



VELA SYSTEMS®

Barton
Malow

Connecting BIM to Commissioning, Handover and Operations

Solution reduces costs of handover and operations for owner and improves contractor efficiency

Maryland General Hospital (MGH) in Baltimore, Maryland, is best known for its reputation as a top-notch, university-affiliated teaching hospital. That reputation will most certainly grow with the completion of the \$57 million, five-story Central Care Expansion project that adds much-needed space, modern facilities and some of the industry's most advanced healthcare equipment.

While the addition of a cystoscopy room, a post-anesthesia care unit and larger operating facilities will certainly benefit doctors, staff and patients, it's the activities behind the scenes that may generate the most significant, long-term benefit to everyone.

As part of an innovative effort by the Central Care Expansion construction management team to drive the benefits of Building Information Modeling (BIM) and field-based tools beyond design and construction, MGH operations and maintenance staff are now implementing a comprehensive digital documentation, maintenance and



Maryland General Hospital, Baltimore, Maryland.

preventive care system that is literally changing the way they work.

Michael A. Plank, senior director for Support Services at MGH, says, "Patient care and safety is a top priority for all healthcare facilities. It's up to our facility managers to keep key building features such as fire suppression systems, fire warning, air handling and air exchange systems operating at top performance because these systems are vital to patient safety. Now we can better manage those systems with the tap of a pen on a Tablet PC."

Complex Connections

MGH serves some 100,000 patients a year in its 245-bed facility. First constructed in 1881, the hospital has more than 500 physicians and 1,400 employees providing a wide spectrum

of inpatient and outpatient healthcare services. In recent years, the hospital has experienced substantial growth in admissions, births, emergency room visits and outpatient visits.

In response, the hospital initiated the Central Care Expansion project, a 92,500 sq ft expansion, designed by Hord Coplan Macht with Barton Malow as the construction manager. The new five-story building attached to the existing hospital includes 15,534 square feet of renovated space and 77,000 square feet of new space. Features include eight new operating rooms, including one dedicated to ophthalmology; two dedicated endoscopy suites; one dedicated cystoscopy suite; a pre-surgical unit with 14 private patient rooms and two inpatient holding bays; and a post-

"It just makes sense to put this kind of system in place. It helps you run a much more efficient building."

—Michael Plank, Senior Director,
Support Services, Maryland General Hospital

anesthesia care unit with 20 recovery bays and two isolation rooms. A new intensive-care unit of 18 rooms with ceiling-mounted equipment gives doctors and nurses better access to patients.

There is also an updated pharmacy and laboratory, family-waiting areas with private consultation rooms and elevators designed to improve the movement of patients through the hospital.

Commissioning Concerns

As the Central Care Expansion project neared completion, Barton Malow's Corinne Ambler turned her attention to commissioning.

The new facility includes a vast array of indoor air handling units, chiller plant upgrade which includes two new 650-ton electric centrifugal chillers and 650-ton cooling towers, temperature and humidity systems as well as the necessary duct work, air handlers, dampers, and fans. The expansion also called for a new 2000 KVA normal power substation, a new 500 KW emergency generator and paralleling switchgear, three new automatic transfer switches and distributions. As well, all new systems must be coordinated with the existing mechanical and electrical systems.

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—Corinne Ambler, Project Engineer, Barton Malow

Ambler's job was to gather all the closeout documentation and maintenance information about the mechanical systems to pass along to MGH. She says, “Commissioning typically creates binders and binders of information that are not easily managed and updated. There is data from the mechanical, electrical, product manufacturers, and many others. Typically, we scan hundreds, if not thousands of documents just to create the commissioning books.”

As part of this effort, Ambler also spent a lot of time with the MGH facilities group only to find a much greater problem.



Field superintendents used Vela Systems on Tablet PCs for Commissioning, QA/QC, Punchlist, and Handover to the Owner.

MGH's Plank says, “Everything is paper-driven. Our current asset management practices do not optimize equipment lifecycles, minimize operating costs or efficiently use staff time. Not all equipment requiring maintenance has been inventoried and therefore maintenance staff is forced to make repairs, which reduces the amount of time available for preventative maintenance and creates a reactive environment with increased costs.”

