

# CST

**THE GLOBAL LEADER IN STORAGE AND COVERS SOLUTIONS**





**CST**



# CST

CST is the unrivaled global leader in storage tank and cover solutions. A dynamic combination of the world's leading coated steel tank and aluminum cover companies, CST is home to world class brands including Columbian TecTank®, Aquastore®, Harvestore®, HydroTec®, BulkTec® and PetroTec®, Vulcan, Temcor and Conservatek.

CST promises the complete package of people, products and technical expertise to fulfill customer needs. You can trust CST to deliver the right tank and cover recommendation for the right long lasting solution. Count on CST for a new level of excellence in storage tanks and covers.

## Evolution of CST

1890's



1940's



1960's

TEMCOR



1970's

CONSERVATEK



1990's



ENGINEERED STORAGE PRODUCTS COMPANY

2000's



CST Storage offers the only complete product line of advanced tank coatings. CST Storage is better positioned to efficiently provide its global customers with

the right tank for the right application, no matter the coating – Vitrium™ glass-fused-to-steel and OptiBond™ epoxy coating system. Complete Storage Solutions are backed by engineering resources located in multiple centers of influence to provide project expertise. CST Storage brings the most experienced team of construction and field service personnel through our network of dealers and representatives to deliver successful installation from start to finish.

With a legacy of almost 120 years and over 250,000 tanks in 125 countries, no other company can match CST's design, manufacturing and construction experience.



CST Covers is the worldwide leader in designing, manufacturing and constructing custom aluminum covers and structures for municipal and industrial storage

and architectural applications. CST Covers represents the combined proud traditions of the world's two leading aluminum cover companies Temcor and Conservatek. Together we have supplied over 16,000 covers in more than 90 different countries.

CST Covers offers multiple structural, high strength aluminum design solutions including domes, vaults, extruded flat covers, formed plank covers, truss supported covers, space frames as well as custom products specifically designed for customers unique applications.



# WORLD CLASS COATING TECHNOLOGIES

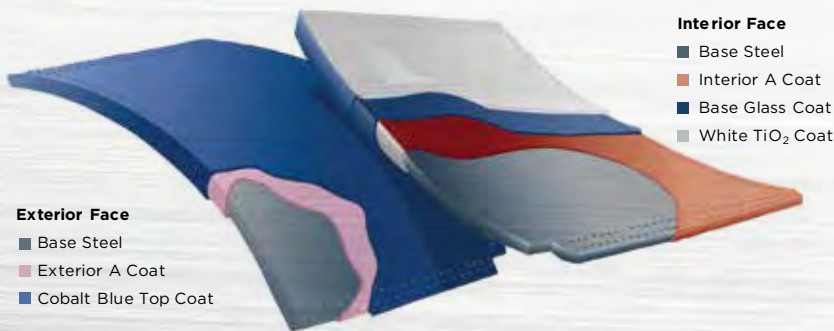
All CST tanks are engineered and manufactured in factory controlled environments. The result is precise steel panel production teamed with optimized coating processes. CST has invested millions in completely modernizing and automating fabrication lines in ISO 9001 certified facilities. CST's state-of-the-art operations deliver the best coated steel tanks on the market.

## VITRIUM GLASS-FUSED-TO-STEEL

Vitrium™ glass-fused-to-steel, featured in Aquastore® and Harvestore® brand tanks, is the premium coating in the storage tank market. It is a single, strong, integrated glass and steel material fused together at 1,500° F (815° C) in a controlled process furnace. The physical properties of Vitrium are specially suited for municipal and industrial liquid applications. The hard, inert barrier on both the interior and exterior tank surfaces guards against corrosion. Impermeable to liquids and vapors, it controls undercutting caused by corrosion and offers excellent impact and abrasion resistance.

