

Bolted Storage Tank Comparison **RTP Design vs. API 12B**

RTP (rolled, tapered panel) Smoothwall Bolted Design

API 12B (flanged panel) Bolted Design



Tank Connection Affiliate Group... "Off the Charts with Performance!"

Once you understand the facts on today's technology and precision storage products available, the tank selection process in dry bulk and liquid storage will narrow to one of six choices: RTP Bolted Construction, FP (flat panel), Field-Weld, Shop-Weld, Hybrid or Concrete Construction. API 12B (flanged panel) and seal welded bolted construction have become outdated designs, relics of the past.

The Tank Connection Affiliate Group is recognized as the new domestic leaders in storage tank designs and integrated storage systems. All storage containment developed by the TCA Group fulfills today's storage requirements as prescribed by engineers around the world... **high quality, low maintenance, long life and cost efficient.**

The TC Affiliate Group is a family of companies that specialize in dry bulk and liquid storage applications. We remain the only company worldwide that designs, manufactures and installs all four types of steel storage systems. This includes Bolted RTP (rolled, tapered panel), Field-Weld, Shop-Weld and Hybrid Tank Construction.



RTP (rolled, tapered panel) bolted design



RTP municipal water storage

Because we listen to our customers and develop products to match today's requirements, our growth over the last five years has been "off the charts." ***We have invested in the future of storage containment worldwide by investing in people. Our affiliate group has over 2100 years of combined storage tank/silo experience.*** In review of our employee profiles, you will find that the TC Affiliate Group are the recognized experts in FP, RTP, API 12B, field-weld and hybrid tank construction. This experience level is tied to tank design, tank specification development, tank accessory development, tank fabrication, field installation, and always "golden rule" customer service. It is a pleasure to serve an industry with products that remain unmatched in the industry. Our products and our people show our commitment to serve our customers.



RTP dry bulk silo under construction



Field installation at grade level utilizing synchronized jacks

Tank Connection Solution:

- Eliminate the API exterior flange, which equated to removing the leak source
- Increase plate thickness (simulate field-weld tank construction for industrial process applications) without adding an “erector’s set” of stiffeners
- Utilize Fusion 5000 FBE™ powder coat system designed by Akzo Nobel for complete coating wrap-around on steel for “long life” storage
- Develop a safe field construction process utilizing “state-of-the-art” technology
- Utilize a field-weld hopper connection approach in dry bulk storage
- Align vertical seams (for symmetrical design)
- Utilize length x height panel equation - similar to field-weld construction

The result was an RTP (rolled, tapered panel) design that could address and eliminate all the problems associated with API 12B flanged panel tank construction.

How good is RTP construction? In the power industry (i.e., limestone, lime, water, fly ash, coal storage, etc.), Tank Connection’s RTP construction is the ONLY bolted smoothwall tank design recognized as an acceptable alternate to field-weld construction.



Power Utility - Lime & Ash Storage

RTP Construction vs. API 12B (in review)

Feature	RTP Design	API 12B
Panel construction	Bolted - rolled, tapered panel	Bolted - flanged panel
Seal between panels	EPDM gasket - dry bulk; mastic - liquid	EPDM gasket - dry bulk & liquid
Plate thickness	Heavy - up to 1/2” plate	Light - up to 1/4” plate
Fabrication quality	Precision fabrication	Inconsistent flange/break connection
Hopper attachment	Field-weld design attachment (upper & lower compression attachment)	Bent plate hopper attachment (same as corrugated grain tanks)
Stiffeners utilized	WF structural when required	Erector’s set of stiffeners
Interior lining	Fusion 5000 & 7000 FBE	Powder coating primer
Exterior topcoat	Fusion 5000 SDP	Acrylic Urethane
NO LEAK storage	YES	NO - continuous leaks
Field construction	Synchronized jacking process	Scaffold built with old process
Field safety	Construction workers at grade	Workers elevated in air
External ledge	None	YES - 2” horizontal ledge
Internal ledge	None	YES - source of product contamination
Single source resp.	YES - Fab & Field install by Manufacturer	NO - API construction utilizes subs
Installed quality	Excellent	Poor

