PROTON THERAPY

THREE STEPS TO ACHIEVE SUCCESSFUL MEP COORDINATION FOR PROTON THERAPY PROJECTS

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The utilization of precisely-controlled beams of protons to destroy a cancerous tumor, also known as proton therapy treatment, is a fast-growing healthcare technology that requires a specialized construction approach. This technology is gaining popularity due to the technological ability to target cancer cells without harming healthy cells, and many new centers are being proposed every year worldwide. In 2006, only five centers were active, yet today there are 28 centers operating across the United States—75 in total worldwide with many more under construction.

Proton Therapy treatment centers can be either multi-room or, more recently, single-room solutions, which are much more economical. The main components of a multi-room proton therapy center include a cyclotron, magnetic beamline transportation system, gantry for patient treatment, power supplies for components and extensive MEP support. Structural stability, radiation shielding, embedded pathways, equipment cooling, and precise temperature and humidity requirements are all critical considerations in the construction of these facilities. Since single-room systems have the cyclotron directly adjacent to the treatment room, thus the lengths for runs on single-room systems are much shorter.

Construction components of these specialized cancer treatment facilities are multi-faceted with complex MEP requirements that require coordination by an experienced construction team. Gilbane has unparalleled experience in the construction of proton therapy facilities, having built five proton therapy facilities with an additional three projects currently in progress. Each vendor has specific requirements for their installations. Having built systems for all of the major vendors, Gilbane has leveraged this unique experience to compile a guide to the successful coordination of specialized MEP in proton therapy projects.

Focusing on the three key areas of scope, cost and time across the purchasing, pre-installation and execution phases, ensures a successful project.
STEP 1: CLARIFYING SCOPE IN THE PURCHASING PHASE THROUGH COLLABORATION

Setting expectations for a collaborative culture at the beginning of a complicated proton therapy project is a crucial step. Early engagement in the purchasing phase allows for critical planning and relationship building.

This type of specialty healthcare facility requires proprietary equipment that comes with its own set of drawings and specifications. Contract documents that include these proprietary specifications from the onset will support greater definition of the scopes of work. Augmenting these inclusive contract documents by interfacing directly with proprietary vendors aids in the review of specifications and ensures no omissions. A collaborative approach with end users also provides the project team with clarification on the intended use of the facility, which seamlessly directs logistics and the flow of work. Open dialogue helps to focus stakeholder goals and better aligns the end result from the very beginning.

The technology and propriety equipment required for these complex facilities often results in contractors performing work that changes with every project—even if they have built these facilities before. Regardless of skill level, uncharted technologies can challenge even the most experienced contractors. Innovative project team members with an open-minded approach to learning new technologies are best positioned to harness the required technical scope. Incorporating these technologies into the purchasing phase is critical to achieving success in the implementation phase.

A culture of collaboration supports a project team's ability to deliver the most complicated scopes of work. A collaborative team that utilizes inclusive contract documents and focuses on engaging innovative and flexible contractors sets a project up for success at the very beginning.

STEP 2: ACHIEVING VALUE ENGINEERING THROUGH PROACTIVE PRE-INSTALLATION COORDINATION

Coordination and intricate planning is a crucial step in successful MEP installation. The application of construction-related technology to complete more in-depth and efficient coordination processes with trades can minimize cost impacts later. Building Information Modeling (BIM) is the front runner in construction coordination and helps to support the seamless transition from design to construction and through to operation. BIM is used to layer MEP systems and equipment in a 3D model to provide a visual graphic to coordinate systems, piping and equipment, and to simplify very intricate installation. Further utilization in positioning MEP components to align with different types of schedules, including estimating, scheduling and operations, can provide a holistic approach to the construction process that helps multiple stakeholders interpret MEP systems.

