

*The inspirational vision for 50 FIFTY was, interestingly for a landlocked state, sailing. 50 FIFTY is a new, 12-story Class AAA Office Tower located in the Denver Technological Center (DTC) near I-25 & Belleview Avenue. MTech Mechanical was brought on board as the design-build mechanical contractor for this notable project and their in-house engineering team was able to provide solutions to budget challenges. The construction team, following the lead of Hensel Phelps, made this an exceptional office building that the owner will be proud to showcase. MTech's scope consisted of mechanical and plumbing work valued at over \$7 million and took approximately 19 months to complete.*

According to the 50 FIFTY website, the building includes six stories of office, over eight stories of parking, two of which are underground. The office building is approximately 185,000 SF and features amenities such as a collaborative lounge and work space areas, state-of-the-art fitness center and secure bicycle storage.

## **PRECONSTRUCTION**

During the preconstruction and system selection phase, the entire team was invited to a mock demonstration at MTech's prefabrication shop to compare and experience in-person 6-7 different potential systems (*see photo 2*). This mock-up demo reviewed sound pressure levels, performance characteristics, features and benefits, service and maintenance considerations, quality, and construction. This had never been done before and was highly praised and allowed the owners to make an informed decision on this unique system.

*"During the schematic design phase of the 5050 South Syracuse project, we asked MTech to assist with early conceptual budgeting and constructability assessments to assure mechanical system design would progress within the overall project budget...MTech's value to the design team became obvious and the team decided it would be beneficial to the project for MTech to take over the design in a Design-Build contract format." Greg Holroyd, Director of Mechanical Services, Hensel Phelps*

The mechanical solution that MTech developed into a final design utilized high efficiency water source heat pumps (*see photo 3*). The distributed mechanical system provided energy savings,

future adaptability and an efficient way to provide heating and cooling simultaneously for parts of the building requiring differing needs.

## **ENGINEERING & VIRTUAL CONSTRUCTION**

Where MTech differentiates itself from their competition is in the streamlined process between engineering/design, 3D modeling, and construction. By integrating the engineering design with the virtual construction team, the result achieved is a higher level of coordination at the permit submittal stage with respect to constructability and 3D coordination with other trades. This reduced the time required after construction documents for coordination of the entire building and minimizes redrawing that can be required otherwise.

Throughout the design phase, MTech's engineers worked together with the construction team to identify coordination issues early in the design process and get them resolved prior to issuing final design documents. MTech's project manager met with the engineering team at multiple milestones throughout the design to provide input on the constructability of systems, ease of installation, and to help with the specification of HVAC equipment for procurement.

One of the challenges faced in virtual construction was coordinating the beam penetrations on the 11th and 12th floors. This was a long, complex process that took almost three months. MTech detailers created a solution that combined storm and overflow drains to drop down the building in one central spot, rather than having several sets of each in multiple places in building. Doing so provided cost savings by having only one riser location (*see photo 4*).

To accommodate the single riser, the storm and overflow pipes had to run perpendicular to the beam while maintaining slope. This became very tricky to not only coordinate, but to install. Teams had to abide by structural rules and beam penetrations had to be a certain distance away from connections and only be a certain height within the beam (*see photos 5 & 6*). The penetrations maintained a clear 10 ft ceiling height in the building with only 14 ft floor to floor and allowed flexibility for future buildout.

## PREFABRICATION SUCCESS

MTEch's prefabrication efforts offered a seamless transition from design to construction. Approximately 98% of the pipefitting hanger system was prefabricated in MTEch's shop 25 miles from the jobsite. Hangers were created and labeled with location details. A Trimble GPS positioning device was used together with the 3D model, to locate and place hangers efficiently, which helped to reduce hanger layout time (*see photo 7*). The pipefitting shop was also able to prefabricate approximately 80% of pipe and deliver to the jobsite to install. It was a hybrid system consisting of welded pipe as well as Victaulic fittings to reduce the number of field welds.

The emergency generator for the life safety system provided another opportunity for prefabrication. The schedule 40, 10" generator flue, fuel tank vents and fuel fill line were all prefabricated to minimize the work above and around the generator and fire pump room (*see photo 8*). Coordination with the exterior curtain wall and generator exhaust louver required a unique solution to bring the exhaust out of the building. A circular penetration was cut in the radiator exhaust louver allowing the generator exhaust to pass through, eliminating an additional opening in the granite wall.