### Physical Properties

#### Vitrium Glass-Fused-To-Steel Technologies

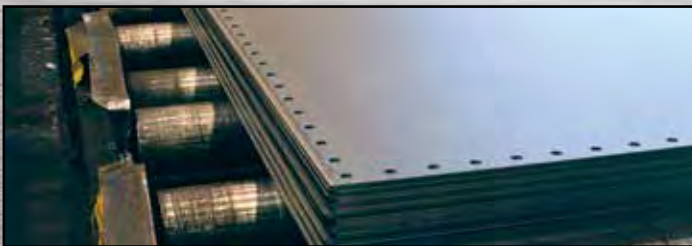


Vitrium™

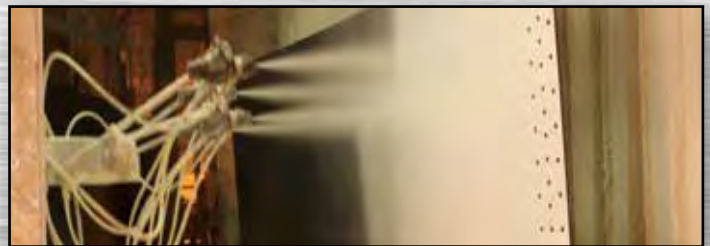
Vitrium technology combines the outstanding chemical and physical resistant properties of titanium dioxide-enhanced (TiO<sub>2</sub>) glass with a highly engineered, ultra-fine glass bubble structure for durability and flexibility. Vitrium glass-fused-to-steel coatings range from 7-15 mils/180-380 microns exterior and 10-18 mils/260-460 microns interior in thickness.

### Glassing Process

A new, state-of-the-art porcelain enameling furnace was recently installed by CST. As the world's largest porcelain enameling furnace, it improves quality, saves energy, increases production and speeds delivery of glass-fused-to-steel products to customers. In all, five advanced temperature control zones regulate the coating process to produce high quality sheets every time.



**Stage 1:** Steel panels are prepared to specification



**Stage 2:** Panels are coated with Vitrium glass coating



**Stage 3:** Glass coating and steel panels are fused together at 1500° F (815° C)



**Stage 4:** Glass-fused-to-steel sheets are quality tested and prepared for shipment



# AQUASTORE – GLASS TANKS WITH A HEART OF STEEL

Aquastore tanks are the premium choice for storage in the municipal and industrial water, wastewater and industrial liquid markets. Proven in the field for more than 30 years, no other tank lasts longer or has greater lifetime value than an Aquastore tank.

## Consider these advantages:

- NEVER NEEDS PAINTING
- Minimal maintenance required over tank life
- Will not corrode or rust
- A guaranteed tank performance warranty
- Turn key services from approval drawings to tank testing
- No need for cranes or other large equipment for construction
- Can be constructed in remote or secluded locations
- Minimal environmental construction site impact
- Minimize lost construction days associated with weather delays or field-applied coatings
- Design for future expansion or relocation
- Remove graffiti easily
- Lowest life cycle cost

# AQUASTORE®

## Glass Chart

Category	Specifications
Outside Sheet Color	Cobalt Blue, Desert Tan, Forest Green, Sky Blue, White
Nominal Thickness	Interior: 10-18 mils, 260-460 microns Exterior: 7-15 mils, 180-380 microns
Service Range	140° (60° C) @2-11 pH-subject to verification, depending on specific products stored
Abrasion Resistance	Taber-8 mg loss (CS-17, 100g, 100 cycles)
Elasticity	Young's Modulus $12 \times 10^6$
Permeability	Impermeable to gases and liquids within normal operating temperature ranges
Thermal Conductivity	20.4 BTU in/hr ft <sup>2</sup> °F
Cleanability	Smooth, inert, glossy, anti-stick
Hardness	6.0 Mohs
Adherence	Over 5,000 psi to base steel
Impact Resistance	24 inch-lb.
Corrosion Resistance ASTM B-117	Excellent, virtually unaffected by most waste waters, brines, sea water, sour crude, salt spray, organic and inorganic chemicals
Continuity Testing	In accordance with EN 28765, up to 1500V

# THE CST OPTIBOND EPOXY COATING SYSTEM

CST utilizes premium epoxy coating technology that provides maximum corrosion resistance and long tank life. Our experience has led to continuous technology and process improvements that have resulted in the finest epoxy coating available in the storage tank industry. The OptiBond™ Epoxy Coating System is derived from years of in-field experience and performance data.

