



BUILT
FOR THE FUTURE

PRESTRESSED CONCRETE TANKS

AWWA D110 Type III



DURABILITY FOR GENERATIONS TO COME

Effectively managing water and other vital liquid resources is a priority for communities and companies everywhere. And safe storage is a core component of any effective solution. That's why DN is more than a designer and builder of liquid storage tanks: We're a partner in keeping the world's most precious resource safe.

The promise of our AWWA D110 Type III Prestressed Concrete Tanks is their ability to stand the test of time. They require little to no maintenance over decades, delivering the best long-term value possible. And behind each of these tanks is the power of our people. We draw on decades of proven expertise to deliver productive relationships that are as enduring as our tanks themselves.



KEY ATTRIBUTES OF A DN AWWA D110 Type III PRESTRESSED CONCRETE TANK

- **Tank Capacities** — from 40,000 gallons to 50 million gallons (MG) and more.
- **Custom Dimensions** — liquid heights from 8' to over 100' and diameters from 25' to over 500'.
- **Siting Options** — at grade, partially buried, differentially back-filled and fully buried (with multi-use capabilities).
- **Seismic Resilience** — designed with an anchored flexible base for enhanced ductility and seismic performance.
- **Durability** — proven reliability through weather extremes, including fire and freeze thaw events, tornadoes and hurricanes.
- **Prestressed Wall Compression** — provides longevity, durability and liquid tightness.
- **Reinvesting in the Local Economy** — use of materials, labor and equipment from within the community.
- **Enhanced Water Quality** — concrete inherently insulates, keeping liquids at a more consistent temperature.
- **Best Long-term Value** — our tanks speak for themselves. No coatings required, which eliminates routine maintenance costs and downtime. Request a lifecycle cost analysis today.

