STATEWIDE AQUASTORE, Inc.

Premium Water & Wastewater Storage Tanks

AQUASTORE® Glass-Fused-To-Steel Liquid Storage Tanks

The LeRay II water system improvement project featuring an AQUASTORE® CET was Awarded the NY APWA 2022 Environmental Project of the Year.

Statewide Aquastore, Inc.

6010 Drott Dr.
East Syracuse, NY 13057
315.433.2728
info@statewideaquastore.com
www.statewideaquastore.com

www.statewideaquastore.com

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INTRODUCTION

AQUASTORE® Glass-Fused-To-Steel Liquid Storage Tanks

AQUASTORE® glass-fused-to-steel storage tanks are utilized for a variety liquid storage applications including potable water, wastewater, leachate, and other applications. The chemically bonded impermeable glass coating offers numerous advantages over other coating types. AQUASTORE® liquid storage tanks come in various configurations, including reservoirs, Composite Elevated Tanks (CET), and standpipe designs.

All AQUASTORE® liquid storage tanks are manufactured exclusively by CST Industries, Inc. in DeKalb, IL using only USA sourced steel and are supported by the world's most experienced authorized dealer network. With more than 100,000 AQUASTORE® tanks installed in over 70 countries, AQUASTORE® glass-fused-to-steel tanks have proven to be an effective liquid storage solution.

Statewide Aquastore, Inc. is the authorized dealer of AQUASTORE® tanks throughout NY, MA, RI, CT, VT, NH, ME, and northern PA with more than 1400 tank installations over forty years. Statewide Aquastore, Inc. provides complete foundation and tank design, construction, and post construction services for our customers.

CST's enhanced factory controlled glass-fused-to-steel coating technology and their commitment to design improvements makes AQUASTORE® glass tanks the most durable and cost effective solution for liquid storage in the water and wastewater industry.

"The town of Woodstock is very happy with the tank and the great service Statewide Aquastore has provided over the years." Michael Welch, Director of Public Works, Woodstock, NH

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MANUFACTURING

- Advanced Technology
- Glass Coating Overview
- Vitrium™ Glass Coating
- Glass-Fused-to-Steel Coating Process
- Edgecoat II™

"Seneca Meadows Landfill was in need of additional leachate storage capacity. Seneca Meadows, Inc. has had great operational experience using Aquastore tanks for its leachate storage needs for decades and chose Aquastore tanks for both primary and secondary leachate storage when it came time to increase capacity." Curt Taylor, Region Engineer, Seneca Meadows, Inc.

Advanced Technology

The exceptional manufacturing process and advanced technology employed in **AQUASTORE®** glass-fused-to-steel tanks distinguish them from conventional painted steel or concrete structures. Glass-fused-to-steel tanks are exclusively constructed using materials sourced from the United States, with all tank manufacturing taking place at the CST factory in DeKalb, Illinois. The aluminum geodesic domes are also manufactured in the USA by CST in Conroe, TX.

As the largest glass-fused-to-steel tank manufacturing facility globally, CST ensures that all critical manufacturing of **AQUASTORE®** tanks occurs within an ISO-9001 certified controlled environment, guaranteeing the production of exceptionally crafted products.

Glass-fused-to-steel panels on the production line

CST's factory-based manufacturing approach eliminates the uncontrolled variables encountered in field-manufactured products such as welded painted-steel and concrete tanks. Factors like adverse weather conditions, extreme temperatures, fluctuating humidity, worker experience, and environmental influences, which significantly impact on-site manufactured products, exert minimal effects on the glassing process. Furthermore, **AQUASTORE®** tanks can be constructed throughout the year, as the manufacturing itself is completed within the factory, requiring only the assembly of components in the field.

Designed, sourced, fabricated, constructed & supported within the USA

Glass Coating Overview

Nearly all storage tanks incorporate a coating to protect their surfaces. Among the primary coating options available today, **AQUASTORE®**'s glass-fused-to-steel coating stands out due to its permanent, impermeable nature and unique properties, offering numerous advantages over alternative choices.

AQUASTORE®'s glass coating process begins with a glass frit mixed with other minerals and water resulting in a liquid slurry. This glass slurry is then precisely sprayed onto prepared carbon steel panels that have been cut, punched, rolled, grit blasted, and cleaned. Ultimately, the panels enter a furnace and are subjected to over 1500°F which chemically bonds the glass slurry to the surface of the grit blasted steel.

Glass frit is specially formulated to produce the distinctive cobalt blue AQUASTORE® glass coating.

Unlike other coatings that rely solely on a mechanical bond with the underlying material, the glass fusing process provides an additional chemical bond. The chemical bond's strength greatly surpasses that of the conventional mechanical bond, preventing any corrosion from spreading on the primary steel material.

