

TANK
CONNECTION
AFFILIATE GROUP



BOLTED TANK DESIGN REVIEW

LIGHT DESIGNS VS PREMIER DESIGNS



KICK LIGHT BOLTED TANK DESIGNS TO THE CURB!

Tank Connection is the largest and leading global bolted tank supplier for liquid and dry bulk storage applications. At Tank Connection Affiliate Group, we have over 500 employees and 5 tank manufacturing facilities. The reason we have become the largest bolted tank supplier is because we design, manufacture and install the top performance bolted tank design available in the world today. At Tank Connection, our bolted RTP (rolled, tapered panel) tank design incorporates the best features of bolted and field-welded tank construction. In contrast to competitors that offer light tank designs reinforced with external stiffeners, TC offers plate thickness. We do it right and the marketplace has responded by making TC #1 in bolted storage tank construction.

At TC, we routinely receive pictures of light tank designs installed by “other brand” suppliers in the field. It is typical, that within a relatively short period of time, we receive additional pictures on these installations that depict design and coating issues. Please note the external stiffeners running around the tank perimeter on the pictures shown below. We ask one simple question to clients that review this type of product for their applications, “Do you want a tank that is designed with proper plate thickness or do you want a tank that is held together with external bands, stiffeners and web supports?”

In the global marketplace, there are an unlimited number of inferior tank products that are offered by “name brand” suppliers today. Light bolted tank designs for water storage, utilizing cheap external stiffeners and web supports, are nothing more than a bad idea. For some time, TC has acknowledged that this problem is out of control and it only continues to get worse. We continue to witness more and more external stiffeners being added to bolted liquid tank designs. In fact, some suppliers are now utilizing them on every horizontal seam. For the manufacturer, it is an extremely cheap product offering. For the client, this product represents an inferior liquid tank design that will not fulfill your expectations for long term liquid storage. In many cases, these tank products will require replacement within a relatively short period of time.

Historically, light designed modular storage tanks were only utilized for temporary storage containment facilities. These products were never designed to be utilized as permanent storage facilities. In all cases, bolted or welded steel storage tanks should utilize a robust tank design and state-of-the-art coating systems that are designed for low maintenance and long term performance. In liquid storage containment applications, anything less is simply a mistake.

Under construction, the external stiffeners run along the horizontal seam. A wind event occurred and this glass coated tank did not make it to completion. ▶



This glass tank was 22 years old when the picture was taken. Tanks that are coated with vitreous enamel/glass cannot be recoated in the future, they can only be patched or replaced. A storage tank that can't be refurbished when needed, should not be considered a long service life product. Does this tank product fulfill your storage requirements? ▶



Tank Connection Bolted RTP Storage tanks do not require stiffeners. You can visually see the difference in quality compared to competitor's light tank designs.

TANK CONNECTION DESIGNS

No external stiffeners required on TC Designs.



So what about those great web stiffeners that are supplied by "other brand" companies today? They are touted as some sort of engineering innovation when the reality is they are just a cheap erectors set of stiffeners. Some of the same shapes are utilized on corrugated grain tanks. Field-welded tanks don't require cheap reinforcement bands and neither do Tank Connection liquid bolted RTP storage tanks.

COMPETITOR DESIGNS

This image depicts web stiffeners attached to a glass tank. According to the manufacturer, their function is to prevent flattening of the shell during a wind condition, but this is not the full story. FEA analysis on page 3 unveils the rest of the story.



Imagine purchasing what you consider to be a premier bolted tank design and you receive a tank shell and an erector set of stiffeners.



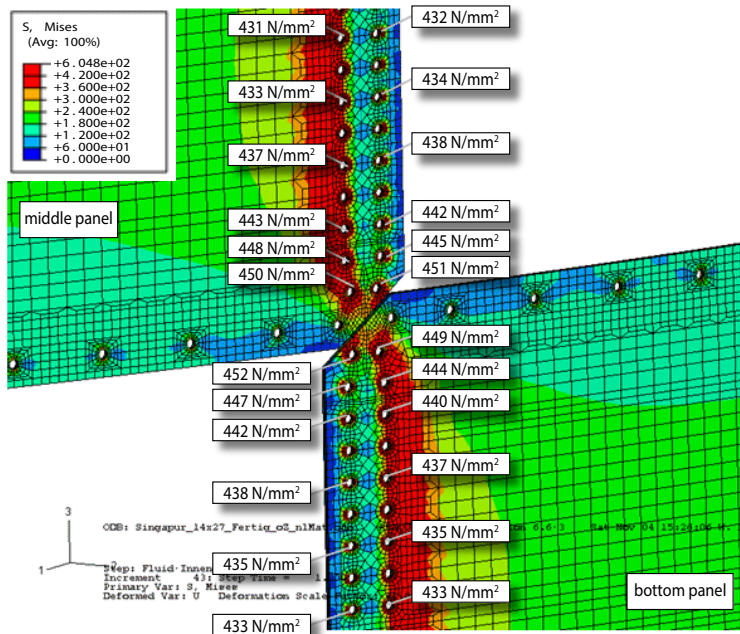
The image on the left is of an 18 year old glass tank. Note that it doesn't utilize web stiffeners. Compare it to the image on the right depicting a newly installed glass tank with multiple (4) rows of stiffeners.