## A PROPRIETARY PROCESS

### CLEANING

#### Stage 1:

- Parts are degreased and rinsed
- Precisely controlled hot air drying and pre-heating at an optimum temperature for a precision coating process

#### Stage 2:

- Parts surfaces are then blasted with engineered grit material
- Rugged 3-D surface topography is created for better powder coating acceptance and increased durability and long-term coating performance
- A high velocity air curtain removes residual particulate



### COATING

#### Stage 3:

- Parts are powder coated with our proprietary electrostatic booth within precise environmental controls
- Parts are cured at a controlled temperature to maximize the cross-link bonding of the epoxy particles

#### Stage 4:

- Uniquely engineered Polyurethane topcoat is applied for UV protection on exterior surfaces for extra durability and longevity
- Sheets are cured at controlled temperature to yield the final product

### QUALITY CONTROL

Parts are subjected to a rigorous quality control inspection with a high voltage defect testing procedure. This will identify any defects, inclusions and thin areas in the coating. No other company has a higher process and quality control standard than CST!



# OptiBond™



# HYDROTEC, BULKTEC AND PETROTEC BRAND TANKS FEATURE THE CST OPTIBOND EPOXY COATING SYSTEM



HydroTec® tanks deliver the highest quality at the lowest cost per gallon. CST has perfected HydroTec tanks to be the most economical choice in municipal and industrial liquid storage without skimping on tank value and durability.



Expansive engineering capability and unmatched design experience make BulkTec® tank systems the best option to contain dry bulk materials. BulkTec tanks systems are manufactured to exact requirements for maximum abrasion resistance and smooth material flow (mass or funnel). Custom components and factory-welded configurations are also available.



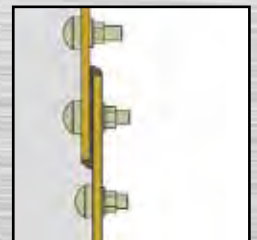
CST originated its business in the oil industry back in 1893 by pioneering the use of bolted steel storage tanks for petroleum applications. Today, CST is the only monogrammed API-12B tank manufacturer in the world. PetroTec® tanks are custom designed to meet the rigorous conditions associated with complex and volatile substances like petroleum.



## OPTIBOND EPOXY TANK DESIGNS

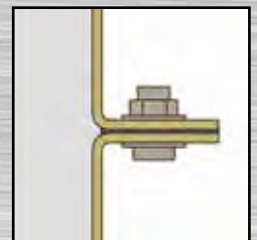
### Flat Panel Bolted

- Leading design for bolted steel tanks around the world
- Manufactured, erected and in operation up to three times faster than field welded or concrete applications
- Equipped to handle large volumes up to 6,000,000 gallons (22,712,470L) and beyond



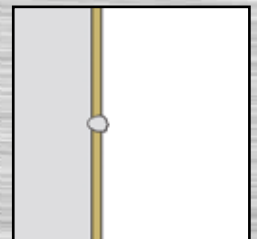
### Chime Panel Bolted

- Economical
- Features factory formed flanges at horizontal seams for added structural strength
- Special gaskets and sealants create leak-proof joints
- CST has the only API-12B monogrammed chime panel bolted tank design on the market



### Factory Welded

- Available in sizes that are 6' (1.83m) to 15' (4.57m) in diameter and up to 85' (25.9m) tall
- Taller units available in multi-piece designs
- Shipped as one unit or multi-piece units
- Can be specified with internal and/or external factory coating
- Mass or funnel flow loads
- Custom engineering and quick fabrication



# GALVANIZED TANKS

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Galvanized tanks are a cost effective way of storing water when other types of tanks are not practical. Constructed of quality galvanized steel using quality controlled processes, these types of tanks can be supplied with a roof cover, galvanized access ladder and platform, and inlet/outlet connections. Insulated walls and roof cover are also available. CST is an FM and LPCB approved manufacturer.