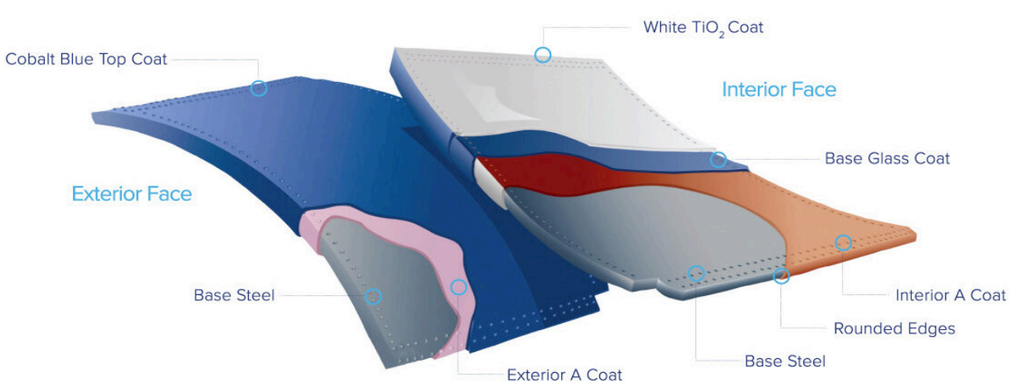
Vitrium™ Glass Coating

CST's unending commitment to product improvement resulted in the development of CST's glass innovation – Vitrium™.

This coating, introduced in 2001, combines the outstanding chemical and physical resistant properties of titanium-enhanced glass with a highly engineered, ultra-fine glass bubble structure.

This process results in high performance glass-fused-to-steel technology. Vitrium™ features and benefits include:

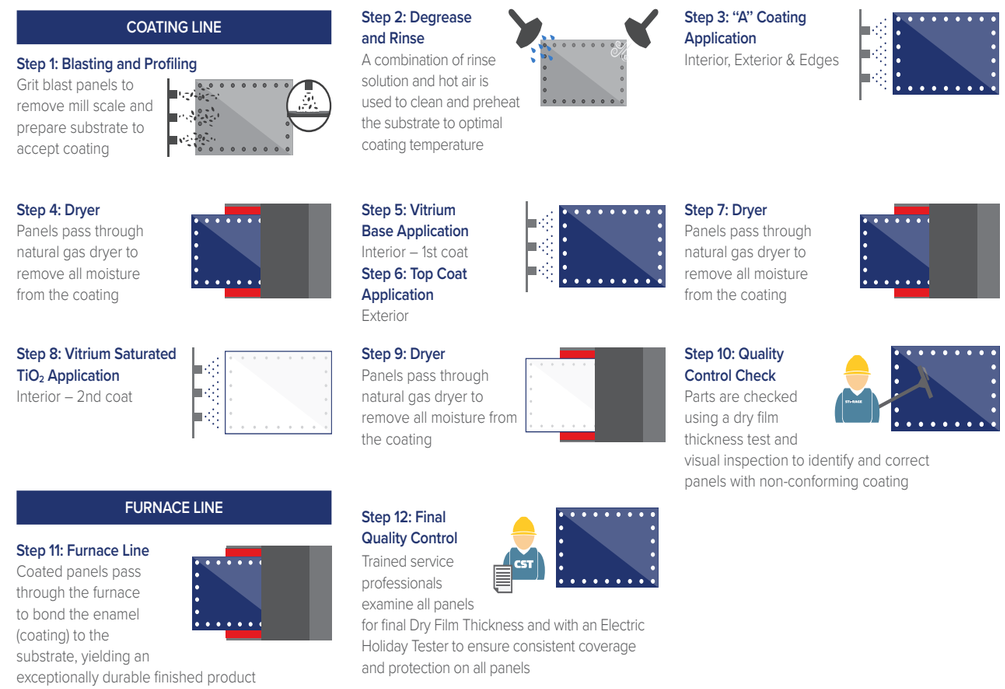
- Tough TiO2 glass formulations provide longer life
- Electrostatic base coat application ensures consistent quality
- Maximum coating effectiveness without requiring increased coating thickness
- Unique process technologies provide factory certified "holiday-free" sheets
- Process efficiencies lead to competitive pricing
- Ideal for both cold and hot climates



Glass-Fused-to-Steel Coating Process

Vitrium features and benefits include:

- Tough TiO_2 glass formulations provide longer life
- White interior is easier to inspect than darker coatings
- Factory certified holiday-free sheets
- Designed for use in both cold and hot climates
- Designed, fabricated, shipped and supported within the USA