## CONSTRUCTION TECHNIQUES

The 50 FIFTY project required crews of about 25 MTEch craftsmen at the peak times. There were also team members working in three prefabrication shops to streamline the process. MTEch is proud that overall there were no safety incidents and the team worked over 43,000 man-hours!

Throughout the project, MTEch's trades strategically worked overtime. When a phase of work or location opened up on the building, MTEch would attack that scope, and when beneficial other trade partners on the project, MTEch would work overtime to keep everyone on pace. The field managers worked closely to create opportunities to move the whole project along. Overtime is a great tool early in the job and is much more beneficial than expending overtime to catch up at the end.

The success on the jobsite can be attributed to the team's overall mindset and pre-planning. All supplies and equipment were palletized offsite for quick loading and unloading as well as to keep items together on the jobsite (*see photo 9*). MTech's Virtual Construction team was able to create a bill of materials list through CAD by jobsite floor or system in order to streamline as materials and pieces were needed to complete the install. This made for a very efficient process.

### **BUILDING STANDARDS / LEED**

Achieving LEED Gold and using sustainable building standards were high on the owner's priority list. The LEED process for MTech included recycling during construction, selecting reduced water use fixtures and indoor air quality management. MTech's engineers selected plumbing fixtures that met the stringent requirements of the LEED Gold pursuit (*see photo 10*). Indoor air quality management completed by MTech included protection of the ductwork systems throughout installation and writing an IAQ plan.

Due to the equipment selected, the HVAC system's energy model for 50 FIFTY is predicting a 23% Annual Energy Savings (\$62,702) to the tenants vs. the Xcel EDA baseline model. A 20% reduction in water use through water efficient landscaping and plumbing fixtures was also maintained.

### **CHALLENGE WITH ON-SITE UTILITIES**

The biggest challenge on this project site was waiting for water & site utilities from the city, it ultimately added 38 days at the time of this writing to the construction schedule. Due to a delay on the permit application process, temporary utilities were required to allow construction activities and testing to progress for plumbing, hydronic and fire sprinkler systems. MTech installed a temporary 12-story riser connected to the construction meter to allow all trades to access the water they needed for drywall, tile, testing, etc. Utilizing the temporary water, MTech was able to continue pressure testing, inspections and insulation without interruption. Within a week of water connection, MTech proceeded with fixture installation, final testing and cleaning of the system. They were able to mitigate much of the delay by taking advantage of the additional time and preparing for the next phase.

## PROJECT SUCCESS

MTech's team was recognized mid-way through the project by the Hensel Phelps superintendent, *"I appreciate the diligence of [MTech] getting ahead and paying attention to minor details that can always lead to huge headaches... and also helping get us to where we need to be for gas piping during these upcoming colder temperatures."*

MTech Mechanical was ultimately awarded the contract due to their collaborative process, innovation in selecting mechanical systems, high quality design, and construction solutions. The project vision called for a partner to engineer a unique design to meet the architectural aspirations for the building. MTech was able to work with the team to offer exceptional mechanical systems to satisfy the vision of the owner while working within the budget constraints of the project. Over the course of the project, it was apparent that MTech was the perfect fit for this project and was able to deliver a quality product featuring a near-perfect design-build procurement for a premier office building of this size and value.