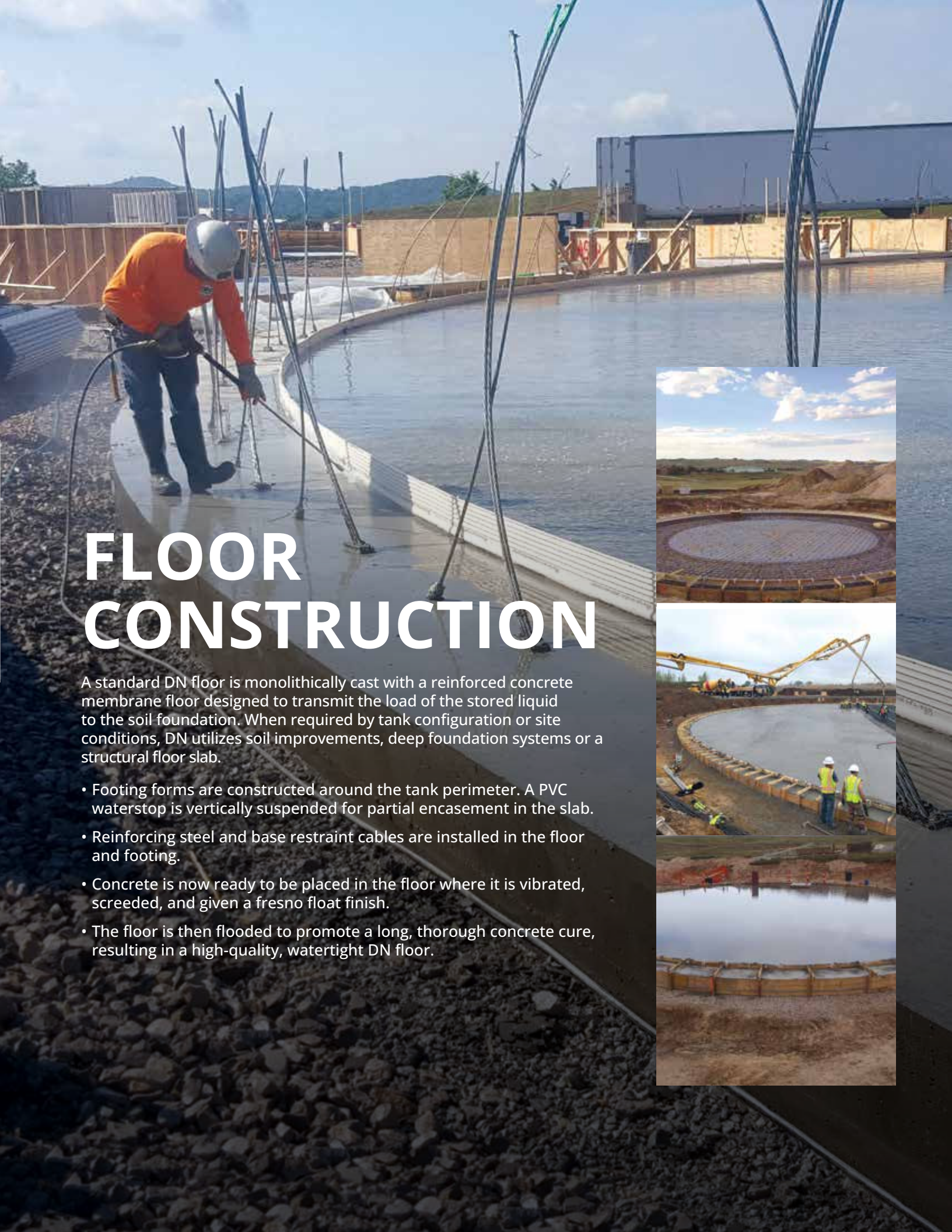
SITE PREPARATION

A properly prepared subgrade is essential to tank construction. Before the structural tank design begins, a licensed geotechnical engineer prepares a site-specific geotechnical report. The report provides design parameters that include bearing capacity, anticipated settlements, seismic criteria, and recommended subgrade and foundation preparation.

- Site clearing and general excavation are undertaken in preparation for tank construction.
- The exposed subgrade is proof-rolled and tested for conformance with the geotechnical report. Select granular fill is placed, if required, for drainage or where unsuitable material is present. The leveling base granular material is then put down in layers and compacted to meet foundation requirements.
- Site preparation includes creating an access roadway around the tank at floor elevation as well as level areas adjacent to the tank for wall and dome casting beds. The casting beds are located near the tank to allow the wall and dome panels to be erected into place.



Subgrade preparation for each project is customized based on local soil conditions.



FLOOR CONSTRUCTION

A standard DN floor is monolithically cast with a reinforced concrete membrane floor designed to transmit the load of the stored liquid to the soil foundation. When required by tank configuration or site conditions, DN utilizes soil improvements, deep foundation systems or a structural floor slab.

- Footing forms are constructed around the tank perimeter. A PVC waterstop is vertically suspended for partial encasement in the slab.
- Reinforcing steel and base restraint cables are installed in the floor and footing.
- Concrete is now ready to be placed in the floor where it is vibrated, screeded, and given a fresno float finish.
- The floor is then flooded to promote a long, thorough concrete cure, resulting in a high-quality, watertight DN floor.





