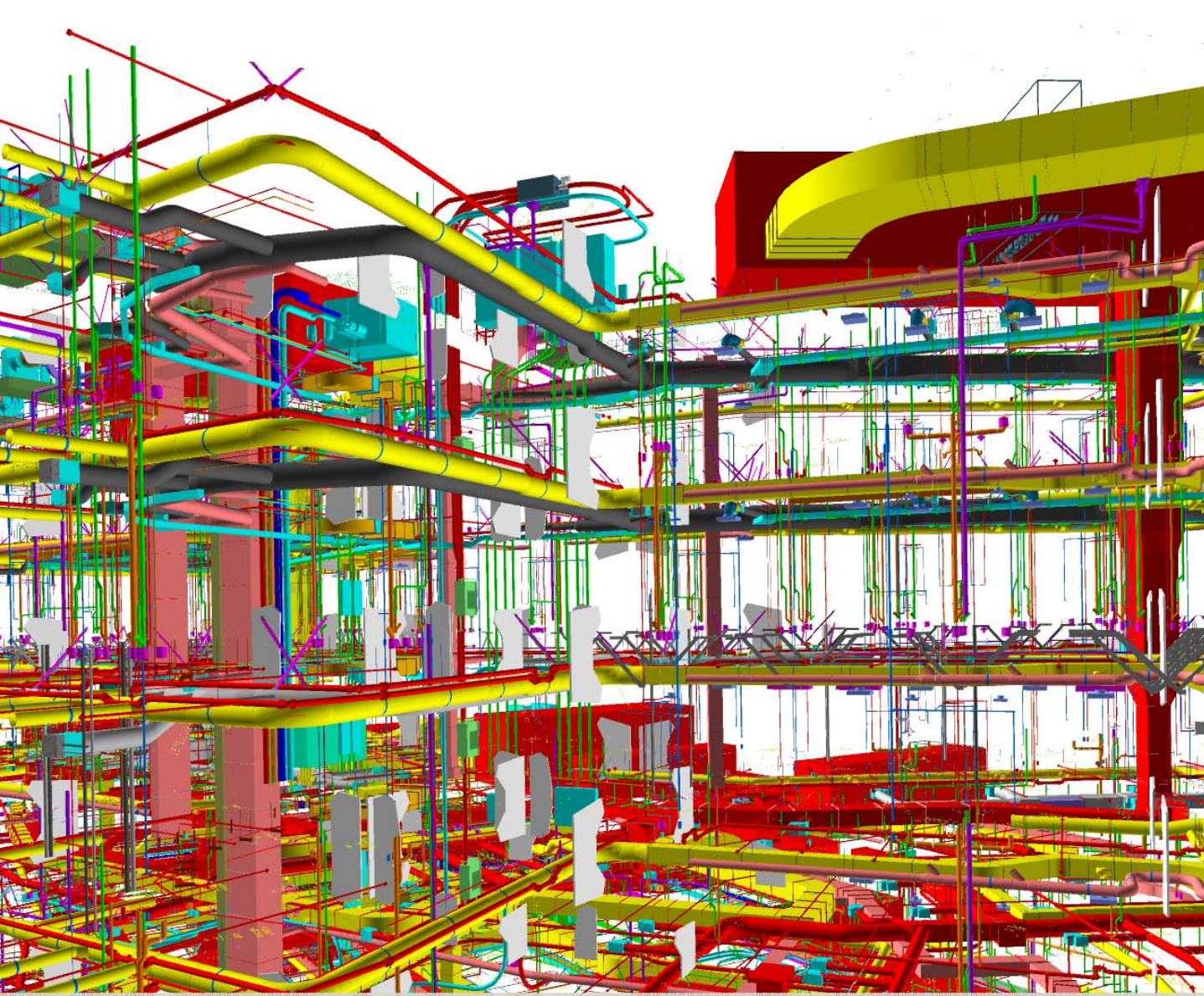
New & Emerging Technology Implementations – Scenario-based project definition and approach

DESCRIPTION

The focus of this CETI award submission is the Sutter Medical Center Castro Valley (SMCCV), a new 130-bed hospital, which will replace the current Eden Medical Center in Castro Valley, California. An Integrated Project Delivery (IPD) team that includes the owner, the design teams, the general contractor, and trade partners is working on designing and planning the construction activities for the \$320 million project.

The team is challenged to design and deliver a complex facility that will offer the highest standards of healthcare delivery and operational efficiency within an extremely accelerated schedule and aggressive budget targets. To achieve those goals, the team is utilizing various combinations of lean design and construction project management methodologies enabled by emerging 3D virtual design and assembly technologies to plan, design, coordinate, detail, fabricate, and pre-assemble the various facility components. Notable among those is Value Stream Mapping which enables the team to visually represent their workflow processes and continuously look for opportunities to streamline them to deliver value faster, better, and less expensively.