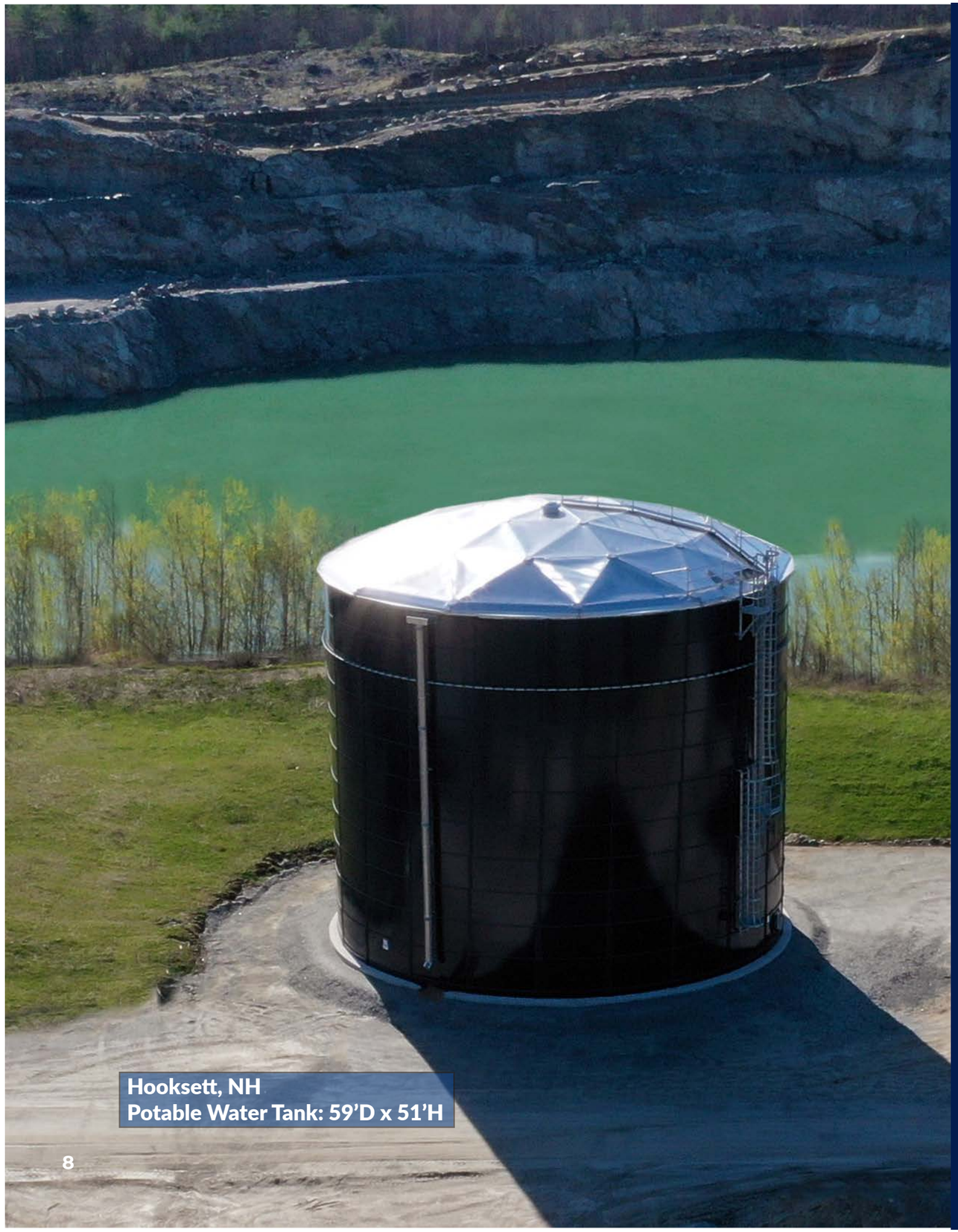
EDGECOAT II™

EDGECOAT II™ is a result of CSTs commitment to an ongoing product development and improvement program.

Following Porcelain Enamelling Institute guidelines (PEI-101), EDGECOAT II™ sheets are mechanically rounded to specific radii that provides maximum glass adhesion to the steel. The combination delivers the maximum corrosion resistance of Vitrium™ glass coating with the greatest protection on every sheet.

Complete edge protection

The EDGECOAT II™ engineered approach involves stringent plant quality control procedures to ensure the glass coating remains in place throughout the life of the tank. Sheet edge corrosion on steel is aesthetically unpleasant and may significantly reduce the life of your storage tank. Due to the manufacturing expense and professional engineering necessary to coat the steel edges, other glass tank providers will leave them uncoated and exposed, relying solely on the sealant fillet to prevent corrosion in this area. CSTs improved process of mechanically rounding the sheet edges to exact radii ensures adherence of the glass for complete encapsulation on every sheet edge.