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## CYLINDRICAL

Cylindrical galvanized tanks are constructed with horizontally oriented galvanized sheets. They are manufactured from mill galvanized steel or hot dipped steel in accordance with the customer's specifications including ASTM, ASME, BS EN 10204 or BS EN 1461:1999 standards. Cylindrical galvanized tanks can also be sealed using liners manufactured from either EPDM or BUTYL synthetic rubber membranes. Liners manufactured from BUTYL rubber have received approval from the UK Water Regulators Advisory Scheme (WRAS) in accordance with BS6920, for use in the storage of potable water.



## RECTANGULAR VERSATANK

VersaTank's® rectangular shape offers design versatility enabling sprinkler water storage tanks to be installed where traditional cylindrical designs cannot easily be accommodated. Almost any shape can be designed with obstructions such as building support columns easily encapsulated within the tank. The sheets are assembled on site using lap joint and galvanized silo bolts. VersaTank is supplied with a galvanized corrugated low profile roof cover that is plastic coated on the external side.



# WELDED TANKS

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CST welded tanks are fabricated from epoxy factory-coated steel, aluminum or stainless steel at our ISO-Certified manufacturing facility. CST's special tank outfitting facilities can assemble all necessary equipment in and on the tank and completely test the entire system before shipping throughout the world.

CST also offers Component-In-Tank (CIT) solutions for welded tanks. CST engineers can design welded tanks to support internal equipment for application needs.

Standardized manufacturing of CST welded tanks ensure process consistency and enhanced product quality. No other company can match CST's global presence, its ability to fully outfit a tank before it is shipped and worldwide service.





# CONSTRUCTION

The ability to provide a customer with a storage tank, cover or architectural solution does not end with merely manufacturing and delivering the components. CST's global team of channel partners as well as CST's own crews are capable of constructing our products and servicing them throughout their life.



## FLAT PANEL TANK CONSTRUCTION

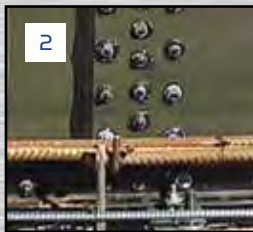
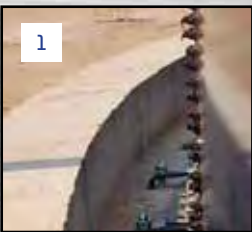
1. First ring of panels and roof are safely constructed at ground level
2. Tank is jacked up and successive rings are constructed
3. The final ring is constructed and tank is lowered onto foundation ring



## CHIME PANEL TANK CONSTRUCTION

1. First ring of panels is constructed directly on the foundation
2. Successive rings are constructed by craning panels on lower rings
3. Cover is constructed on the ground and craned into place

## FOUNDATION DESIGNS



Foundation designs are done in-house and are customized to customer needs and storage application. Depending on tank specifications, the typical foundation can be one of the following.

### 1. Slot Mount

Used for lower profile tanks, particularly suited for wastewater treatment applications

### 2. Curb Mount

Used for lower profile tanks, well suited for tower mounted storage tanks

### 3. Embedded Starter

Used for larger municipal and industrial applications and higher seismic applications

### 4. Modified Starter

Combines Embedded Starter for large tank and higher seismic features with Slot Mount convenience

# COVERS

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CST Covers is the worldwide leader in designing, manufacturing and constructing custom aluminum covers and structures for architectural, environmental and industrial applications. With the proud heritage of Temcor and Conservatek, CST Covers offers multiple aluminum design solutions including domes, flat covers, vaults and space frames. CST's professional engineering staff will design the right customer cover solution for your application.

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## WHY ALUMINUM?

The unique properties of aluminum make it far superior to other materials and alloys used for covers due to its:

- **Corrosion Resistance:** Aluminum is inherently corrosion resistant versus other alloys. It will last the lifetime of the structure and will not need to be painted or repainted for protection from the atmosphere.
- **Fast & Low-Cost Construction:** Creative design and lightweight components provide for installation in 1/3 the time it takes to install other cover systems. Less time, labor and equipment needs combine for a low total cost of installation.
- **Low Lifetime Maintenance Cost:** With no corrosion or the need to repaint to protect the structure over time, there is little-to-no maintenance costs associated with an aluminum dome.
- **Design Flexibility:** Aluminum's excellent strength-to-weight ratios and creative component design yield covers and structures that cannot be achieved with other materials.
- **Clear-Span Capability:** Aluminum's lightweight characteristics allows for larger clear-span cover capability than structures utilizing steel, concrete and other materials.