Photo 2

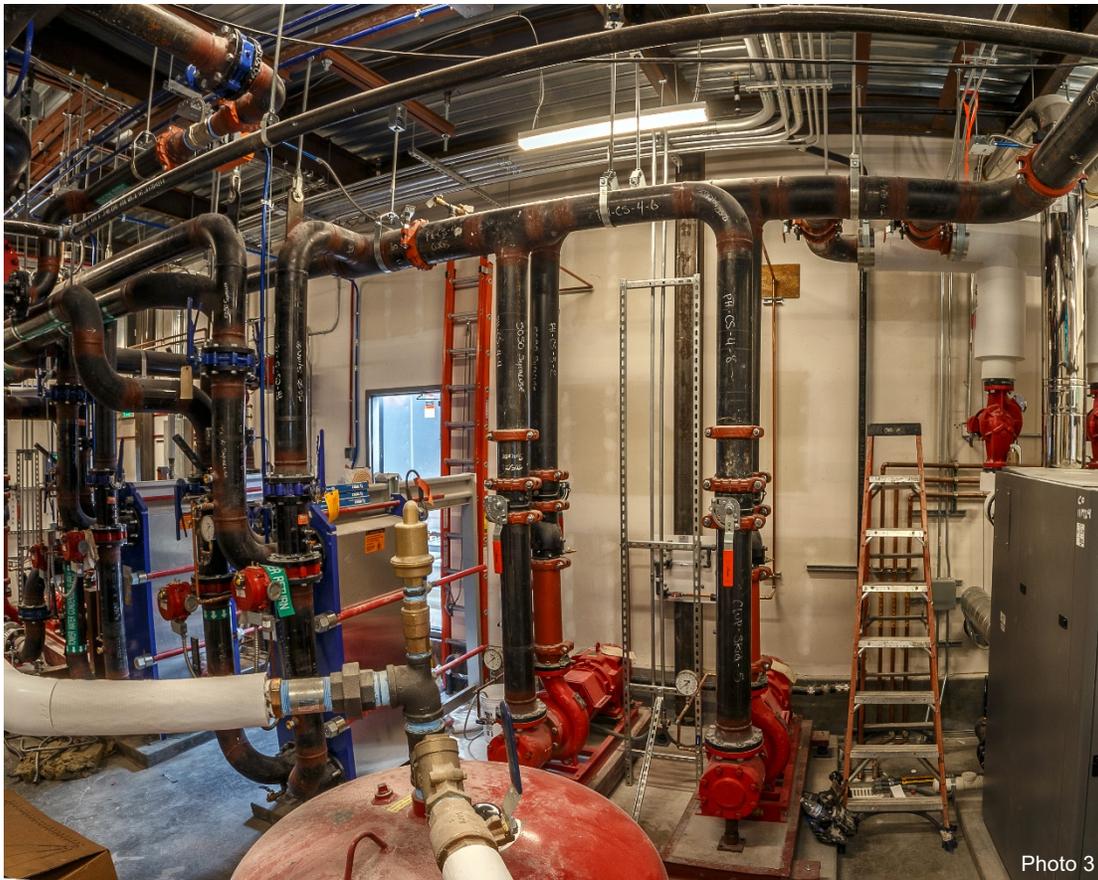


Photo 3



Photo 4

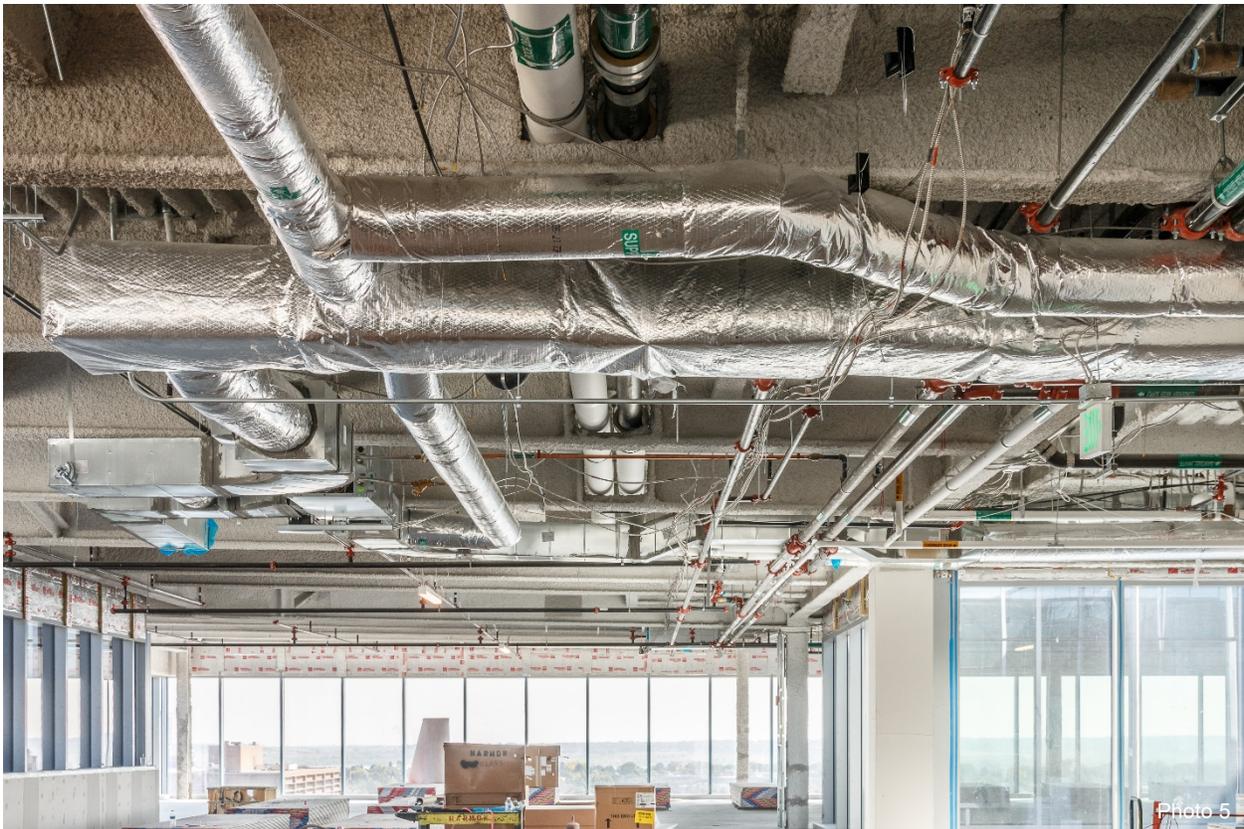


