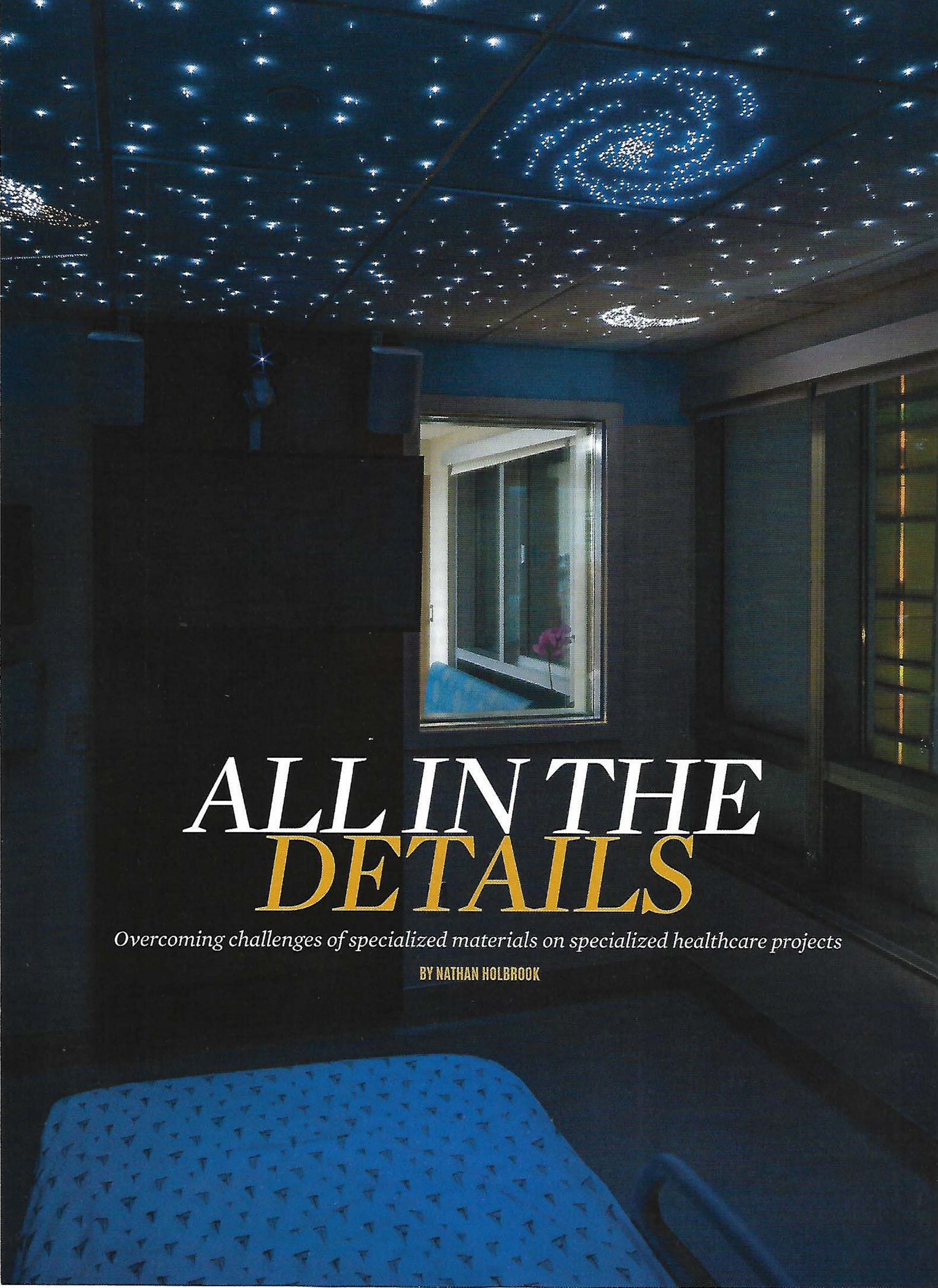

ALL IN THE DETAILS

Overcoming challenges of specialized materials on specialized healthcare projects

BY NATHAN HOLBROOK

Due to the high levels of radiation emitted, the mobile lead-lined panels surrounding patient beds help to reduce the amount of radiation exposure to staff entering the room during treatment.

The physicists were able to use the scans when performing their calculations to determine how thick the lead needed to be to ensure the suite and surrounding areas were safe. Once the team had that information in hand, we were able to figure out the quantity needed and what it would weigh, which directly affected how we would approach the installation.

The weight of the material alone required special consideration, but transporting it to the suite location necessitated careful coordination between partners. The structural plans showed straight beams; however, because this particular suite was on the 6th floor, the team had to use a freight elevator. This required attention to both the length and weight of the beams. Length to ensure it would fit in the elevator and weight so the elevator could hoist it.

This also required additional splices in the beams. We worked with the steel erector to fabricate a custom trolley to move the beams from the elevator to the construction space. It was determined by the structural engineer that the floor decks could not withstand the weight of the lead, thus the structural beams spanned column to column to transfer the weight of the lead to the columns. This required a cold-formed metal framing substrate for the lead assembly to attach to while ensuring the bottom of the cold-formed metal framing was not bearing on the floor.