# ALUMINUM DOMES

An aluminum dome's superior structural design gives it many advantages. Using proprietary variations of geodesic geometry, our aluminum domes are noted for their ability to meet exacting live load requirements by providing greater stiffness and strength, pound-for-pound, than any other dome geometry system.

CST domes can be designed for snow loads of up to 350 pounds (158.7kg) per square foot and wind loads of more than 175 mph. And, our unique panel design is specifically engineered to support loads as much as 500 pounds (226.8kg) on any one square foot. CST's professional engineers can design domes as large as 1000 feet (304.8m) in diameter or greater. They are used in a variety of applications including:

- Water
- Petrochemical Terminals
- Architectural Structures
- Wastewater
- Bulk Storage Facilities

CST cover systems are supported by engineering expertise that recognizes each dome system boasts its own unique characteristics. The result is cost-effective designs that allow for error-free fabrication and construction.



## Material Comparison Chart

Aluminum vs. Alternative Materials	Aluminum	Steel	Concrete	Fiberglass
Corrosion resistance	●		●	
Resistance to ultraviolet and ozone degradation	●	●		
Will not rust, spall or tear	●			
Clear span capability	●			
Low profile construction capability	●			
Simple and fast construction	●			●
Low lifetime maintenance costs	●		●	
Easily customizable for accessories and penetrations	●			

# FLAT COVERS

Our innovative clear span aluminum flat cover roof systems can help wastewater and other facilities control odors and provide a safe working environment for operators. They are built to withstand harsh, humid treatment plant environments. CST's flat cover roof systems require little to no maintenance and can be easily retrofitted with an array of appurtenances that allow them to interface—not interfere—with plant equipment and operations. They can be manufactured in a wide variety of shapes and sizes without compromising their precise fit and performance.

Our flat panel covers are designed to be self-supported (clear span) or supported with beams and trusses. CST Covers has multiple design configurations to choose from depending on your application:

## EXTRUDED FLAT PANEL ALUMINUM

Our extruded panel cover design is available in clear spans up to 18 feet (4.57m) and custom designed to meet your project's specific functional and design loading requirements. All aluminum design constructed of 6061-T6 and 6063-T6 aluminum structural members and 6063-T6 sheets ensures quality, durability and longevity.



## FORMED FLAT PANEL ALUMINUM

Our formed panel cover design is available in clear spans up to 30 feet (9.14m) and custom designed to meet your project's specific functional and design loading requirements. By using quality 5052-H32 aluminum panels and 6061-T6 structural members along with the proper sealant and gaskets, CST Covers ensures ultra-low maintenance for the life of the cover.



## Flat Cover Features

Feature	Extruded Cover	Formed Cover
Removable	●	●
Gasketed panels	●	
Reduced air volume	●	●
Slip resistance	●	●
Low deflection	●	
Lifting handles/devices	●	●



# CUSTOM COVERS

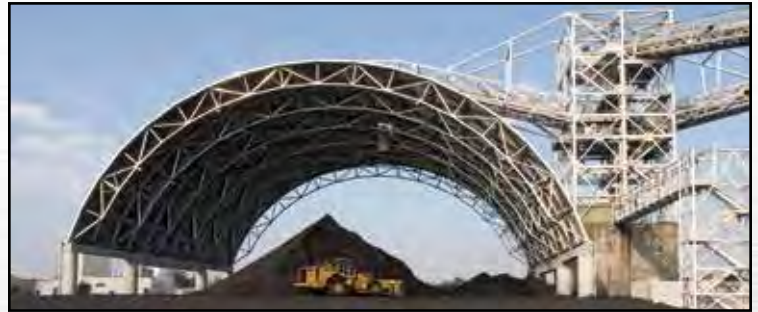
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CST Covers has designed, engineered and manufactured many types of specialty covers over the past 50 years for all types of unique applications. The design flexibility and strength of aluminum allow us to create large truss supported devices for basins of virtually any size and shape. We have created custom covers for all types of raw material storage. No matter how unique your application demands, CST Covers can custom design the right solution.