Photo 5

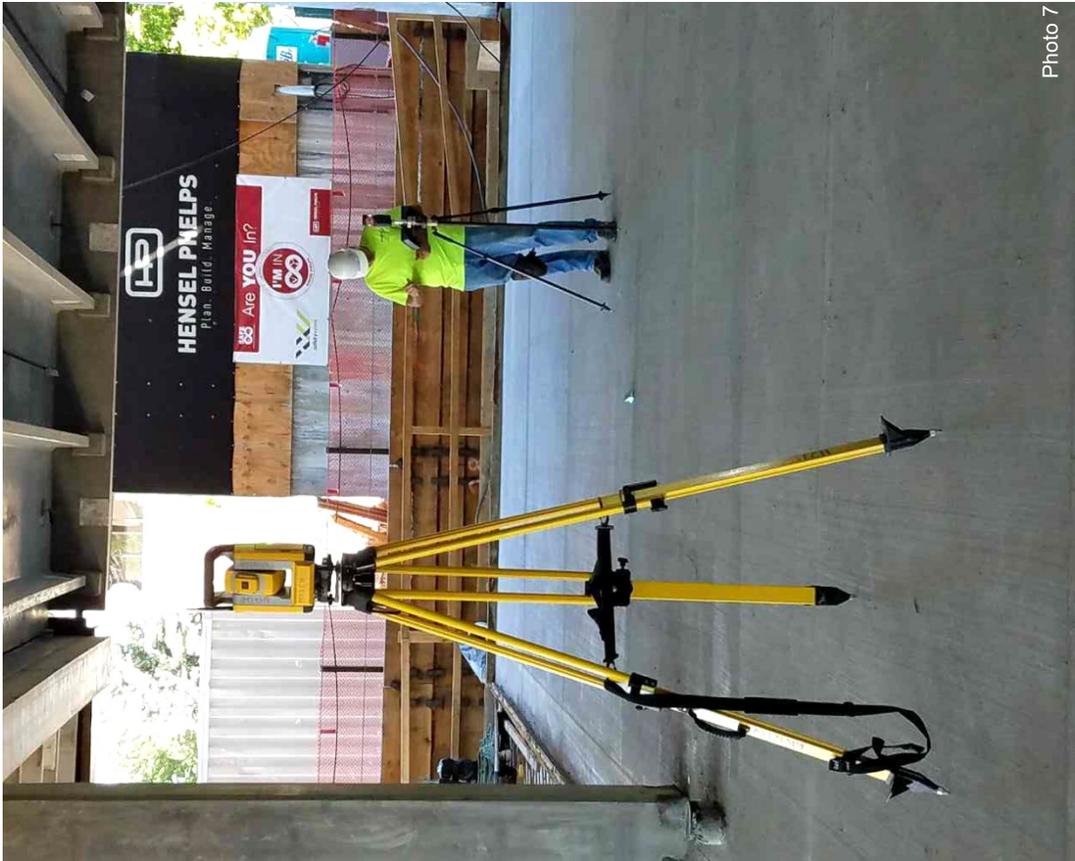




Photo 8



Photo 9

