



Engineering Report

Fuel Compatibility of Containment Solutions UL Listed FRP Tanks and UL Test Fluids

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Containment Solutions single and double wall tanks are listed by Underwriters Laboratories Inc. under UL Standard 1316 - *Glass-Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures*

This standard outlines the requirements for fiberglass reinforced tanks for the underground storage of petroleum-based flammable and combustible liquids, alcohols, and alcohol-blended fuels. This standard is accepted in the United States and some other countries as the governing standard for underground petroleum tanks.

In order to obtain this listing, fiberglass tanks were subjected to many tests as listed in UL Standard 1316. We refer to the UL standard as a “performance” standard because it defines the performance criteria that a fiberglass tanks must meet to qualify for the UL listing. Those tests include tank structural tests and corrosion tests. The corrosion testing includes various fuels and fuel blends and other chemicals to simulate exterior environments.

CSI has developed a proprietary process that includes the addition of silane treated silica sand to the laminate construction. In order to achieve the advantages of this process and laminate construction, CSI's UL 1316 listing allows CSI to manufacture UL listed tanks with any level of sand from 0 to 45%.

To obtain a UL 1316 listing, actual tank laminates were exposed to a number of environments and then tested for property retention to meet UL's minimum specified values. Laminates with varying levels of sand were included in this testing to allow any level of sand from 0 to 45%. This testing done by UL included the following environments:

- Premium Leaded Gasoline (high octane)
- Regular Unleaded Gasoline

- ASTM Reference Fuel C (50% toluene, 50% iso-octane)
- No. 2 Fuel Oil (Diesel Fuel)
- Sulfuric Acid (pH=3)
- Saturated Sodium Chloride (Salt Water)
- No. 6 Fuel Oil
- Ethanol - 100%
- Ethanol/ASTM Fuel C Blends
 - 10% Ethanol, 90% ASTM Fuel C
 - 15% Ethanol, 85% ASTM Fuel C
 - 30% Ethanol, 70% ASTM Fuel C
 - 50% Ethanol, 50% ASTM Fuel C
- Methanol - 100%
- Methanol/ASTM C Blends
 - 15% Methanol, 85% ASTM Fuel C
 - 50% Methanol, 50% ASTM Fuel C
- Toluene
- Distilled/Deionized Water
- Hydrochloric Acid (5%)
- Nitric Acid (5%)
- Sodium Carbonate - Sodium Bicarbonate solution (pH=10)
- Sodium Hydroxide Solution (pH=12)

As a result of these tests, Containment Solutions single and double wall tanks, with any level of sand from 0 to 45%, are listed by Underwriters Laboratories Inc. under UL Standard 1316 (*Glass-Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures*) for the storage of :

- Petroleum Products
- Alcohol/Petroleum Blends (gasohol)
- Alcohol and Alcohol/Petroleum blends (up to 100% Alcohol)

In addition to these UL fuel approvals, CSI has verified satisfactory long term tank performance (by testing or field experience) for the following fuels:

- Jet Fuel (which is similar to Kerosene)
- Methanol Blends at 85% (with and without co-solvents)
- Gasoline with Ethers: MTBE, ETBE and TAME
- High Octane Fuels - Similar to Aviation Fuels

CSI tanks carry a 30 year corrosion and structural warranty which includes the above listed fuels. I hope that this supplies the information you need. If any further information is required, please contact me at 936-756-7731.