The History & Facts - API 12B (American Petroleum Institute) Bolted Tanks

API 12B fabrication evolved from the oil patch market in the early 1900's. This standard was developed for a bolted flat bottom tank that would store crude oil. The tank sizes were small (~ 100 to 10,000 barrels in size) and were shipped to the field to be erected by oil field workers. The seal between panels utilized a buna nitrile gasket material. Flanging dies were utilized to create an exterior horizontal flange (chime) connection (see figure 1.1), which allowed the panels to be easily assembled in the field using a gin pole and scaffold system. The flanging dies were designed for forming light gauge material thicknesses ranging from 12 gauge up to 3/16" plate. Eventually these tanks evolved to include small hopper bottom designs for the storage of grain and other bulk materials.

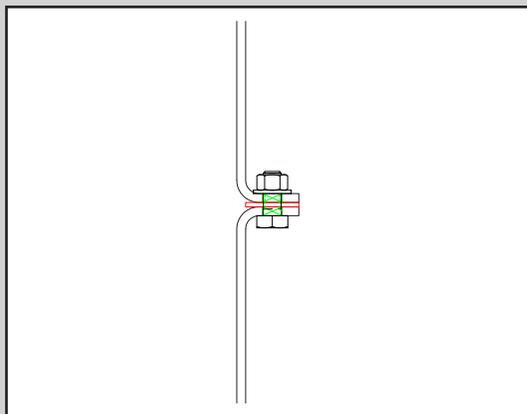


Figure 1.1 - API 12B flanged panel connection



API 12B flanged panel tank - scaffold built

As time passed, the market required larger tank sizes, which historically had been served by field-weld and concrete construction. As a less expensive design, the API flanging dies were used and the material thicknesses were increased to 1/4" plate. An erector's set of stiffeners were added to meet basic design parameters (i.e., wind, seismic, etc.). The process continued to evolve with more and more stiffeners added to the tank skirt and sidewall areas, similar to today's corrugated grain tanks. Dry bulk and liquid storage tanks continued to grow in size and capacity. ***This is when the design failure in API 12B fabrication started to appear.*** When standard tank design parameters required heavier plate thicknesses, the flanging dies designed for 3/16" material were utilized on 1/4" and 5/16" plate material. The results were exterior flange connections (chimes) that did not break at 90 degrees and would not seal (see figure 2.1).

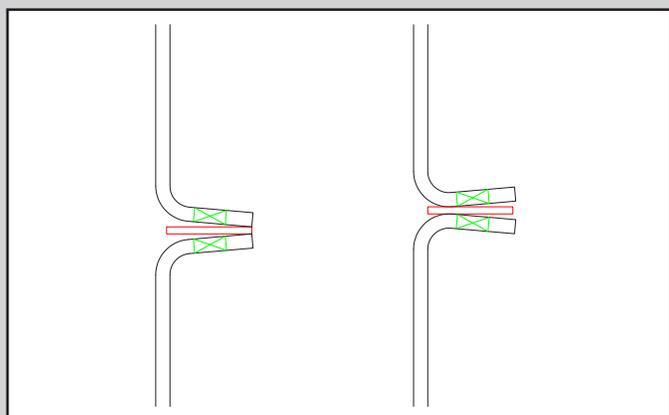


Figure 2.1 - Under/Over break flange (chime) connection

In 5/16" plate construction, the API 12B flange connection would not seal and the tanks would leak. The flange that originally simplified field construction in the oil field had now become a problematic issue with leakage in dry bulk and liquid storage applications. Additionally, in dry bulk storage, the flange created a collection point that held debris and rain. The exterior flange (chime) would quickly corrode, the paint would peel and the results were rusted exterior flange seams (see figure 2.2).

By pushing API 12B fabrication outside of its intended use and range of application, poor quality containment was being developed. When 12B fabrication evolved to include excessive stiffeners and 5/16" plate material, the API 12B tank failed miserably. Higher material grade steel (50, 60, 70 KSI) compounds the fabrication deficiency. The net result is a fabricated panel design that will not seal and will leak continuously in the future.

This is when API 12B fabrication becomes your problem.



Figure 2.2

The Goal was clear...