Hooksett, NH
Potable Water Tank: 59'D x 51'H

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CONSTRUCTION

- Consistent Quality Control
- Factory Trained Construction Crews
- Floors
- Sidewalls
- Geodesic Domes & Knuckle Roofs
- Composite Elevated Tanks (CETs)

"Statewide Aquastore, Inc. once again proved they could provide and install a potable water tank in a timely fashion. Coordination amongst Aquastore Engineers and Contractors to overcome unforeseen conditions was paramount to keeping this project on schedule." Dan Thaete, Director of Engineering, Town of Ithaca

Construction

Every AQUASTORE® tank is factory engineered to customer specifications. Because all components are manufactured in the factory and easily assembled, AQUASTORE® tanks can be assembled in many types of weather conditions where field-welded steel and concrete tanks cannot.

Unique jacking system

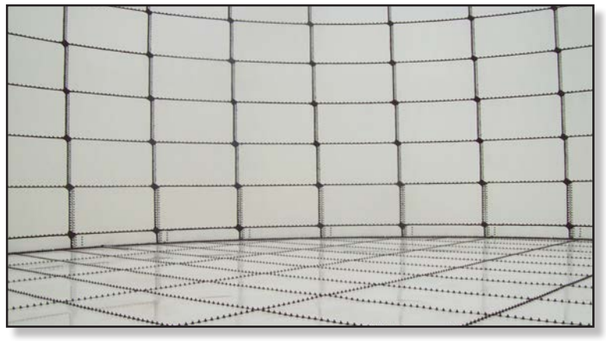
AQUASTORE® tanks are constructed by Statewide Aquastore, Inc. employees with years of experience. Our factory trained crews attend an annual builders school to maintain the highest level of build quality. Many of our construction foreman and crew members have been with the company for decades and have overseen the installation of 100's of tanks. Their combined construction experience coupled with the precise engineering of AQUASTORE® tanks ensures the highest quality product is provided to the customer.

Reinforced concrete floor with embedded starter ring

AQUASTORE® tanks are assembled from the top down by factory trained construction crews with a unique jacking system that progressively elevates the structure without the need for expensive cranes and extensive scaffolding. As a result, construction crews can stay safely on the ground. This construction method enables rapid, systematic progress for timely completion.

Floors

AQUASTORE® floors can be glass-fused-to-steel or reinforced concrete. Concrete floors with an embedded tank starter ring are commonly used for potable water storage tanks. Glass-fused-to-steel floors can be utilized for highly corrosive liquids such as leachate and other wastewater applications.



Glass floor and sidewall construction

Sidewalls

Sidewall construction is completed using a series of specially designed motorized jacks. Each glass-fused-to-steel panel is bolted and sealed into place. Upon completion, the motorized jacks raise the sidewall ring so subsequent rings can be attached. Construction of an AQUASTORE® tank does not require heavy-load cranes or lifting equipment on-site. This unique installation process allows for construction in remote regions as well as metropolitan areas.

Geodesic Dome

Aluminum geodesic domes are available in all sizes and are available for the complete range of AQUASTORE® tanks. Geodesic domes are free spanning (do not require columns to support) and are installed on the tanks during the initial phase of construction. They are constructed with non-corrugated triangular aluminum panels interlocked by a truss system with wide flange extrusions. Domes are designed to each individual customer's needs, taking into account wind, snow, and seismic loads and applicable design codes.

Geodesic dome construction at ground level

Geodesic dome prior to aluminum panel installation

Interior view of geodesic dome

Knuckle Roof

Glass-fused-to-steel roofs are manufactured with hard tooling and include radially sectioned steel panels. The roofs are assembled using the same sealant and bolting techniques as the sidewall panels. Glass-fused-to-steel roofs are available up to 31 feet in diameter.

Knuckle roof with decal

Knuckle roof exterior view

Composite Elevated Tank Construction

CET's are elevated water storage tanks constructed of a glass-fused-to-steel storage tank atop a reinforced concrete support slab and pedestal. The concrete pedestal interior is often used as dry storage, a lab, or a treatment building to eliminate the need for a separate structure.

Statewide Aquastore, Inc. designs and constructs CET tanks using a combination of long-recognized and widely accepted industry standards and guidelines such as AWWA D103, ACI 371R, ACI 318, ASCE-7, AISC 360, and IBC, as well as state building codes where applicable. Statewide Aquastore, Inc.'s CET designs are PE stamped to ensure quality and safety.

We also understand that aesthetics are important in a tank design. Whether displaying the proud heritage of a town's name, logo, or mascot, or using the space for commercial advertising, simple and intricate logos can be included with your tank order. For long-term durability, many logos can be "glassed" into the tanks surface so they will look as if they were newly applied for the life of the tank.