BUSINESS DRIVERS, CHALLENGES, RISKS, AND LIABILITIES

Demand on design and construction of acute and critical care hospitals in California is at its highest level in many years due to unprecedented state mandated deadlines to pass new seismic safety requirements. In response, Sutter Health - one of the largest health care providers in California - is undergoing a \$5.5 billion capital investment program between 2004 and 2012 with over \$1.7 billion already invested in capital improvements.

Embarking on such a large capital investment program is extremely challenging especially when historically such projects tend to finish late and over budget and in certain cases undergo extended litigation. Unsatisfied with the traditional approaches to project design and delivery, Sutter Health is demanding fundamental changes from its design and construction supply chains to work collaboratively, implement Lean Project Delivery (LPD), and adopt automated design and construction methodologies to eliminate handoffs and maximize efficiency.

To drive this change Sutter Health is implementing the Integrated Form of Agreement (IFOA) to replace traditional contracting methods on all its capital projects to promote high levels of collaboration across its design and construction value stream. Key project participants including the general contractor, the design architect, major consultants and trade partners are selected early and together with the owner they work collaboratively to define their approach to design and deliver a project that meets the owners goals, schedule, and budget.

SPECIFIC PROJECT CHALLENGES

- Design a facility for a new healthcare delivery model
- Highly accelerated schedule (fixed end date).
- Aggressive cost target.
- Challenging site conditions.
- Phased permitting approach use for first time.
- Not enough time to do a traditional design process
- High escalation costs (5-9% per year) in California.



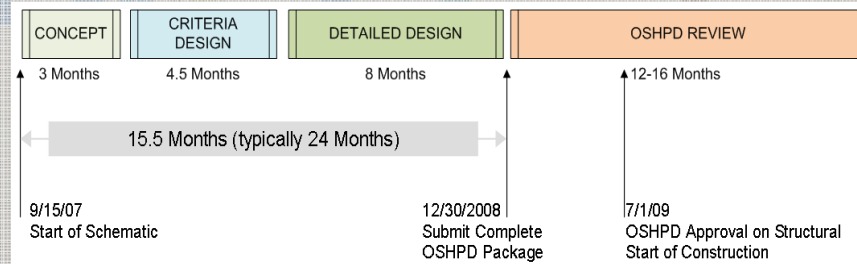
PROCESS, METHODOLOGIES, AND STRATEGIES

The team identified a number of tools and strategies to achieve the project objectives of delivering a facility right sized for the new healthcare delivery model within the constraints of budget and schedule. Notable among them:

1. **PROJECT AS LABORATORY:** to create opportunities to quickly assess various evolving tools and technologies and adopt what is appropriate to meet project goals.
2. **ELIMINATE ARBITRARY GATES and HANDOFFS:** including conceptual design, design development, and detailed design. Define processes that allow information to flow based on its downstream requirements.
3. **PLANNING AND PREPLANNING:** design not only the building but also the process of the design and construction to maximize flow of value. Identify appropriate points to make decisions and determine intermediate freeze points to release work early to the next stage.
4. **NETWORK OF COMMITMENTS:** once flow of value is understood (mapped and optimized) members of the team make commitments to each other to complete the released activities and remove constraints to release downstream activities.
5. **OFFSITE FABRICATION AND PRE-ASSEMBLY:** design with early and direct input from the fabricators to increase fabrication and pre-assembly efficiencies.
6. **BIM:** model as much as possible, coordinate constantly to increase reliability and certainty in the model data for fabrication and on-site assembly.
7. **AUTOMATION:** pursue direct digital exchange whenever possible including design, detailing, estimating, and automated fabrication.
8. **REAL-TIME ACCESS TO INFORMATION:** implement information management and document control systems that provide real-time access to all project information regardless of its authoring location, quantity, or file size.

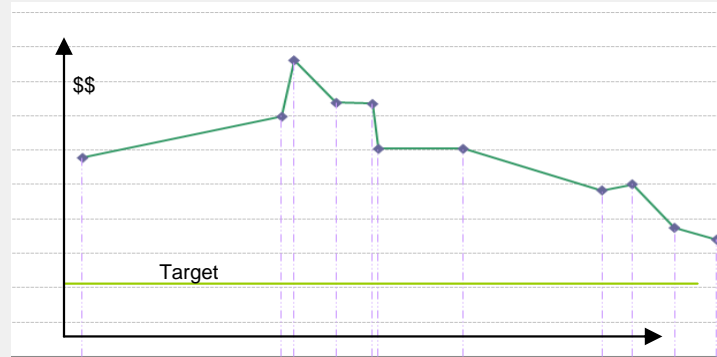


Typical time to design a comparable facility is 24 months. The team needed to deliver complete designs in less than 15 months to meet regulatory deadlines.