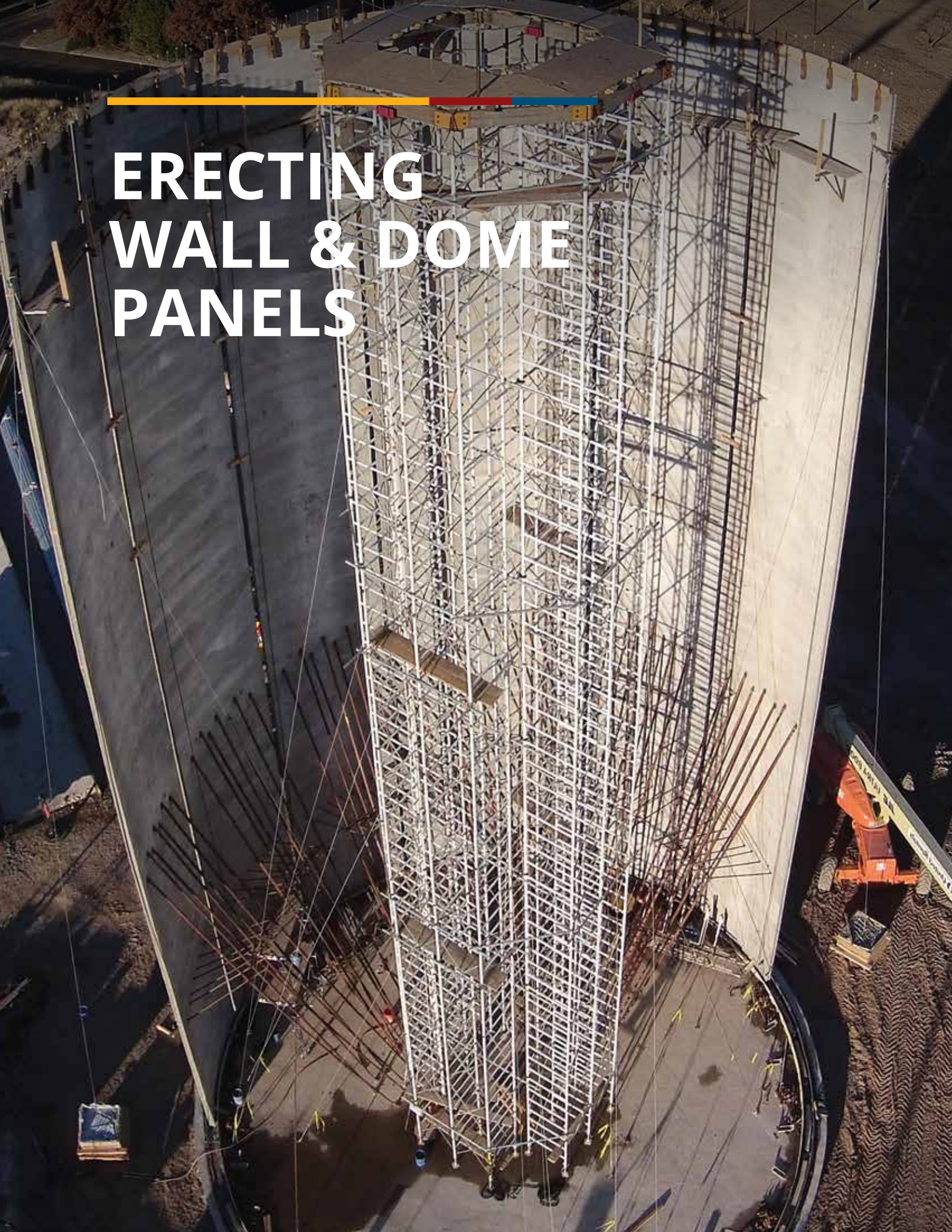
PRECASTING WALL & DOME PANELS

On-site precasting combines in-plant quality with on-site efficiency.

- Wall and dome panels are precast on-site in casting beds that are custom formed to the curvature of each tank.
- An essential feature of AWWA D110 Type III tanks is the use of an embedded steel diaphragm in the tank wall, which acts as a positive water barrier to assure watertightness.
- The standard DN Type III roof system utilizes a freestanding, spherical, concrete dome with no interior columns.
- The dome is constructed as a series of concentric rows of individual dome panels, curved radially and circumferentially to form a spherical dome.
- When required due to site conditions, DN can construct a cast-in-place dome.
- When a tank is designed to receive earth cover or to minimize the total finished height, DN constructs a column-supported flat slab concrete roof.
- Open top tanks can also be designed to specification and are often used for wastewater clarifiers, EQ, aeration, or digester storage tanks.







ERECTING WALL & DOME PANELS

This aerial photograph captures a massive construction site for a large-scale building project. The central focus is a tall, rectangular structure completely encased in a complex, multi-level scaffolding system. To the left of this central structure, a large, dark, curved wall panel is visible, with numerous vertical rebar rods protruding from its base. To the right, a large, light-colored, curved wall panel is also under construction, with a dense network of rebar rods extending from its base. The entire construction is situated on a flat, light-colored ground surface. In the background, a large, circular concrete foundation or base is visible, surrounded by a network of rebar rods. The overall scene conveys a sense of large-scale industrial construction and engineering.