CET Foundation

CET construction with jump forms

Crane placement of a CET geodesic dome

CET with pan and initial tank construction

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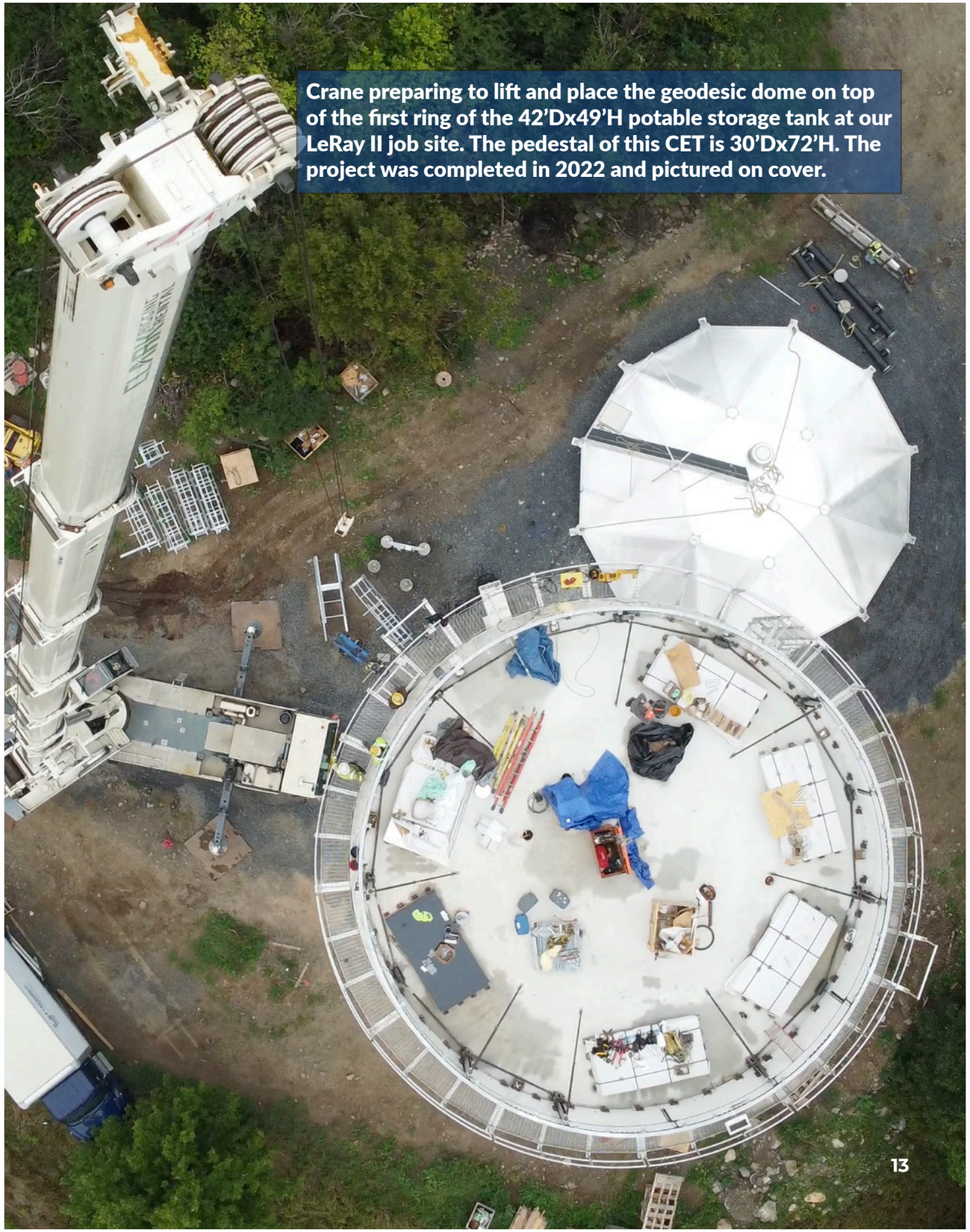

Crane preparing to lift and place the geodesic dome on top of the first ring of the 42'Dx49'H potable storage tank at our LeRay II job site. The pedestal of this CET is 30'Dx72'H. The project was completed in 2022 and pictured on cover.

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ADVANTAGES

- Low Maintenance Costs
- Design Flexibility
- Sustained Beauty
- Expandability
- Ancillary Items

"The Village of Kiryas Joel has undertaken a multi-phase project to connect their drinking water system to the New York City Catskill Aqueduct. The two tanks are being used as clearwells for two booster pump stations along the 13.5 mile route from the aqueduct tap connection to the Village's distribution system. The Aquastore glass-fused-to-steel tanks were a cost-effective alternative to a traditional below-grade, cast-in-place clearwell." Gary Stuart, CDM

