

Category 8 Best Building Project – General Contractor (Under \$10mil)

General Contractor – GH Phipps Construction Company

Project Name – Hybrid OR #15

Banner Health – North Colorado Medical Center

TAVR and other Super-Powers

Hybrid: *definition - a thing made by combining two different elements.*

Almost anyone with a driver's license can operate a hybrid, the car that uses gas *and* battery power. Building hybrid operating rooms is an increasing trend in the healthcare business.

Hybrids are **surgical** theatres also equipped with advanced medical **imaging** devices. This relatively new technology is used by a select few surgeons but offers them the “super-power” of x-ray vision while they perform their skills under the skin without opening up the patient. Only six years ago the FDA approved an artificial transcatheter heart valve to treat patients.

Transcatheter aortic valve replacement (TAVR) performed in a hybrid OR has revolutionized the treatment of these patients. Teaming with GH Phipps Construction to build Hybrid OR #15 in the middle of a suite of existing operating rooms with all the possible airborne infections, building constraints, demanding staff, vulnerable patients, and worried family members was a revolutionizing experience for Banner Health and North Colorado Medical Center. The planning, existing building discovery, user interface, cutting edge product review, faultless project delivery and overall Lean approach are why this project is worthy of an ACE award.

Banner Health is a large regional healthcare provider. Its North Colorado Medical Center's wing of 14 operating rooms was set to expand into the shell space always planned for OR#15. This was an important project that would house the next generation Hybrid OR using the latest equipment but had to be built within the fully occupied operating room suite. Banner Health, recently implementing Integrated Project Delivery (IPD) and Lean Construction principals, selected GH Phipps Construction to join their team early in the planning process to avoid potential issues in this mission-critical part of their hospital.

Our team met with Banner and understood three critical factors: 1) the shell space was designed 10 years ago without knowing today's equipment details, 2) there are currently only two models of the specialized equipment – one is a ceiling mount and the other floor mount, and 3) the two key TAVR surgeons had already decided on the equipment choice - the ceiling mount! Our planning began there. We not only had to know the room's existing conditions, (under slab soil conditions, under floor obstructions, existing mechanical/electrical), and the new equipment's details but the “why” of the project. As available information was gathered, the Project Team presented several layout options with cost and schedule impacts so the surgical team could make the best choice.

The entire room was stripped of all non-essential walls, drywall, and ceilings, then laser scanned and detailed. This data was input to a virtual model identifying each pipe, conduit, air duct and structural component and became the background model upon which the hundreds of equipment/switches/connections and personnel spaces would be reviewed. *Hundreds* because the TAVR process requires two entire operating teams. Both the TAVR equipment, surgeons, and support **and** an entire backup open heart team with its separate equipment, surgeons and support all in the room at the same time.

Additionally, a trip was taken by key individuals from Banner and GH Phipps to two sites in Arizona where the new TAVR equipment was in operation. This offered our team a hands on experience with the equipment and examples of working layouts. The key surgeons were able to feel the actual difference between the ceiling & floor mounted equipment.

Reviews of two completed virtual models with virtual reality glasses allowed all the stakeholders to “virtually see, feel and touch” the space before it was built. Reviewing the options in this manner identified that the ceiling mounted option as cost-prohibitive. The ceiling space, where the ceiling mounted equipment would be, was already loaded with piped systems for the entire OR suite and Central Sterile! Even a structural column in the room's interior made that choice difficult. This was the final step that convinced the team the cost was too great for the ceiling mounted choice, our team could now move to the final room layout with the optimal outcome of the teams embracing totally the floor mounted choice. Not an easy task.

The goal of this next planning phase was to determine, as close to 100% as possible, the best layout with user acceptance leading not to just efficient design and construction delivery but also optimal for the lifesaving mission of the OR. The GH Phipps team with architect Bennett Wagner Grody|CannonDesign proposed to Banner that an actual mock-up of the space be created in a shell area (this project's Big Room) of the hospital. This would be no ordinary mock-up where just a portion or piece of a building, already detailed, is built then replicated. This was to be a giant puzzle of parts where every piece of equipment, all connections and switches could be moved to discover the optimal placement of every part and personnel within an actual drywall perimeter. The props needed to be as realistic as possible. The largest prop was the floor mounted C-Arm that rotated and orbited, then multiple ceiling mounted operating lights (4), monitors (3), and booms(4), equipment cabinets, control room equipment and every connection point or switch. Much of the prop/equipment was built-to-scale in Styrofoam but a breakthrough in the process came when the GH Phipps construction superintendent added motion to all the parts. The moveable C-Arm, ceiling mounted booms, lights and monitors came alive using PVC connections that articulated and rotated in ALL the ways the actual equipment does. An antique car restorer and mechanic, our superintendent excelled in creating accurate operable props which allowed the teams to really feel as if they were in the actual operating room which developed more accurate feedback. Pictures of actual equipment connections and switches were taped to the walls. Color linking was then added. A red switch operated a light with a red tag etc. During a standard TAVR operation 20 professionals and one patient are in the room! These valuable users, then, were invited to three dress rehearsals to go through the motions of an actual operation, especially one where the backup open heart team is called to action. Most of the equipment could be moved during the session and documented. Session after session the design evolved to establish the final layout. At this phase's conclusion and for the first time the Architect put pen to paper and developed CD's in 3 weeks!

Environmental/Safety. There are few construction types with more risk than working in an operating hospital and, within hospitals, working within an OR suite is a top risk. Our planning and implementation of the work on OR#15 had to take into account the unpredictability of scheduling and the possibility that 5 or 6 (or more) of the available OR's might be occupied at any given time. One of the key decisions for safety involved separating our work from the OR suite. We cut a temporary opening from the hospitals busy elevator lobby into a hallway next to

OR#15 to assist in isolating the project work. All work conducted outside the project limits next door or the floors above were subject to careful planning and execution. Implementing all aspects of the GH Phipps infection control protocols from establishing negative air filtration and monitoring for airborne particulates, to controls for people and tools through training and cleaning. There were no infection control incidents throughout the project duration. The job site also conducted standard safety meetings with subcontractors and staff to continue our message of keeping a safe jobsite. There were zero safety incidents on the project.

Excellence in Client Service: The GH Phipps team provided excellence in client service in supporting Banner Health's relatively new Sr. Project Executive, Development and Construction with his background in IPC and Lean construction. His focus on this delivery method and hiring GH Phipps proved itself effective on this project. Our planning effort eliminated both schematic and design development drawings, **and delivered** a project that had only a single minor change, zero RFI's, \$600,000 under budget and a month early. The key surgeons indicated their approval "Because of a great team this project was a success in choosing, building and deploying the best system. Everyone had a role, listened to one another, stayed engaged, and was dedicated to making sure everything was done right." The mock-up room remained in "operation" as long as the hospital could keep it. It served as an example of innovative planning techniques for the Sr. Project Executive, Development and Construction to drive Lean construction techniques deeper into the corporate fabric at Banner Health. Key project members from Banner, Bennett Wagner Grody/CannonDesign and GH Phipps, also conducted a breakout session at the Colorado Association of Healthcare Engineers & Directors (CAHED) annual meeting detailing OR#15's successes. Communicating tough-to-see philosophy's like Lean Construction may also be a super-power.

GH Phipps was glad to help.