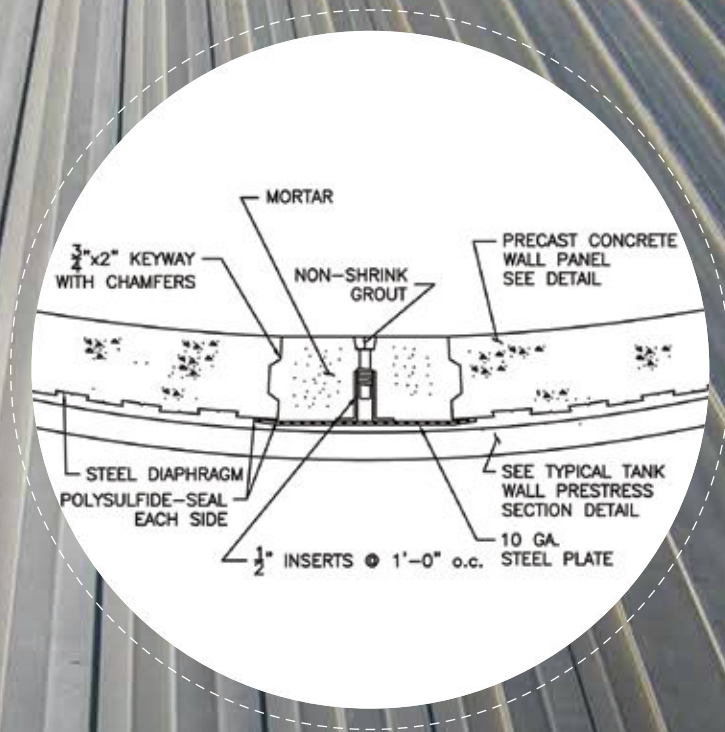


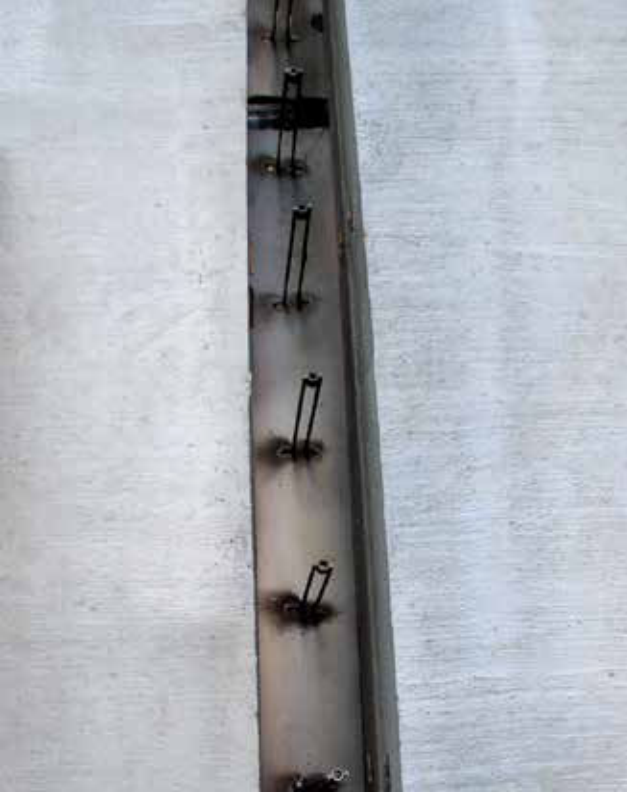
Precast wall and dome panels are inspected, and concrete quality and strength are confirmed prior to erection.