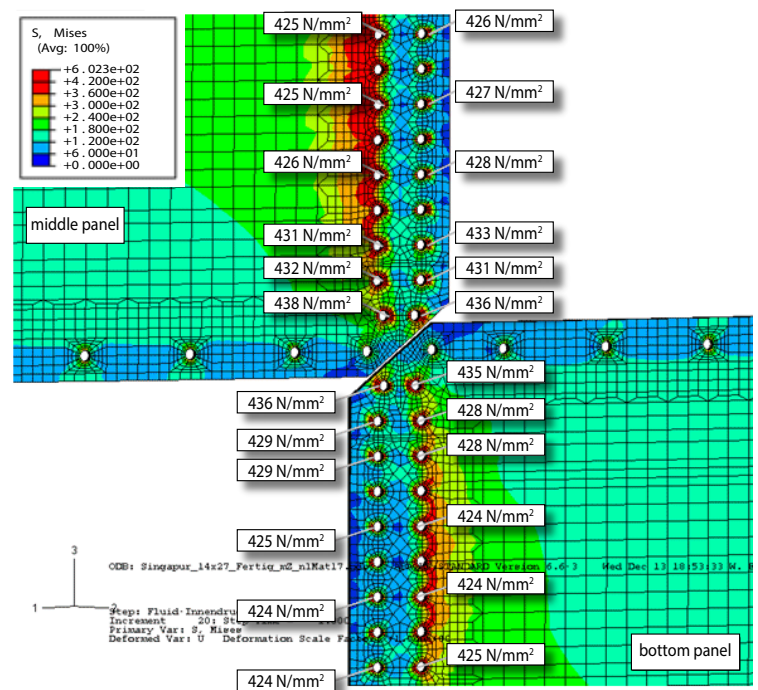
Under finite element analysis (FEA) the deficiency of glass panel tanks becomes perfectly clear. As shown, the bolt holes and joint connections are the high stress (in red) problem areas, which is why glass coatings can fracture in the bolt connection area. The steel panel under stress yields in a ductile manner, whereas brittle glass coatings do not.

The reinforced tank design utilizes external bands & stiffeners to lower stress failure. Nonetheless, the stress on glass coatings in the bolted seam connection remains. Glass coatings that fracture in this area will expose bare steel to the stored liquid. Unless it is promptly repaired, corrosion will occur, which can eventually lead to panel failure.

STANDARD TANK



REINFORCED TANK



KICK LAYERED BOLTED TANK DESIGNS TO THE CURB!

Relatives to light bolted tank designs, another poor design has recently resurfaced in the international market. This involves glass tank suppliers that are layering/laminating thin shell sheets in the field to build larger bolted tank sizes. This is not a recognized design approach, but rather a bad and unsafe idea. It was offered by a former European glass tank supplier and the company eventually went out of business. Layering bolted panels together, in order to bid larger bolted tank projects, is representative of bad design practices. Let's review some specifics.

The practice of laminating thin sheets of steel (layering) is not allowed in the U.S. per AWWA D103. This is not a structurally sound practice. Laminating thin sheets does not allow for proper load distribution between the sheets and the bolts within the vertical seams. High shear loads can develop at the additional shear planes created where the laminated plates meet in the joints; which can result in premature joint failure.

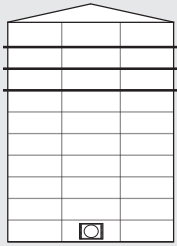
As the panels are rolled, and as the tank expands due to hydrostatic loads, these are additional reasons for panels to move out of alignment at bolt holes. These out of alignment conditions will also place additional shear loads on the bolts within the vertical seams.

Essentially, the entire vertical seam bolt load can be placed on a panel thickness one half the prescribed and supplied thickness, due to a laminated construction method.

This is the most significant issue with laminating thinner sheets. Additionally, there are also potential sealing and corrosion issues. Due to the structural risks involved, laminated tanks should NEVER be used, and will not be used in the U.S. by a reputable engineer.