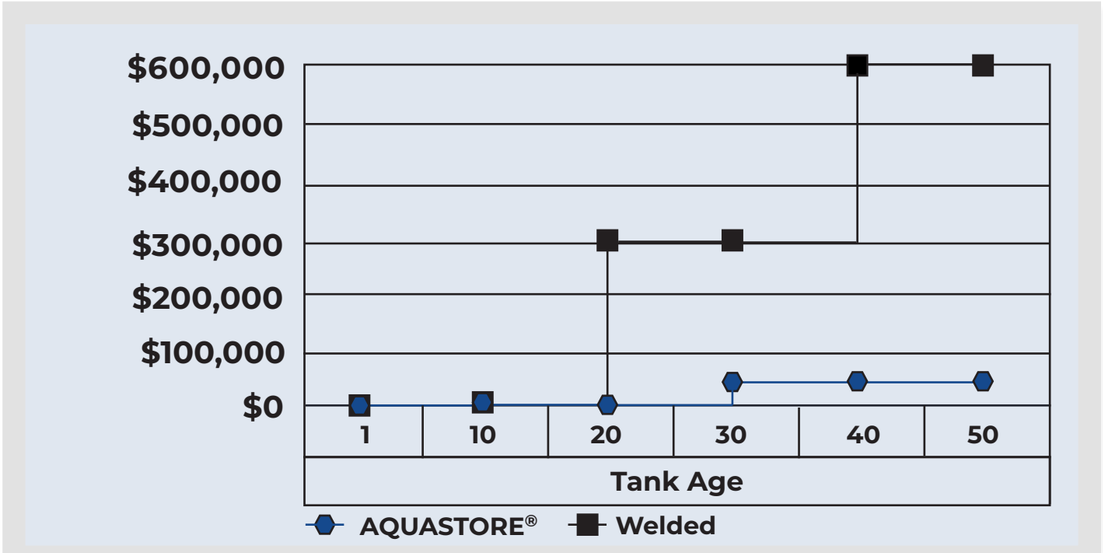
Low Maintenance Costs

There are numerous advantages to utilizing an AQUASTORE® glass-fused-to-steel liquid storage tank in comparison to painted steel or concrete tank designs. One of the most compelling economic benefits stems from the fact that the glass coating never requires repainting—it is permanently affixed. The financial resources saved throughout the life cycle of the tank from avoiding the inevitable need to repaint a tank or repair aged concrete can be allocated to other projects within a municipality. From a sustainability viewpoint, no paint, epoxy, or concrete bi-products are deposited in a landfill as is the case with designs necessitating a costly and environmentally unfriendly recoating.

Life-Cycle Cost Comparison: AQUASTORE® GFS vs. Welded Steel

Estimated Life-Cycle SAVINGS with an AQUASTORE® Glass-Fused-to-Steel Potable Water Storage Tank

$599,394*



*based on a 50yr life-cycle comparing a 31'D x 66'H glass-fused-to-steel-tank with a welded steel tank.
Comparison includes resealing for GFS tanks, repainting of welded steel tanks, and cathodic anode replacements for both tanks.
Comparison does NOT include initial construction cost or routine inspections.

Design Flexibility

Easy panel replacement

The bolted design and assembly of AQUASTORE® tanks offer a level of flexibility unmatched by any other tank design. Because manufacturing is completed in a factory, the requirement for large staging areas during on-site construction is eliminated. The construction of the tank can typically be accomplished with a cleared area of approximately 6 to 10 feet around the tank diameter. This reduction in site clearing and levelling results in substantial cost savings for a project. The panels themselves can be carried by hand and assembled in tight areas when necessary, enabling installation in locations that would be impractical for other tank types.

Tight footprint installation

Individual panels can be replaced in the event that additional manways, nozzles, or other components are required, unlike concrete or welded tanks which would necessitate extensive and expensive modification.

Sustained Beauty

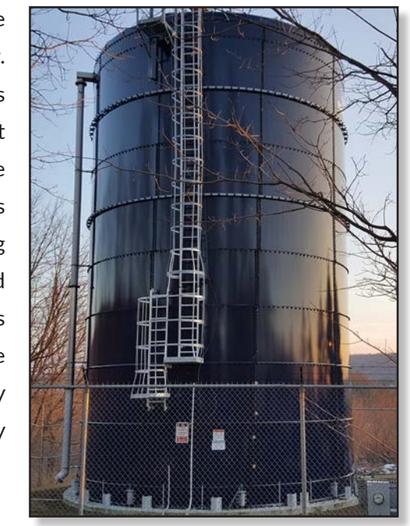
26yrs stand between these tanks

Another advantage of the AQUASTORE® glass-fused-to-steel coating lies in its ability to maintain its appearance over time. The glass does not chalk, fade, or discolor, ensuring that the tank's visual appeal remains intact for the life of the tank. While painted tank coatings erode, rust, and deteriorate with time, the glass coating retains its original appearance. Unlike concrete tanks that require an exterior recoating to preserve the concrete's appearance and necessitate reapplication over time to mask unsightly cracks, efflorescence, and staining, the glass coating withstands the elements. Glass-fused-to-steel tanks are frequently constructed in areas where long-term visual appeal is desired.