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## VAULT COVER

CST custom aluminum vaults can be designed to meet the demands of almost any bulk storage application. Aluminum is the ideal material to handle outdoor applications where the entire structure is exposed to the elements. CST vaults are designed to accommodate many different reclaimers systems used in bulk storage facilities.



## RESERVOIR COVER

Large water basins and reservoirs are a particularly difficult challenge to cover effectively to meet surface water regulations. CST aluminum specialty covers have been effectively designed to cover some of the largest water reservoirs as well as non-standard shapes. You don't need a new reservoir, you just need the right cover solution.



# CONSTRUCTION

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CST aluminum domes can be constructed in a variety of methods. The most common are outside-in, used mainly with jack-constructed storage tanks and inside-out, where the dome is constructed from the center outwards and is lifted into place. Certain specialty covers are constructed with proprietary jacking and crane systems specifically designed for fast, easy and safe construction of your aluminum dome.

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## INSIDE-OUT COVER CONSTRUCTION

1. Inner frames and panels are constructed and raised by a pole crane
2. Remaining frames and panels are constructed outward until dome is complete



## OUTSIDE-IN COVER CONSTRUCTION

1. Outside frames and panels are constructed directly on the walls of the structure
2. Frames and panels are constructed inward until dome is complete

# ARCHITECTURAL APPLICATIONS

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CST aluminum covers offer unique options for architectural applications. Advancements in lightweight, high-strength aluminum allow for a wide variety of configurations and cover options. Proprietary systems allow for novel 2D and 3D space frame solutions while proven dome and truss systems have long been the global standard for large cover applications. CST has the ability to bring architects' and engineers' cover concepts to reality through products, engineering, precision manufacturing and a reputation for durability and service.

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Arts & Science



Leisure & Gaming



Social Service



Transportation



Signature & Custom Services





# OTHER ROOF AND COVER OPTIONS

CST offers a full line of steel and membrane roof options. Depending on the application, CST is your one stop source to fulfill almost any coated storage tank roof need.

## Steel Roofs

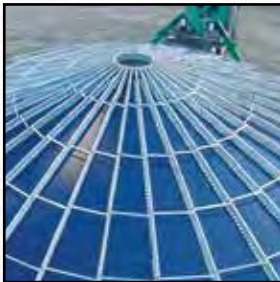


### Sloped Steel Roofs

A very common and economical roof design when no design pressure is required and under standard roof loads. It can be epoxy coated, stainless steel or other alloys as specified. Large diameters can use multiple column supports.

### Trough Deck Roof

A free span truss support roof designed to keep out debris. Designed for low roof loads. Can be column supported in larger diameters. The trough deck design is an economical choice when design specifics allow for its application.



### Externally Supported Roof (ESR)

The most common roof design in the industry with a smooth internal roof surface and no rafters. Used when moderate to high pressure or vacuum design limits are anticipated. It is also preferred when there are heavy load conditions expected from mixers and/or other ancillary equipment is installed in the cover.

### Knuckle Roof

An option for smaller diameter storage tanks, a knuckle roof is best suited for lighter pressure and vacuum applications with no load bearing requirements. They are fabricated with glass-fused-to-steel coating or stainless steel to provide excellent gas zone longevity.



## Membrane Covers



### Single Membrane Covers

Designed to operate in applications with low gas pressures where there is not a design requirement for a fixed steel or aluminum cover. Generally requires a pole and strap support system to keep membrane elevated above slurry.

### GeoFrame™ Supported Membrane Cover (GSM)

Unique proprietary design incorporates a geodesic aluminum strut support frame in lieu of post and struts provides a clear, obstruction-free cover. Used in single and dual membrane configurations with low-medium pressures.



### Dual Membrane

Designed to operate in applications with low to moderate gas pressures where there is not a design requirement for a fixed steel or aluminum cover. Multiple layers and optional center support structures are utilized depending on design considerations.