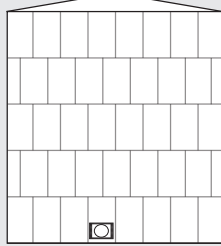
STEEL TANK DESIGNS

DESIGN - D

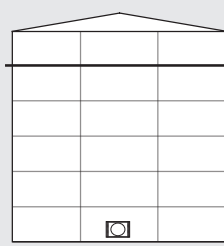


DESIGN - D • Low Quality

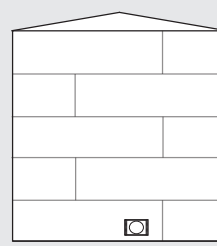
DESIGN - C



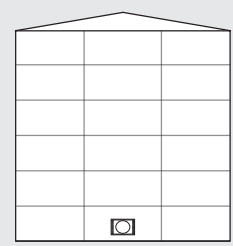
DESIGN - B



DESIGN - A



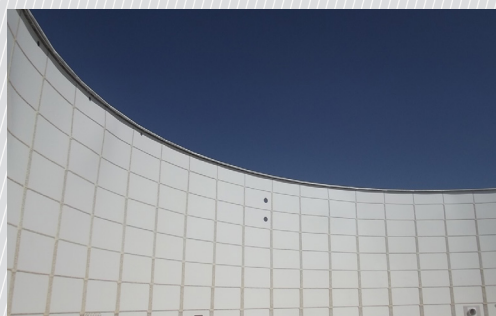
DESIGN - A



DESIGN - A • High Quality

DESIGN	Flat Panel	API 12B	Bolted RTP (rolled, tapered panel)	Field-weld	Bolted RTP (rolled, tapered panel)
PANEL TYPE	Horizontal panel	Vertical flanged panel	Horizontal rolled, tapered panel	Horizontal rolled panels	Horizontal rolled, tapered panel
PANEL SIZE	Varies	5'W x 8'H	10'W x 5'H	Varies, typical 25'W x 8'H	10'W x 5'H
WEB STIFFENERS	2 or more	None	1	None	None
APPLICATION	Ag	Drilling Fluids, Ag	Potable Water, Wastewater, Fire Protection, Industrial Liquids	Power, Potable Water, Wastewater, Standpipes, Industrial Liquids	Power, Potable Water, Wastewater, Fire Protection, Standpipes, Industrial Liquids

At Tank Connection, one storage tank product does not fit every application. This is one of the reasons why TC is the only tank manufacturer worldwide that offers all types of tank construction including bolted RTP, field-weld, shop-weld, SIT, hybrid tank construction, as well as composite pedestals for EWT's and aluminum geodesic domes. When a bolted tank doesn't fit the application, we offer the right type of storage tank needed. We don't offer cheap external stiffeners and layered, laminated panel designs. At TC, we don't take short cuts at our client's expense. If we don't offer the right product for your application, we will direct you to the appropriate supplier. As the global leader in liquid and dry bulk bolted storage applications, we offer the best storage tank products and services in the industry. Our bolted RTP storage tanks set the highest benchmark of performance in tank design, high performance coating systems and field construction services. We prescribe to any buyer to always ask questions up front on tank designs proposed for your project. When you encounter light bolted tank designs that utilize external stiffeners, bands and web supports, be safe and kick them to the curb.



CONNECT WITH THE BEST!

At the Tank Connection Affiliate Group, we offer:

- The #1 bolted tank design selected worldwide
- The #1 LIQ Fusion 7000 FBE™ coating system available worldwide
- The ONLY “Fusion Coating” line certified for bolted tank fabrication worldwide
- The BEST bolted storage tank systems available worldwide
- The TOP TEAM of industry experts in dry and liquid storage applications
- GOLDEN RULE customer service on every project

DESIGN Our bolted RTP (rolled, tapered panel) tank design is unmatched worldwide. It is the strongest, precision tank design that does not utilize cheap web stiffeners.

COATINGS Our LIQ Fusion 7000 FBE™ coating system and application technology is unmatched in water storage applications. It is a *STRONGER SYSTEM THAN GLASS COATINGS* and other epoxy powder systems. It is provided exclusively by one company, Tank Connection.

PRODUCT QUALITY Simply unmatched worldwide. Our facilities are ISO 9001 quality system certified. TC operates 5 storage tank manufacturing facilities in the U.S. and supports over 500 employees. Our storage products and services are requested globally because our quality is recognized as “the BEST” in the industry!

INDUSTRY EXPERTS IN STORAGE We are the leading experts in storage applications with more years of combined industry experience than any other tank company.

FIELD CONSTRUCTION PROCESSES Unmatched in quality and field safety. EMR: .59



Request A Quote And “Get Connected” With Real Performance From The Market Leader, Tank Connection!



Tank Connection is an ISO 9001 certified company. TC leads the storage industry in application expertise, storage innovation and solutions, storage tank manufacturing technology, vertical integration of operations and field construction services. When you specify Tank Connection, you have selected the top performance storage systems and field construction services available globally.

Tank Connection, LLC
3609 North 16th Street
Parsons, KS 67357
Phone: +1 620.423.3010
Fax: +1 620.423.3999
www.tankconnection.com