Expandability

Expanded tank with two new rings at bottom

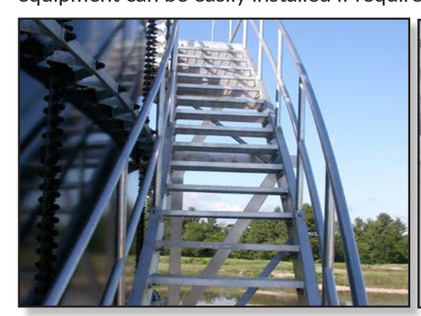
Another distinctive and significant feature of the AQUASTORE® glass-fused-to-steel bolted tank design is the ability to accommodate vertical expansion. In the event of community or industrial growth requiring additional capacity, the unique jacking process enables the end user to swiftly and cost-effectively obtain the required expansion. The factory-certified tank construction crew will simply unbolt the bottom ring from the original starter sheet, raise the tank, and add the necessary number of rings to achieve the new capacity. Tank expansions are typically completed in less than a week, resulting in substantial cost savings compared with purchasing a new tank for increased capacity. If the potential for future expansion exists for any community or industry, it is advisable to consider this during the initial project design phase, ensuring that the tank foundation is designed to support loading from the expanded tank. Due to the superior glass coating, the expansion of these tanks does not affect their appearance, with no discernible difference between the original panels and the new ones. Several communities have successfully expanded their tanks after 25 years of service with no noticeable disparity in appearance.



18yrs after original construction, there is no discernible difference between the original panels and the newly installed ones

Ancillary Items

The bolted design permits the easy and straightforward installation of additional nozzles or penetrations into the tank at any time, mitigating the challenges associated with other tank designs. Insulation, baffles, specialized walkways, stairs, platforms, and internal equipment can be easily installed if required.



Stairway

Manway

Vent

Our factory trained crew servicing a CET located in Cape Vincent, NY.

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OTHER CONSIDERATIONS

- Ice Mitigation: Mixers & Heaters
- Tank Color Options
- Cathodic Protection

"NY American needed to increase water storage in its Cambridge system to increase fire protection and improve system reliability. The Aquastore tank solved these problems with a cost effective tank that was constructed quickly and on budget." Richard Ruge, New York American Water

Ice Mitigation: Mixers & Heaters

Unheated structures, especially those with limited or no turnover, face the risk of freezing when subjected to extended periods of severe cold temperatures. The principles of heat transfer are universally applicable to all tank construction materials.

For most municipal applications, the system's operation inherently ensures sufficient turnover if designed correctly. However, if this is not the case, the design of any system must address this requirement to prevent freezing from occurring. Numerous solutions are available for situations with low turnover during prolonged extreme cold spells. It is advisable to consult with the design engineer and Statewide Aquastore, Inc. to obtain guidance on the best course of action.

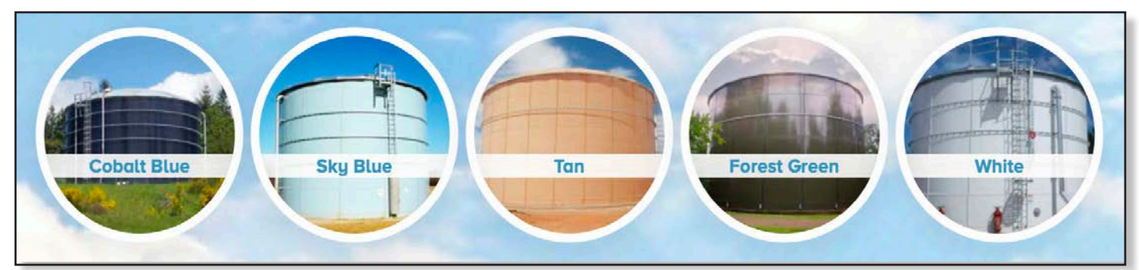
Heater with insulation on tank exterior

Mixer on bottom of tank

Heater, interior view

Tank Color Options

Cobalt blue is the standard AQUASTORE® color. Sky Blue, Tan, Forest Green, and White are also available at a slight *increase in cost.*



Life Cycle Leader | Ultimate Corrosion Resistance | Never Needs Painting

Cathodic Protection

A cathodic protection system with sacrificial anodes is custom-designed for each individual system. The determination of the precise number of anodes required to sustain the system for approximately ten years relies on factors such as water resistivity and conductivity, the surface area of exposed steel, and various additional considerations.

Once the anodes have been depleted, replacement becomes necessary. This can be conveniently carried out during a scheduled inspection when the tank is empty or, if necessary, by employing a diver.