Identifying alternate work routes

The team at Levine Children's also found an alternate route that didn't require going through the pediatric floor. Because of the significant weight of the new lead brick walls, we had to add structural steel to not only the 11th floor where the new MIBG suite would be, but also the 10th floor to support the new lead panels below the concrete slab. Portions of steel beams were brought up the patient transport elevators at coordinated times and welded together to the required length to be installed on both floors. All overhead utilities within the rooms on the 10th and 11th floors had to be temporarily relocated so that the existing adjacent rooms would not lose HVAC or electrical service.

In addition to lining the room and making special accommodations to do so, there are other factors to consider to ensure safety of the patient and others in the hospital, such as lead doors and ceilings. The lead doors outside the suite in Texas weighed approximately 3,200 pounds and required a tube steel assembly inside the walls to support their weight.

The direction of the radiation is linear and dissipates after it bounces off lead a certain number of times. To account for this, we had lead-lined ceilings along with overhead MEP infrastructure (mechanical, fire sprinkler and conduit) that had to penetrate the lead. The team also worked with the physicist on doghouses that satisfied the bounce quantity, ensuring that radiation would not escape the room to protect patients throughout the hospital.

Considerations for tech integration

While most important, safety was not the only priority—comfort and family experience were taken into consideration as well. At Levine Children's, together with Little Diversified Architectural, the team designed and installed an A/V system that allows patients and families to communicate.

From talking back and forth from room to room to Skype and virtual video games with friends, the system allows people to connect with patients throughout their treatment. To further enhance the atmosphere in the suite, the ceiling included a fiber optic light system to make it look like a starry night with planets and shooting stars. "The added touch of the A/V system has created a serene, welcoming environment for patients. It's the little details like those that make a big difference to those using the suite," said Dr. Oesterheld.

From the ceiling to the floor and everything in between, the teams considered every detail to make the MIBG suites both safe and inviting for patients and families, alike. It required attention to the tiniest elements, a collaborative relationship between the hospital, staff and design and construction teams to account for specialized materials and extreme coordination — and the outcomes are life-changing.

"The MIBG suite at Atrium provides the best family centered care for those going through some of the rarest treatment out there," said Dr. Oesterheld. "It really feels like we are doing something greater than ourselves, and I am so privileged to be part of it."

Nathan Holbrook is the Carolinas healthcare leader at JE Dunn.

Healthcare projects all come with a special set of requirements and challenges, but some projects are so specialized that they require a different plan altogether. The specific care required for some pediatric cancer patients is so rare, there are only a handful of hospitals in the U.S. equipped to perform it.

With approximately 20 MIBG (named for meta-iodobenzylguanidine, the radioactive isotope used in treatment) therapy suites in the country, there is little history to reference, which is why — after constructing two in the last four years — JE Dunn had to rely on previous hospital experience, innovation and collaboration to overcome the challenges that come with specialized materials and sensitive patients.

Though each presented unique challenges, the biggest obstacle — and the common one — was materials. Because of the amount and type of radiation used to treat MIBG patients, the suites required a large amount of lead. The sheer volume and weight of lead required a non-traditional approach and coordination to not only get the materials where they needed to go, but also to install them in a way that would not compromise the integrity of the existing hospital.

At Atrium Health's Levine Children's Hospital, in Charlotte, North Carolina, two patient rooms were converted into a MIBG suite, allowing families to interact for the duration of their stay. Because children must be isolated for 4-10 days after radiation, the suite includes one room for the parents and one to administer the treatment — on the 11th floor. Working in an occupied space on an upper-level floor is challenging in its own right; however, coupled with the task of working with non-traditional materials on a floor that cares for severely immunocompromised pediatric patients, the project team had to come up with a design, plan and accommodations that would be the least disruptive to all affected.

Carefully coordinate construction activities

The project team decided early on to not bring any construction personnel or materials through the active patient space. Instead, an adjacent stairway was utilized with access through a much less critical area of the hospital. This allowed us to complete all work on the project within the confines of our construction space.

Because of the adjacent patient population, we carefully coordinated all construction activities, especially those that made significant noise and would be disruptive to pediatric patients. Trade partner teams were responsive to immediate requests for silence from the nursing staff. To limit the noise transmission, we installed acoustical insulation between the construction space and the patient-occupied areas and continuously monitored the sound level with help from the nursing staff.

"The team did a fantastic job of communicating and coordinating with our staff not only to limit the disruption as much as possible, but also to try to mitigate any potential activities that would upset our patients and their families," said Dr. Javier Oesterheld, specialty medical director – Pediatric Hematology/Oncology/BMT. "The result of their efforts is a revolutionary suite that allows us to offer therapies no one else can — and we recognize it was no easy feat given the unique requirements to construct it."

The team that completed the MIBG suite in a Texas pediatric unit used a third party to scan and assess the floors above and below the work space as a risk mitigation exercise. The lead thickness of the rooms depends on the physicist who determines the requirements based on the measurement of radiation and isotopes emitted during treatment.

From left: At Atrium Health's Levine Children's Hospital, in Charlotte, North Carolina, two patient rooms were converted into an MIBG suite, allowing families to interact for the duration of their stay. To enhance the environment, the ceiling included a fiber optic light system to make it look like a starry night. > This adjoining parent room includes A/V equipment to allow video communication between parent(s) and child, as well as a viewing window that is lead-lined for additional radiation protection.