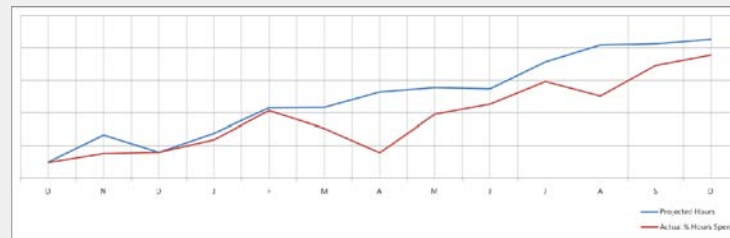


BENEFITS AND RESULTS / ROI

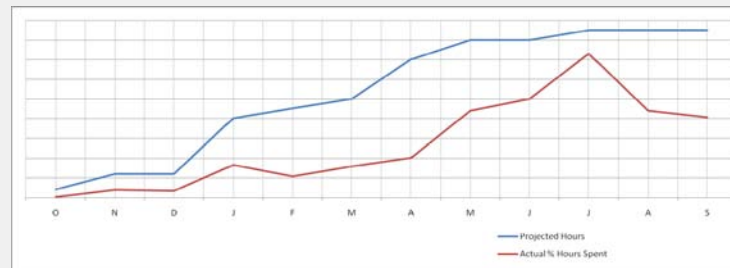
1. Planning and continuous evaluation of the plan as the design is progressing is increasing the quality and reliability of the information produced during design is accelerating decision making.
2. Value stream mapping the process identified last responsible moment to start facility design and provided the owner with five additional months to complete planning and programming and provide reliable information to the team to design without increasing the overall schedule.
3. Continuous design reviews via the 3D models is allowing the cross-functional team to contribute their best practices and iterate through the design more frequently early in the process to arrive at better solutions.
4. Reliability of the information in the models is enabling the team to extract automated quantity takeoffs frequently and more accurately. Estimating is done more frequently and in less time as the design evolves and quantities are further detailed and refined.
5. The structural design team and fabricator are implementing workflows to eliminate the need for 2D shop drawing submittals and reviews and replace them with model based reviews.
6. The mechanical team implemented and tested workflows to eliminate the need for 2D drawings entirely from early design to fabrication. Permit drawings will be produced when models are fully coordinated and the same models will be used for automated fabrication (see mechanical hours trending on right).
7. Original plan showed a minimum of 12 months to complete the structural construction documents (Actual 8 months).
8. Through continuous evaluation of the value stream and ability to identify and eliminate redundancy and waste in the system the team is able to continue to drive the overall project cost down without compromising quality (see graph on right).



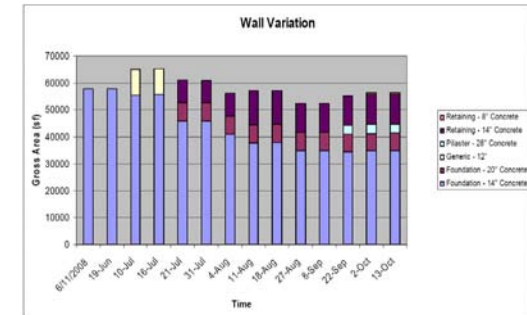
Monthly overall budget trending towards target budget



Monthly trending of architectural design hours against budget (Blue is budget, Red is actual).



Monthly trending of mechanical design hours against budget (Blue is budget, Red is actual).



Material quantity trending in preparation for automated estimating

LARGE TEAM AND GROWING

Integrated Project Delivery Team

Sutter Health, Owner
 Architect - Devenney Group
 General Contractor - DPR Construction
 Mechanical and Plumbing Design - Capital Engineering
 Electrical Design - The Engineering Enterprise
 Structural Design - TMAD-Taylor & Gaines
 Mechanical Design-Assist and Construction - Superior Air Handling
 Plumbing Design-Assist & Construction - J.W. McClenahan
 Electrical Design-Assist & Construction - Morrow Meadows
 Fire Protection - Transbay Fire Protection
 Lean and VDC Consultant - Ghafari Associates

Expanded Project Team

Structural Steel Design-Assist & Construction - Herrick Steel
 Structural Bracing Design & Construction - ISAT
 Pneumatic Tube System Design & Construction - Swisslog
 Operational Input - Eden Medical Center
 Owner Representative/Project Management - Sutter Health Facility
 Planning & Development, MPS Project Management
 Clinical Best Practices Consultant - Navigant Consulting
 Civil Engineer - Greenwood & Moore
 Landscaping - R. DeValle Ltd
 Stairways Specialist Installer - C.E. Toland
 Elevator Specialist Installer - Otis
 Roofing Specialist Installer - Alcal
 Fenestration Specialist Installer - Royal Glass
 Building Exterior Specialist Installer - Clark Pacific
 Interior Designers - McCarthy Nordburg
 Lighting Designers - Candela
 Vibration and Acoustic Design Consultants - Sparling
 Technology / I.T. / Low Voltage System Designers - Sparling
 Information Technology / Data - Sutter Health IT
 Medical Equipment Specialists - Criterion
 Commissioning Consultant - Capital Engineering
 Contract Handling / Legal Support - MHA
 Planning Software - Strategic Project Solutions
 Fire and Life Safety - Rolf Jensen & Associates
 Kitchen Design Specialist - Robert Rippe
 Clinical Space Program Consultant - Stephen Short Planning