Proton Therapy equipment requires a large network of electrical and low voltage conduits, mechanically processed cooling water piping and air distribution ductwork runs. In a larger facility, the embedded electrical conduit alone can exceed eight miles in aggregate length. Due to shielding requirements to control radiation emanating from the proton therapy equipment, often achieved through cast-in-place concrete ranging from eight to ten feet thick, all MEP support infrastructure must be embedded within high density concrete walls, ceilings and floors.
The systems installed in these pours need to be pre-planned and coordinated in great detail. Most of the infrastructure will span multiple pour areas, traveling from the "pit" level of a gantry through several walls or floors of poured concrete and terminating under raised access flooring at equipment power supply cabinets. This requires complete coordination of all support systems before any concrete pours begin. Unlike standard MEP coordination, floors cannot be coordinated individually and "stacked" on each other. The systems supporting proton therapy equipment are entirely unique. Each embedded conduit or piping run is distinct and travels through the entire treatment side of the building to get to its destination.

In addition, each run that penetrates shielding concrete needs to have a minimum of two 90-degree bends to ensure that a straight pathway is not accessible to stray radiation particles. The conduit bends also have minimum radius requirements to accommodate the wiring size, which will eventually be pulled hundreds of feet through the pathways. Minimum radii typically start at 24 inches. Fitting a bank of 20, three-inch conduits into a poured concrete wall while bending all conduits to a minimum of 180 degrees and avoiding adjacent stainless steel water piping and duct runs is a complex task. The ability to view these pours and systems in three dimensions using BIM during planning is crucial to capture all requirements and fully coordinate the approach prior to construction. Proper coordination using BIM expedites the installation time between pours to maintain and improve the overall schedule during critical path pouring activities.

The implementation of BIM during this coordination phase saves extensive time and cost over the life of a project. The proactive implementation of BIM helps a project team avoid MEP conflicts that would have been impossible to see using traditional 2D drawings. Transforming MEP systems into 3D models provides the additional angles and increased perspectives that are necessary in navigating and successfully coordinating complicated MEP systems.

**STEP 3: SAVING TIME THROUGH THE IMPLEMENTATION OF QUALITY CONTROLS DURING EXECUTION**

Once the detailed planning phase is complete, it is vital to implement quality controls during the execution phase of MEP installation. The creation of innovative quality control strategies should be applied specifically to the project’s unique needs to streamline the installation process, ensure accurate results and mitigate punchlist items. Quality controls should be considered when distributing information, bringing final coordination to the field and throughout real-time review during installation.
Complicated proton therapy projects require a proactive, strategic approach to planning, expectation setting and quality control implementation to ensure that quality is achieved at the beginning of a project and not retrospectively.
ABOUT THE AUTHOR:

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Lindsey Yingst is a project manager with a Bachelor of Science in Civil Engineering from Cornell University. Working for Gilbane Building Company, Lindsey is currently delivering the New York Proton Therapy project where she is solely responsible for the full MEP and structural coordination of this medical facility. Lindsey focuses on a lean approach that delivers consistent, high-quality results for clients. Her creative and specialized MEP skills, coupled with her experience in implementing project controls and focus on strong subcontractor relationships, ensure successful and collaborative project results. In Lindsey’s spare time, she participates in the ACE Mentor program and Habitat for Humanity.

CONTACT US:

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Brian Garbecki is Gilbane Building Company’s Director of Healthcare. In this role, Mr. Garbecki works in partnership with our healthcare clients and project teams—assisting in developing and implementing high-level strategic facility plans often involving cost studies for master facility planning and other long term capital plans. He has more than 25 years of experience in the healthcare sector as an engineer, builder and facilities professional.

Prior to joining Gilbane in 2005, Brian worked for Baystate Health System in Massachusetts where he was responsible for the development, implementation and management of strategic facility planning and construction. He brings his unique perspective to Gilbane’s healthcare clients, supporting their goals and objectives. Mr. Garbecki is a LEED BD+C Accredited Professional, as well as a Professional Engineer (PE) in the Commonwealth of Massachusetts. He is a member of the American Society of Healthcare Engineers and Tau Beta Pi (engineering honor society).

For more information on Gilbane Building Company, visit www.gilbaneco.com.