- When the floor achieves its required strength, heavy-duty shoring is erected to temporarily support the precast dome panels.
- The wall panels and dome panels are erected concurrently.
- The wall panels are placed onto bearing pads outside of the encased waterstop. Set approximately 7 to 10 inches apart, the wall panels form a series of open slots, which are later closed.
- Simultaneously, the dome panels are set, spanning between the concentric rows of circumferential forms.
- For tanks requiring a flat slab roof, support columns are constructed and a shoring system is erected. Once the roof slab reinforcing is completed, the roof concrete is placed, finished, and cured in place.

TANK CLOSURE

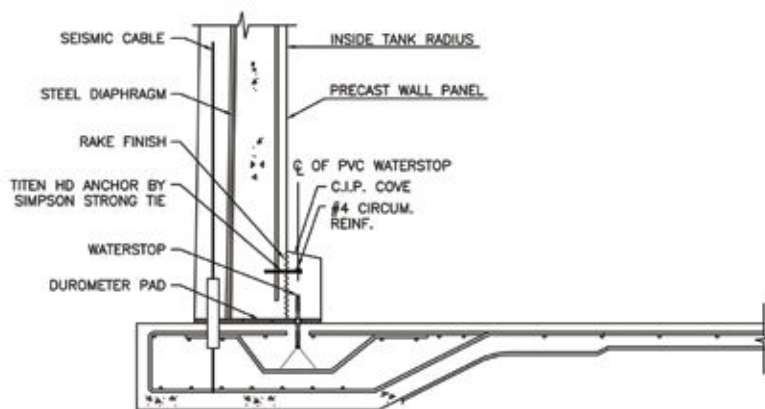
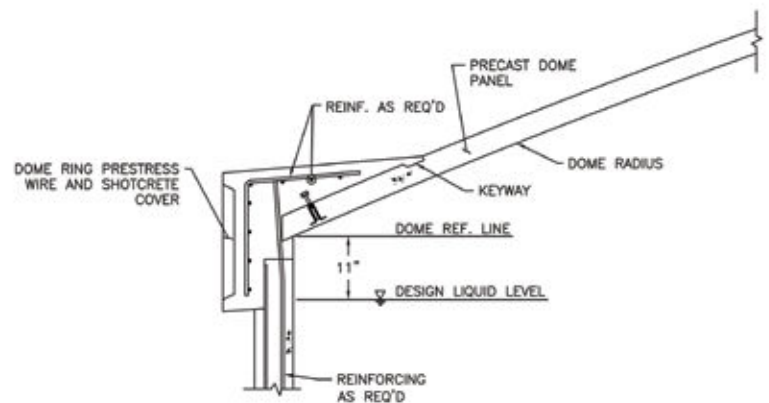
The completed system provides a permanent watertight connection, minimizes vertical bending stresses, and creates resistance to lateral displacement forces.





Wall and dome slots are permanently sealed.

- Heavy-gauge steel plates are erected to span the outside of the wall joint. Temporary forms are erected to span the interior joints, and then high-strength, superplasticized mortar is placed to fill the connection.
- The tank wall is now a continuous cylinder consisting of a high-strength, corrosion-resistant concrete wall on the interior surrounded by a watertight steel shell on the exterior.
- The circumferential and radial joints in the dome are reinforced and filled with concrete, producing a uniform spherical shell.



Floor/wall and wall/dome connections are completed.