Ambler recalls, “It seemed we could leverage the BIM technology that had already been put in place during the design and construction process, and field-ready solutions such as Tablet PCs and field software to streamline commissioning and create real value to the owner.”

The mechanical contractors involved in the project had already put together a 3D model of the new mechanical systems as part of the fabrication and construction process.

“That seemed like a good place to start,” says Ambler.

Model Basics

Created in Tekla Structures, the 3D model is fairly simply, indicating mechanical system locations with rough geometry. The model provided the construction team valuable insight into space and movement limitations.

“The value of the mechanical systems model is in the connected data and documents,” says Ambler. “Keep in mind that mechanical system coordination is difficult to do on a new building. This is a long-existing city hospital that requires many new mechanical systems that must connect to the existing systems.”

Her vision went beyond delivering electronic product cut sheets and owner's manuals. The goal was to create an

electronic centralized database that compiled field-generated data gathered during construction with electronic closeout files. Then, using the mechanical systems 3D model, we can associate all documents with the relevant mechanical system component to maximize intelligence and utilization of data throughout commissioning and into facilities maintenance procedures.

Ambler adds, "I wanted the ability to manage the mechanical systems commissioning process in the field or in the office. For instance, if I want to check the air handling system, there should be a way to go to that piece of equipment, scan a barcode and automatically retrieve all operational and maintenance information."

To accomplish her goal, Ambler looked to Vela Systems field software bar coding and the F5 Tablet PC from Motion Computing.

Beyond the Model

Vela Systems software automates the execution and oversight of field activities on construction and capital projects for contractors, architects, engineers and owners. Instead of carrying a field notebook and paper plans or specs, the commissioning team uses Vela software on mobile computers to electronically access documents and to complete QA/QC inspections, worklists, punchlists, field reports, update the BIM, and carry out many other critical field activities. Additionally, Vela software is used on a desktop to then feed the Building Information Model with documents and data.

The first step was to create a list of mechanical systems in Vela, define bar codes for each unit and then tag the units with the unique bar code designations. Within the Vela software, she stored maintenance, warranty and inspection notes for every tagged unit, captured key information on each piece of equipment (e.g., warranty dates, serial #s) and also created the links between documents and specific systems and equipment.

Then, the Tablet PC links the field and the office. With the Tablet PC, field teams can move from unit to unit throughout the facility. The Motion F5 is a rugged, highly mobile Tablet PC that includes Bluetooth wireless connectivity, an integrated digital camera, RFID reader and barcode scanner and natural pen/speech input. The View Anywhere display is ideal for outdoor viewing.

For instance, when commissioning an air handling unit, the commissioning agent or contractor scans the bar code using the Tablet PC's scanner. Upon scanning the bar code, Vela



Field personnel scan barcodes to access equipment-specific documents and data (e.g., installed date).

Systems software displays all relevant documentation (e.g., manuals, product cut sheets, submittals) to that piece of equipment. The field user can update key information like installed date and add notes by simply writing on the Tablet PC or selecting options from an on-screen template. The built-in camera can be used to document any questions or areas of concern. Updates are automatically incorporated into the Vela software and then automatically updated in the Tekla Building Information Model. Ambler says, "We don't need paper plans, journals or clipboards—everything is on the Tablet PC. Then, the information recorded on the Tablet PC is synchronized to the Vela server which is synchronized to the Tekla 3D model!"

Managing From a Model

Back in the jobsite trailer, Ambler and her team can track the commissioning process. "The 3D model becomes a digital dashboard, documenting the every step giving operators a very fast, accurate picture of the exact status of the commissioning process," explains Ambler.

If the mechanical contractor passes a unit through inspection, the unit 3D object turns green on the Tekla model. When the city inspector evaluates and approves, the unit turns red.

"The same tasks that used to take us days to manage and track, now take just hours," she adds. "The model is a powerful way to navigate the structure while facilitating field-specific workflow tasks that are an integral part of commissioning, which includes work-to-complete lists, punch lists and QA/QC.