### Membrane Gas Holders

Gas holders are commonly used in conjunction with other storage vessels to store and regulate gas from the process. The gas can then be regulated and delivered to a power generation process, compressor or flare.



# APPLICATIONS/MARKETS SERVED

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## Potable Water

- Above ground storage tanks
- Composite elevated storage tanks (CET)
- Aluminum geodesic domes
- Reservoir covers
- Flat cover systems for all size storage tanks and basins
- Desalination storage tanks and covers
- Municipal and industrial applications



## Wastewater

- Storage tanks for clarifiers, trickling filters, aeration, flow equalization and sludge
- Sequencing batch reactor tanks (SBR)
- Storm water retention storage
- Aluminum domes and flat covers for all types of storage tanks and basins
- Launder covers



## Industrial Liquid

- Bolted steel storage tanks
- Welded silos for wide variety of industrial liquids
- Steel sloped, trough deck and knuckle roofs
- Aluminum domes and flat covers for all types of storage tanks



## BioEnergy

- Complete line of storage tanks and covers for anaerobic digesters
- Storage tanks and silos for biofuels
- Storage silo and reclaimer systems for biomass handling
- Dual membrane and steel tank biogas storage systems
- Custom engineered to meet developer specifications



## Bulk Storage

- Bolted steel storage tanks for all types of industrial mining, minerals and agricultural dry bulk materials
- Welded steel silos for bulk material processing
- Custom aluminum structures for large bulk storage and conveying systems
- Drive-through and train-through designs
- Domes for bulk terminal storage facilities
- Reclaimer systems for non-free-flowing materials



## Petroleum

- API storage tanks for exploration and production
- Drilling fluids and liquid chemicals
- Frac water storage, recycling and waste processing
- Frac sand storage and processing
- Aluminum domes and covers for terminal storage tanks of any material/type construction



## Power Generation

- Demineralized water storage
- FGD chemical process and storage tanks
- Liquid fuel storage tanks and silos
- Process water and wastewater handling
- Vault covers for coal storage and other fuels
- Aluminum domes for fuel conveying equipment



## Fire Protection

- Sprinkler system water storage
- Industrial and commercial facilities
- Combination potable and fire protection reservoirs
- Cylindrical and rectangular storage solutions



## Agriculture

- Grain and haylage silos for feeding operations
- Unloaders for feed processing
- Slurry holding and processing tanks
- Storage tanks for dry and liquid fertilizers and additives
- Tanks and covers for digesters and biogas production



# ACCESSORIES

## LADDER, CAGE AND PLATFORM

Tank ladders are constructed of aluminum rails and rungs with hot-dip galvanized cages and step off platforms. Ladders with locking safety cage doors are available.



## GRAVITY VENTS

CST tank gravity vents are designed to allow for air exchange during filling and emptying. They are equipped with corrosion-resistant bird and insect screens.



## SIDEWALL MANWAYS

Tank manways are designed in accordance with AWWA D103 standards. They are 24 inches (61 cm), 30 inches (76 cm) or 36 inches (91 cm) in diameter and are manufactured with hot-dip galvanized or stainless steel.



## HANDRAILS AND WALKWAYS

Hot-dip galvanized handrails and walkways can be constructed on tanks and covers to allow access. All are designed to meet required worker safety specifications.



## DORMERS

Dormers can be included as part of CST aluminum cover designs for those applications that require regular entry. Roof and sidewalls are all constructed from aluminum. Doors are available in corrosion resistant materials.



## SKYLIGHTS

Skylights are available for insertion into CST aluminum cover designs when natural light is needed. Skylights are manufactured from clear and durable materials to withstand the elements.



Other accessories include staircases, nozzles, baffles, level indicators and cathodic protection in addition to many others options.





Photo credit: GBM

**CST**

# WORLDWIDE AVAILABILITY

## CST Global Manufacturing and Offices



When it comes to coated tanks and aluminum covers, you get the highest engineered quality, best service, longest product life and greatest value from CST. Contact CST for all your global tank and cover requirements.

### CST Global Headquarters

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Phone: +1-913-621-3700  
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### Go to [CSTIndustries.com](http://CSTIndustries.com)

for information on sales service offices.

# CST

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