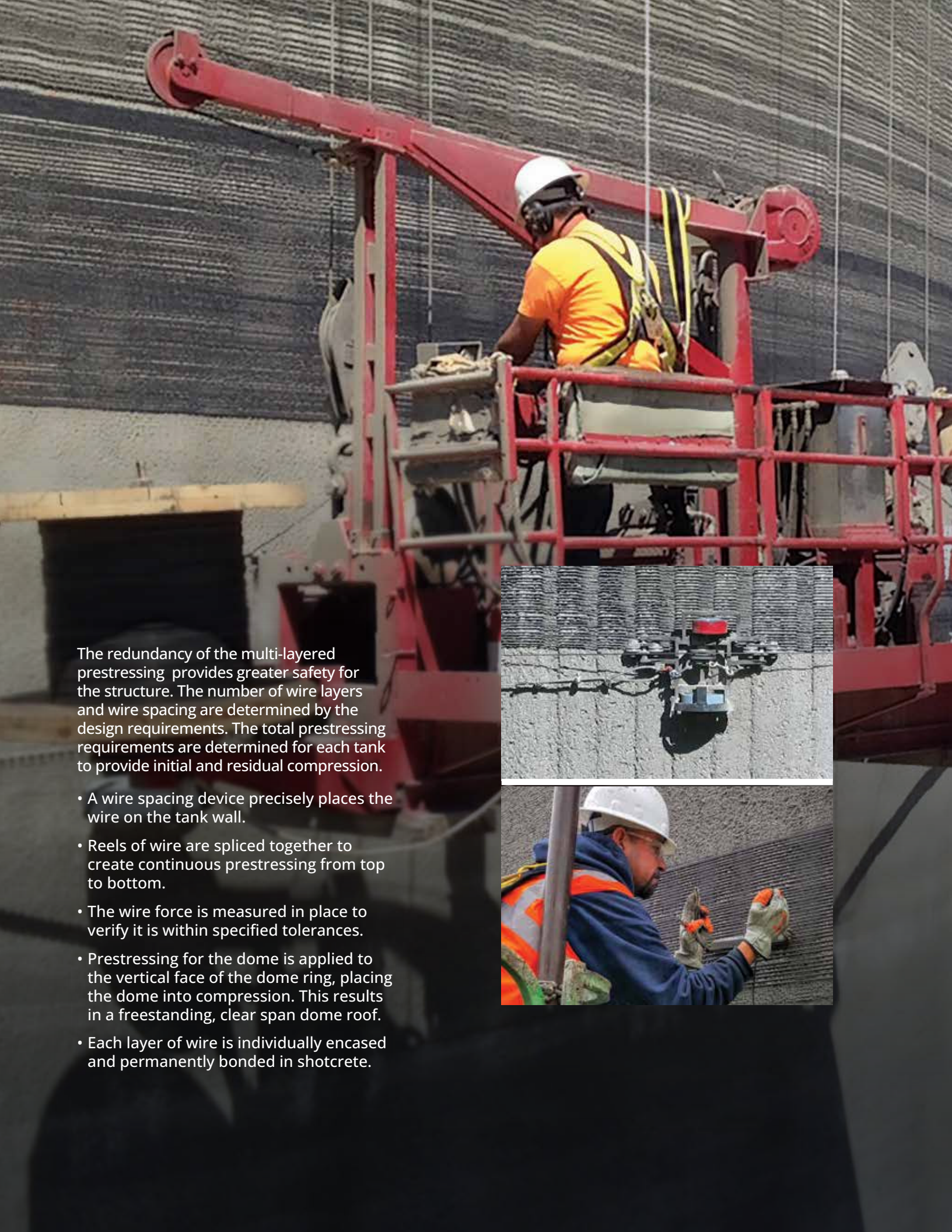
- The flexible floor/wall connection is designed specifically to minimize vertical bending stresses in the tank wall.
- The waterstop is encased with concrete placed on rubber pads to maintain separation from the floor. The concrete bonds to the rake finish at the bottom of the wall panel.
- A dome ring is formed, reinforced, and cast, providing structural continuity between the tank wall and dome roof.
- For open top tanks, a wall cap is designed and constructed to provide structural continuity between the wall and the cap.

EXTERNAL WIRE PRESTRESSING

A DN standard Type III prestressing system utilizes a proven wire-winding method. Multiple layers of high-strength, bright steel prestress wires are applied continuously to gradually place the wall and dome into permanent compression.

A full-page photograph showing a construction worker in a green scissor lift applying a layer of shotcrete to a large, corrugated metal wall. The worker is wearing a red hard hat, a light-colored long-sleeved shirt, and safety harness. A spray of concrete is visible coming from the nozzle of the equipment. The wall is made of vertical corrugated metal panels. The ground is a flat, light-colored surface. The sky is clear and blue.