Once the commissioning process was complete, Barton Malow handed the F5 Tablet PCs to MGH facilities management staff for use in ongoing operations. The MGH team will continue to access Vela Systems software and



Tekla BIM during the operations of the building. Data from Tekla and Vela Systems are imported into the facility management system in use at the hospital for immediate availability. Tekla and Vela Systems will be used to visualize and manage documents and data updates to systems and equipment.

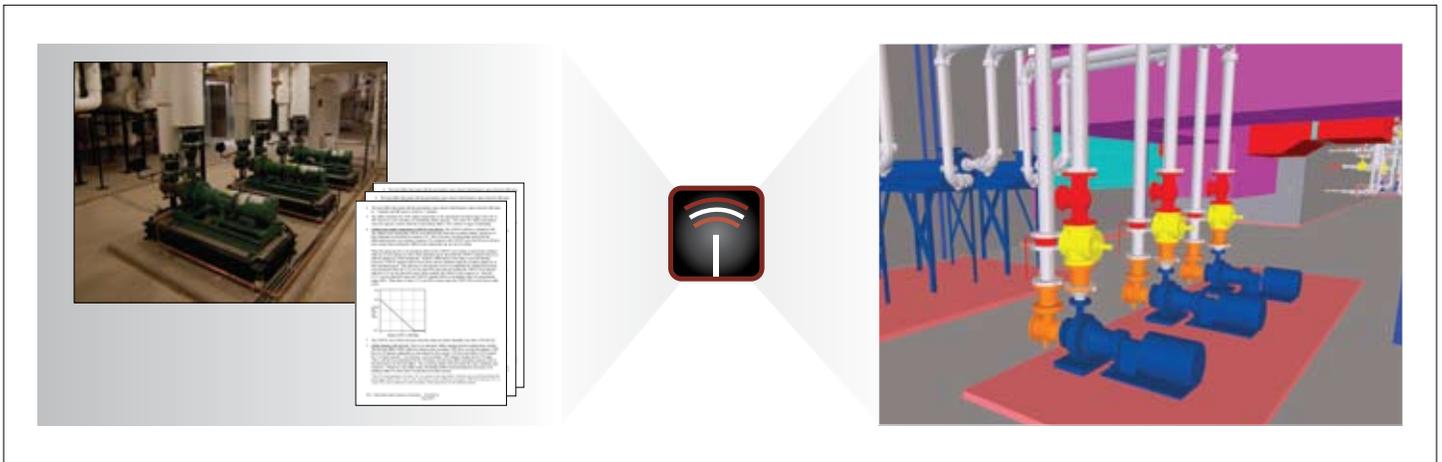
Streamlined Efficiency

One of MGH's goals with the new construction is to achieve energy savings and improve operational efficiency across the new and old building infrastructure. With the Central Care Expansion, MGH will cover about 1 million square feet.

It's up to the Support Services team to keep mechanical systems operating at peak performance. Plank says, "At the end of the day, having a technology-driven solution to manage our system and its preventative maintenance systems is critical. The more we do that, the better we look to the Joint Commission for the Accreditation of Healthcare Organizations. The auditors from JCAHO continually check to make sure we're on top of all this."

The MGH Support Services staff is particularly excited about the F5 Tablet PCs. Plank explains, "These Tablet PCs will forever change our workflow for the better. The facilities guys really like the idea that everything is bar coded so information is readily available on the tablet. They like the camera and especially the ability to write directly on the tablet and have that information get recorded on the appropriate forms and submitted automatically. It's very exciting."

Plank says he's excited about the efficiencies that the new system will bring to operating the hospital. "Having all of the stuff at their fingertips makes the team more efficient and certainly gives them a lot more confidence when they go into the field." In the words of one of his managers, "This is a system we can no longer afford not to have."



Vela Systems links data, files and photos to BIM to connect the commissioning and handover process to the model. Images courtesy of Tekla Structures and Barton Malow.

About Vela Systems

Vela Systems construction field software automates the execution and oversight of field activities on construction and capital projects. Instead of carrying a field notebook and paper plans or specs, jobsite users work with Vela Systems software on mobile computers to electronically access documents and to complete field reports, QA/QC inspections, worklists, punchlists, update the BIM and many other critical field activities.

Construction happens in the field - Manage it.™