Upon review of the TCA Group employee profiles, you will find that TC is a collection of the recognized experts in API 12B, field-weld, RTP, FP, shop-weld and hybrid tank fabrication. The Tank Connection goal was to take the FP (flat panel) tank design that was outdated the API 12B tank in the liquid market and establish it in the dry bulk market with industrial process standards. The FP (flat panel) tank designs (i.e., Aquastore, Permastore, Fusion, etc.) at one time were the best bolted tank designs in the liquid markets with field performance that far exceeded the API 12B specification for liquid storage. *The FP tank designs will always outperform the API 12B tank in every performance rating.*

- No leaks
- No problematic exterior flange connection
- Improved field construction techniques

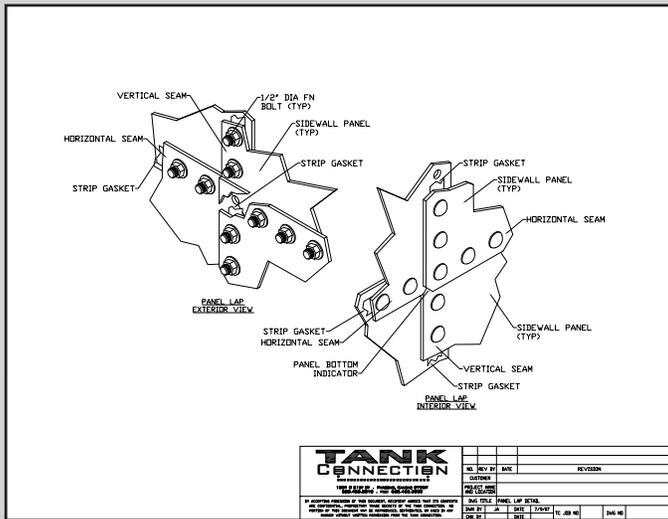


Figure 3.1 - RTP Precision Panel Connection



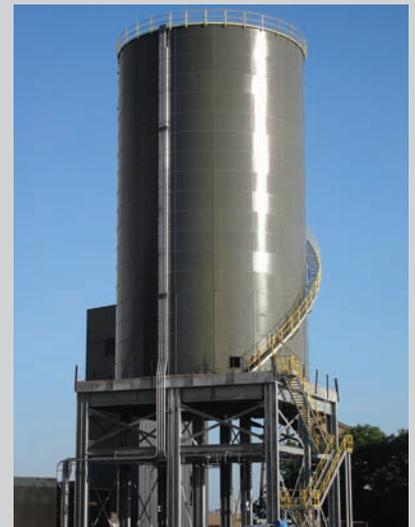
RTP Tank under construction

The Solution identified...

The FP (flat panel) designs could be improved with a precision taper and mitered corner connection (see figure 3.1), “state-of-the-art” powder coating technology and further development of a synchronized field jacking process that would improve quality and safety in the field, while keeping field crews on the ground. Needless to say, this field construction process would become the #1 rated process for tank construction within a short period of time.

Today’s storage market requires the following:

- *No leak storage containment*
- *Heavier tank designs for industrial process applications*
- *The best powder coat system technology for extended service life*
- *Safe field construction*



RTP (rolled, tapered panel) bolted design

The Outcome...

Tank Connection now crosses the seven year mark and our “dry bulk” industrial storage business in North America exceeds all other bolted tank manufacturers. TC, with its precision RTP tank design, has restored customer confidence in bolted tank construction. TC’s international market demand for RTP construction in liquid and dry bulk applications remain “OFF THE CHARTS”. With six facilities and over 300,000 sq. ft. of manufacturing space dedicated to storage tank fabrication, TC Affiliates has created the ultimate SINGLE SOURCE approach to dry bulk and liquid storage systems... and they back it with the largest support team of recognized industry experts in storage containment applications.

Don't make a mistake when you purchase your next liquid tank or bulk storage silo. Demand quality, long life, low maintenance and cost efficiency. In storage containment, you will find that only one company will meet your requirements... Tank Connection!

“Tank Connection has refined and perfected the tank manufacturing fulfillment process far beyond other steel bolted tank companies.”

World Water Works... Mark Fosshage



RTP Dry Bulk Storage



RTP Clarifiers

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