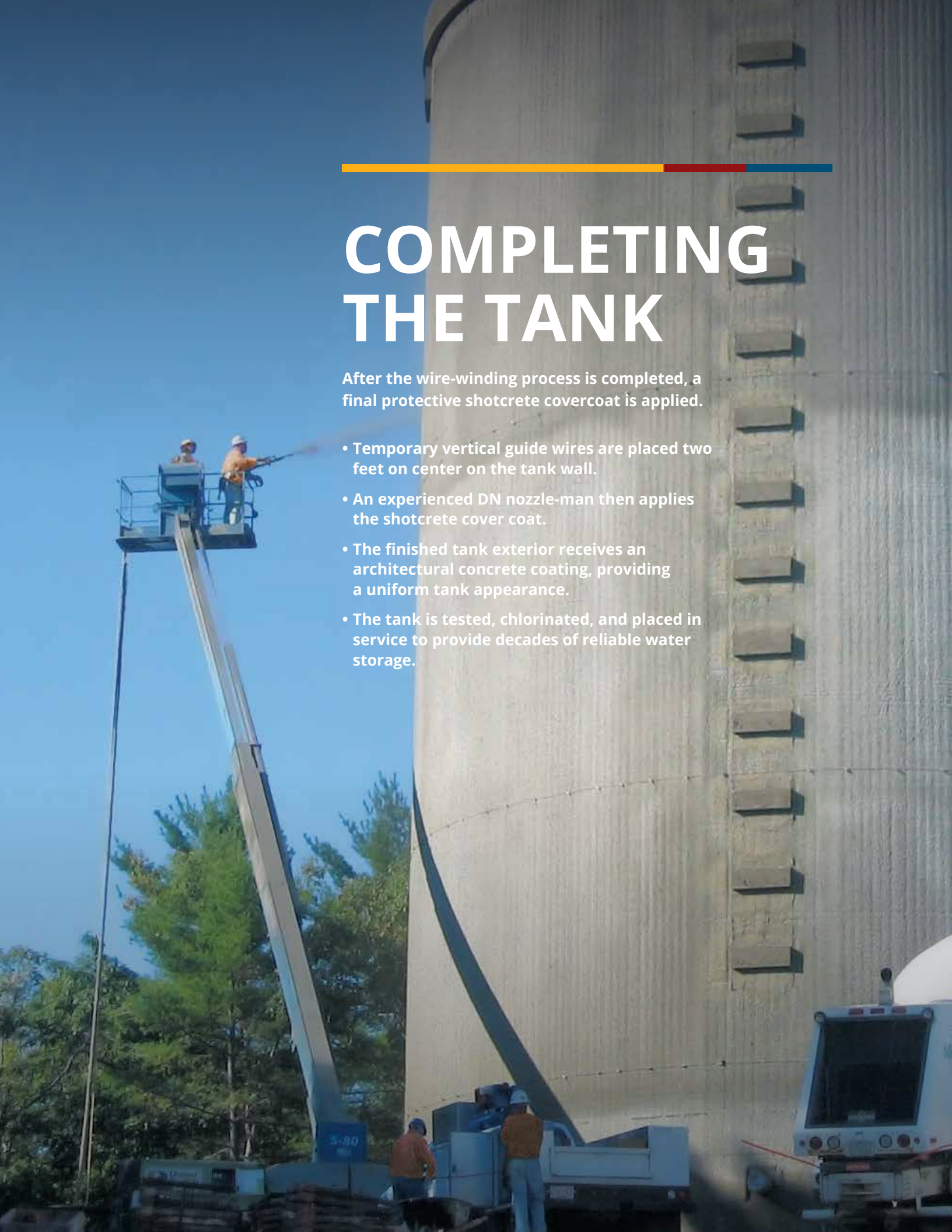
An initial layer of shotcrete is applied to the wall, encasing the steel diaphragm and base-restraint cables. The high-pH shotcrete passivates the steel, providing permanent corrosion protection.



