

WHITE PAPER / **TERMINAL PROJECT BEST PRACTICES**

NAVIGATING TANK CONSTRUCTION FOR STORAGE, TERMINAL AND LOGISTICS PROJECT SUCCESS

BY Greg Saye

From a single tank to full-scale terminal construction, tanks represent a critical component of terminal and pipeline projects. In order to achieve success, these projects should strive to streamline and efficiently manage project planning, design and construction.



Bulk tank storage helps operators minimize downtime and manage costs by having fuel, materials and feedstock readily available. Likewise, the right terminal storage system can improve the efficient loading and unloading of valuable product. From crude oil to compressed gas to refined products, storage tanks help industries optimize operations. Regardless of the scale of storage tank projects, it is essential to manage the critical path of tank planning, design and construction.

STREAMLINING PROJECT EXECUTION

Whether a new storage facility or an upgrade of existing storage assets, tank projects can be complex. On almost all storage projects, the tank design, fabrication and construction is the critical path to completion. This means the tank package needs to be awarded early in the project design, driving early decision-making on many other project factors to avoid cost and schedule impacts later in construction.

Among early factors that contribute to project complexity:

- Analysis and determination of governing codes for the project.
- Consideration of maintenance access.
- Constructability for portions of the project beyond the tank construction.
- Environmental requirements and compliance.
- Existing utilities analysis and considerations to minimize long runs of cable or piping to support new installations.
- Identification and consideration of any process tie-ins to be completed.
- Layout of supporting project assets including mechanical and electrical equipment, piping and manifolds, and fire protection.
- Local permitting requirements and compliance.
- Location of loading and unloading support systems, be them existing or new, for minimized piping and electrical runs.

- Operational control facilities and control installations.
- Overall site layout and tank locations for operation and construction, including considerations of existing assets.
- Primary and/or secondary containment for storage, loading or unloading operations.
- Site geotechnical considerations and design to support cost-effective installations — that is, avoiding areas with poor soil conditions where feasible.
- Site topography and grading considerations for stormwater drainage systems.

Because of these complexities, owners should seek to partner with experienced engineer-procure-construct (EPC) contractors that have the in-house capabilities to consider all aspects of the project in lieu of contractors whose primary experience lies with tank design and construction. This can lead to a project that is efficient in schedule and cost controls and execution.

Tank storage is used for a wide range of materials from solid to liquid to gas and organic to nonorganic. Tanks can be used for short- or long-term storage, as part of custody transfer, pipeline breakout storage, feedstock for refining or refined product storage.

Just as there are many uses, there are a variety of different types of storage tanks that come in different shapes, sizes and materials. Tank types include:

- Above-ground tanks
- Below-ground tanks
- External and internal floating roof tanks
- Geodesic dome pitch roof tanks
- Pressurized tanks
- Spheres



STORAGE TANK CONSTRUCTION BEST PRACTICES

Storage tank project execution requires project owners to interface, coordinate and track a large number of trade subcontractors while managing a range of interrelated design and construction activities. This complexity is compounded because storage tanks are typically the critical path of the schedule; however, the project won't be successful without the ancillary components of the project being executed successfully in parallel.

Relying on a specialized tank fabricator/erector with experience only in tanks tends to narrow the focus to the tanks only. To manage the many complexities and subcontractors of an entire project, owners can leverage the EPC contractor to serve as the interface to integrate the design, procurement, fabrication and construction of the tank, in conjunction with the rest of the construction activities.

An experienced EPC contractor with diverse knowledge and capabilities will focus on the entirety of the project while also collaborating with the tank fabricator/erector to achieve success. Additionally, the EPC contractor can successfully integrate the tank fabricator/erector with all the other trade subcontractors by defining scopes and responsibilities, encouraging collaboration, maintaining clear communication and tracking progress to complete the project successfully.

