



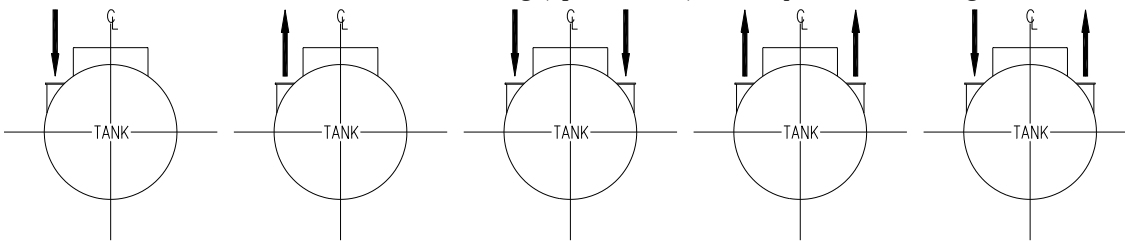
Synopsis of PetroFirst Engineering Design

In-depth Engineering analyses were performed in the development of the PetroFirst Tank concept. Consideration of all the various and most severe design conditions that are prevalent or could occur in the worldwide retail petroleum marketplace were addressed by fully experienced and certified engineering professionals.

The engineering design criteria, calculations, analysis and final report manuals are lengthy and somewhat complex, therefore the following description of the engineering work performed is provided to aid a prospective client to better understand and reach a comfortable level with the product quality and technical credence.

I. Downloads/Uploads

There are five scenarios of vertical loading (up and down), that required full investigation:



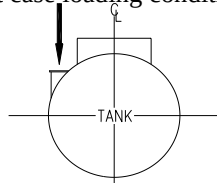
The loads used in the design development account for the effects of gravity wind, snow or seismic conditions. The standard design therefore will accommodate the most severe magnitude of these effects which can be expected in North America. The Tank was field tested in witness by the Underwriters Laboratory officials to verify the design and as a prerequisite to the UL certification issued in July 1996. The download is the more critical design concern therefore, each canopy column connection seat is designed to accept a minimum of 53,000 lbs download with an additional safety factor as prescribed by A.I.S.C. specifications.

The UL certification limits the load per canopy column seat to 42,500 simply because that was all the concentrated weight available at the time of UL field testing. This load capacity is significantly more magnitude than can be expected by any typical canopy, even in the geographical areas subject to heavy snow loads.

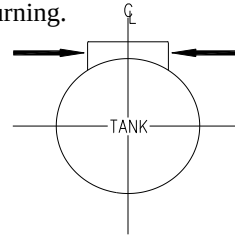
II. Impact Forces: The Tank is designed to withstand the impact of a heavy vehicle on a canopy column which is connected to the PetroFirst Tank. The impact analysis was conducted following the design specification by the American Association of State Highway and Transportation Officials(AASHTO). The selected force/load criteria is based on a severe impact scenario, one that may occur however it is unlikely to occur at a service station facility given the type of traffic, speed, and controlled accessibility. (i.e. Heavy truck type vehicle, traveling at 30 Mph, striking the column at vehicle bumper height.) To further preclude the unlikely possibly of a larger impact force being transferred to the Tank, the column connection has a patented impact relief feature, which will allow a separation (disconnect) of the column connection bolts from the Tank if subjected to an impact of a larger magnitude than identified above.

III. External Hydrostatic Pressure: The Tank is designed to withstand the hydrostatic effects on an empty tank which is completely submerged in water to a depth of 5 ft. over the top of the Tank. The analysis identifies the Tank can withstand this maximum hydraulic head pressure (13 ft.) when the Tank is structurally supported (internal stiffeners) at points not more than 35 ft. apart along the length of the Tank. In the case of the PetroFirst Tank, there are several points where additional internal stiffeners are placed to accommodate product compartments and/or column supports stiffeners, therefore distortion of the Tank, due to hydrostatic pressure, is not a significant design concern.

- IV. **Stability Analysis:** The Tank stability analysis identifies there is no potential for Tank overturning once installed underground and backfilled including the worst case loading condition when the Tank is subjected to loading in a eccentric application.



It should be noted the design calculations were indeed conservative due to the fact the longitudinal trough on top of the PetroFirst Tank was not considered as a resistance to overturning. The trough in reality generates a significant resistance, acting similar to a key way on a shaft, which in this application will resist overturning.



It should be further noted there is no need for Tank tie-downs to deadman buried in the surrounding soil to resist overturning of the PetroFirst Tank. Tie downs are not required for any reason other than to resist the tendency to float as it is with any U.G. tank installation.

- V. **Buoyancy:** The uplift analysis assumed a worst case scenario of an empty Tank completely submerged. The overburden, drive slab and canopy structure are in place and the unit is simultaneously subjected to uplift forces of 110 mph. hurricane winds. The calculations clearly identify there is no need for tie-down to deadman in the surrounding soil once the Tank installation is fully complete as described above.

CAUTION:

The critical time for potential Tank floating is during the construction process. PetroFirst recommends all tank installations should be fully ballasted and tied-down to deadman to preclude any potential for floating particularly in geographical areas with high water tables and/or areas subject to heavy rainfall conditions.

- VI. **Fatigue Analysis:** The fatigue stress analysis focused on the most critical point on the Tank base metal at the toe of the fillet welds adjacent to the column connection seat. The analysis used the AISC, category “C” specifications which prescribes a large number of loading cycles (2,000,000) at a design wind velocity of 110 mph. The analysis identifies that fatigue stress is of no concern whatsoever. The analysis produced a margin of safety regarding fatigue stress of 560 percent with the canopy connection being subjected to 110 mph hurricane winds, 183 times per year for 30 years.

VII. **Seismic Load Analysis:**

In earthquake conditions the U.G. PetroFirst Tank must resist the dynamic loading from the movement of the surrounding earth. One must remember the Tank is a monolithic steel structure internally stiffened at several points along the length of the tank and further reinforced by the application of the steel trough welded longitudinally along the top length of the tanks as well. Steel tanks are inherently more resistant to damage due to earthquakes than tank or other materials (such as fiberglass) and in the case of PetroFirst the added structural integrity further decreases the likelihood of failure (rupture) due to movement of the ground surrounding the tank structure.

The seismic analysis was based on ASCE, 7-95 using the peak seismic acceleration of 0.40g and a peak seismic velocity – related acceleration of 0.40 the largest values used in the USA, which meet or exceed the expected severity of the global seismic conditions. A conservative soil profile (soft clay) and a heavy deadload including (80# psf snow) were used in evaluating the seismic inertia forces.

There is no totally fail safe design for structures subjected to the undeterminable forces caused by earthquake conditions, however the inherent strength of the PetroFirst unitized design further reduces the potential for rupture of the Tank. The canopy would be subject to failure due to the movement of the Tank in much the same way as any canopy on conventional concrete foundations.