The redundancy of the multi-layered prestressing provides greater safety for the structure. The number of wire layers and wire spacing are determined by the design requirements. The total prestressing requirements are determined for each tank to provide initial and residual compression.

- A wire spacing device precisely places the wire on the tank wall.
- Reels of wire are spliced together to create continuous prestressing from top to bottom.
- The wire force is measured in place to verify it is within specified tolerances.
- Prestressing for the dome is applied to the vertical face of the dome ring, placing the dome into compression. This results in a freestanding, clear span dome roof.
- Each layer of wire is individually encased and permanently bonded in shotcrete.

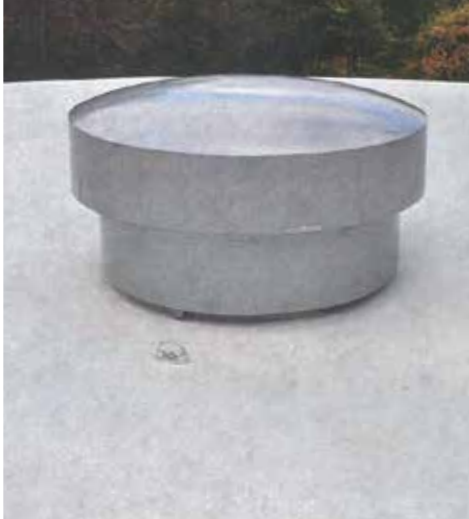


A large, cylindrical concrete water storage tank is the central focus of the image. Two workers in orange safety gear are positioned on a blue aerial lift platform, applying a protective shotcrete covercoat to the tank's exterior. The lift is extended high up the side of the tank. At the base of the tank, another worker is visible near a concrete mixer truck. The tank's surface is covered in a grid of temporary vertical guide wires. The background shows a clear blue sky and some green trees. A horizontal bar with orange, red, and blue segments is located above the title.

COMPLETING THE TANK

After the wire-winding process is completed, a final protective shotcrete covercoat is applied.

- Temporary vertical guide wires are placed two feet on center on the tank wall.
- An experienced DN nozzle-man then applies the shotcrete cover coat.
- The finished tank exterior receives an architectural concrete coating, providing a uniform tank appearance.
- The tank is tested, chlorinated, and placed in service to provide decades of reliable water storage.



In response to specific water quality design requirements, various mixing systems are available, ranging from separated piping, to flow-based systems, to mechanical mixing equipment.

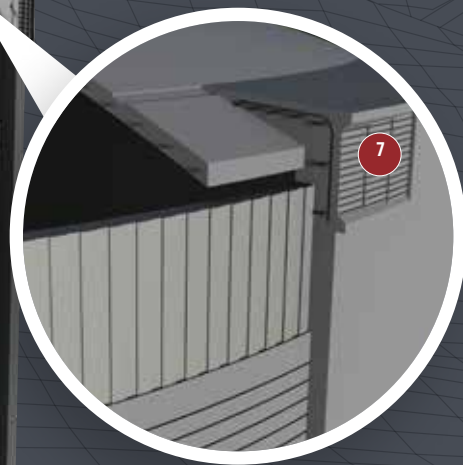
INTERIOR PIPING, APPURTENANCES & WATER QUALITY

- Appurtenances, such as roof and wall access hatches, interior and exterior ladders, vents, safety railings, level sensing equipment or specialized security hardware, are available to meet specific project requirements.
- Baffle wall systems are available to meet C/T design requirements for finished water storage.



- 1 PVC Waterstop
- 2 Duometer Pad
- 3 Steel Diaphragm
- 4 Seismic/Base Restraint Cables
- 5 Layers of Prestressed Wire
- 6 Shotcrete Encasement Over Each Prestressed Layer
- 7 Prestressed Dome Ring
- 8 Free-standing Dome Roof
- 9 Vent





- 10 Covercoat
- 11 Inner Concrete Corewall With No Coatings Required
- 12 Monolithic Cast Floor With a Reinforced Concrete Membrane
- 13 Precast Concrete Wall Panel

DN SHOWCASE





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