PROJECT TEAM RESPONSIBILITIES

These considerations around project team composition and collaboration are key to project success:

- **Leverage tank experience.** EPC project teams must include members with tank erection and layout experience. Leveraging firsthand experience helps drive efficiency in designing the layout plan to accommodate the required space for fabrication, lay down, construction and storage. Knowing what it takes to build a tank and the importance of staging and setup supports a cost-effective tank erection.
- **Define scope breaks.** Define what a tank fabricator will and won't do on the project. Knowledge of tank construction drives the breadth of scope decisions that need to be made, including who designs the foundation, who completes the installation, and the coordination of work at and around the tank. Clarity is key to confirm roles and responsibilities and develop a strong collaboration.
- **Engage early.** With tank construction experience on the EPC team and scopes defined, the tank fabricator selection process can get underway early. Bringing on a qualified tank contractor at the earliest opportunity means this essential subcontractor can be integrated into the team, allowing responsibilities to be defined and collaboration to begin.

SITE PLANNING

A deep understanding of the project site is essential to keeping a project running efficiently and effectively:

- **Understand foundation requirements.** The complexities of storage tank foundations must not be overlooked. Deep foundations, driven piles, piers and other requirements should be determined early. Sites where simple/traditional ring wall foundations are not adequate may require the EPC contractor to perform the design of the foundation and to hire specialty subcontractors to perform the foundation installation in lieu of the tank erector. Identification of these required critical components can help see that the right people and subcontractors are engaged and avoid costly rework and/or schedule delays later.

- **Establish site layout.** Using tank construction experience, the EPC contractor must define the site layout so that it is constructable for all subcontractors, including the tank erector, and provides access and good laydown space and staging areas for all materials. Delineating the site layout at the project start creates efficiency and expectations among team members and subcontractors.
- **Define workspace.** The EPC contractor must delineate adequate working space for the tank subcontractor and other trade subcontractors to use. Ambiguity can result in miscommunication or subcontractors encroaching on other needed work areas. Consider the site plan and layout requirements based on what tank connections will be made, mechanical and electrical installation requirements, construction timing and a set of milestones that determine the order of work.

TANK CONSTRUCTION

The priorities for tank construction should be focused around safety and meeting client-specific needs:

- **Tank fabrication.** Actual tank construction is most effectively completed using clear communication and tracked using a comprehensive schedule. Teams should have a constant pulse on the project progress, to include when materials are fabricated and rolled, what is expected at the site, what documentation is required to verify materials are in compliance with project requirements, when the materials need to arrive to meet schedule requirements, and the progress curve through the tank erection process. Critical decisions and communication on specific responsibilities upfront drive the fabrication and erection process.
- **Tank coatings.** EPC contractors should confirm requirements for both interior and exterior coatings and responsibilities. Coatings will depend on the type of tank installation and the type of products stored in the storage tanks. Determine what will be coated, what epoxy or corrosion-resistant materials will be used, and whether the tank fabricator will perform the coating, or if this is to be done via a specialty coatings subcontractor.
- **Cathodic protection.** To prevent corrosion and rust, cathodic protection may be used on tanks

and structures to preserve the steel by using another highly active metal that acts as an anode and will corrode. In the planning stages, it should be determined if specialty designs are required — and, if so, who will perform these designs and how. Installation of cathodic protection for the tank needs to be considered along with cathodic protection installation for piping surrounding the tank.

- **Tank hydrotesting.** In addition to identifying subsurface conditions and soil properties, the geotechnical engineering will dictate expected settlement and verification of settlement during the hydrotest. EPC contractors should plan on fully vetting and defining the hydrotesting procedure for the project. They should also verify that tank contractors understand requirements, including what water sources will be used and any environmental considerations for drainage. The EPC contractor should work with the tank contractor to produce a tank hydrotesting plan for review by the owner well in advance of the hydrotest being performed. The entire team should expect no surprises during the hydrotesting phase of the project.
- **Safety.** Tank construction requires unique and specialty scaffolding, rigging and use of cranes. A tank fabricator must provide an erection plan, sound scaffold approach, appropriate documentation and a safety plan. The EPC contractor should see that tank fabricators have safety plans that cover all aspects of the construction.



CONCLUSION

While tank construction is just one part of an overall terminal and storage project, careful and comprehensive management of this activity is a linchpin to project success. An EPC delivery method that follows best practices can see that all client-specific standards are met, costs are managed and contained, safety is a priority, progress is effectively tracked, and schedules are met.

BIOGRAPHY

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