Anode on tank floor

Four cathodic anodes on tank floor

Town of Binghamton, NY
Potable Water: Tank 50D x 24H

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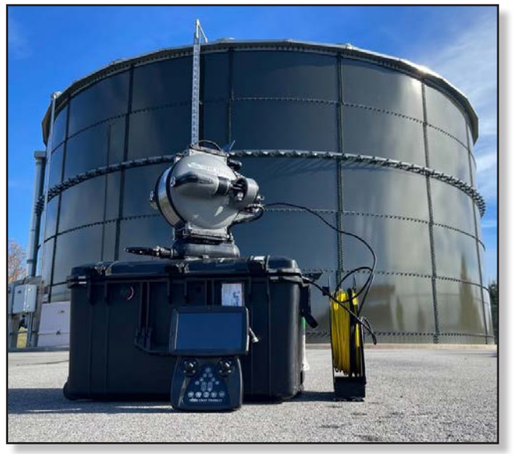
MAINTENANCE

Neglecting maintenance is the primary cause of expensive, unnecessary repairs or complete replacement of ANY type of storage tank.

Maintenance

Although AQUASTORE® glass-fused-to-steel tanks require minimal maintenance, nothing is maintenance free. It is prudent to incorporate a routine inspection and maintenance program for all water and wastewater system components, including glass-fused-to-steel storage tanks.



Submersible drone used for wet inspections

The American Water Works Association (AWWA) recommends that all potable water storage tanks undergo inspections every 3 to 5 years. Each system should implement a periodic inspection program to ensure its optimal functioning. Addressing any issues promptly mitigates the risk of their escalation into costly repairs and system downtime.

Apart from periodic inspections and power-washing, the only maintenance requirement pertains to the periodic replacement of sacrificial anodes utilized in the cathodic protection system.

According to the National Association of Corrosion Engineers, considering the significant expenditure on failing infrastructure annually, any structure that could benefit from cathodic protection should employ it. Essentially, if a storage tank incorporates steel or rebar elements, the use of cathodic protection should be considered to extend the structure's lifespan.

Historically, glass-fused-to-steel tanks have exhibited the lowest maintenance requirements and associated costs over the structure's lifetime, in comparison to painted steel or concrete structures.

AQUASTORE® *tanks have a white interior making them easy to inspect*

Submersible inspection of cathodic anode

Life Cycle Leader | Ultimate Corrosion Resistance | Never Needs Painting

"The Town of Reading's existing Auburn St. elevated steel water tank needed to be replaced as it had reached the end of its useful life. The town decided to replace it with a glass-fused-to-steel composite elevated tank (CET) to minimize required future maintenance as the tank site is in a residential neighborhood and has cellular antenna and equipment mounted to it." Michael Warner, PE, Weston & Sampson Engineers

Town of Reading, MA
Potable Water Tank: 59D x 40H

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CONCLUSION

"After evaluating several types of storage tanks, Star Lake chose the Aquastore glass-fused-to-steel tank. Factors that went into the decision were cost, low maintenance, small footprint requiring minimal site work, and quick construction schedule. The project was on time and within budget." Chris Lawton, PE, Barton & Loguidice, DPC

Why Choose an AQUASTORE® Glass-Fused-To-Steel Tank?

When evaluating various tank designs and materials available today, several crucial factors must be taken into account: initial construction costs, anticipated lifespan, and long-term maintenance expenses. These factors hold significant weight and should guide the decision-making process when determining the most suitable product for a specific project.

AQUASTORE® glass-fused-to-steel tanks present a reliable, cost effective solution for fulfilling the liquid storage requirements of municipalities and private industries. The simple design of bolted glass-fused-to-steel tanks makes them an ideal solution for potable water systems. Furthermore, due to exceptional chemical resistance of the permanent glass coating, AQUASTORE® glass-fused-to-steel tanks are equally suitable for applications including wastewater management, landfill leachate containment, and various aggressive industrial processes.

A regularly inspected and well maintained AQUASTORE®glass-fused-to-steel tank provides the lowest life cycle cost when compared with painted steel or concrete tanks.

An equally important consideration in the selection of a tank is the company to partner with in the design and construction of the tank project. Statewide Aquastore, Inc. has over 40 years experience designing and constructing AQUASTORE® glass-fused-to-steel liquid storage tanks and CET's with over 1,400 installations throughout New York, New England, and Northern Pennsylvania. Statewide Aquastore, Inc. is positioned to assist in all phases of design, construction, inspection, and maintenance throughout the lifespan of the tank.

For additional information on the advantages and specifications of AQUASTORE® glass-fused-to-steel tanks, we encourage you to reach out to us. A member of our engineering team is available to answer your questions.

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6010 Drott Dr.
East Syracuse, NY 13057
315.433.2728
info@statewideaquastore.com
www.statewideaquastore.com

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www.statewideaquastore.com