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Featured Projects

DoD Design Standard Protects Fuel Storage Tanks from Corrosion

It is a truism that petroleum is vital to military operations. As it propels the machines of war and peace, petroleum-based fuels power DoD aircraft, sail ships, and move a variety of ground vehicles.



Military engineers who design aboveground storage tanks like the ones found at Joint Base Pearl Harbor-Hickham (near Honolulu, Hawaii) will benefit from a newly revised design standard that allows for increased customization. Photo courtesy of U.S. Air Force.

The U.S. military procures, stores, and uses refined, bulk-petroleum liquid fuels such as gasoline, diesel, and jet fuel. Much of this fuel is stored in steel, upright aboveground storage tanks (ASTs), which are located both stateside and abroad. Ranging in size from 100,000 to 10 million gallons with diameters from 20 to 200 feet, these storage tanks are mammoth welded steel structures designed to hold the weight and stresses of fuel stocks, but they are not immune to the effects of corrosion.

The area most vulnerable to corrosion in ASTs is the tank bottom, which comes into contact with soil or sand beds. Underside or “soil” side corrosion on the tank reduces the thickness of the tank bottom and can lead to fuel leaks if not addressed. Corrosion on storage tanks can lead to the release of hazardous materials into the environment. It also shortens the tank’s life cycle, which can affect the availability of fuel for missions involving the warfighter.

In its aim to serve the warfighter and protect the environment, DoD understands that preventing corrosion on ASTs is paramount. With these aims in mind, the Tri-Service Fuels Facility Engineering Panel (FFEP), which oversees design and construction criteria for

aboveground storage tanks and other DoD fueling facilities, completed the update of its design standard for ASTs in 2011. The standard is titled, *DoD Standard Design AW 78-24-27, Aboveground Vertical Steel Fuel Tanks with Fixed Roofs*.

The DoD standard is based on the standard, *American Petroleum Institute (API) 650, Welded Steel Tanks for Oil Storage*. Because the standard was last revised in the mid-nineties, the FFEP sought to update it to incorporate improvements in tank operational features and standardize construction details.

“We in DoD want to build ASTs that meet *API 650* standards, but *API 650* doesn’t address the added features beyond the tank shell,” said Mike Zapata, Air Force Fuel Facilities subject matter expert. “By having a standard tank design suited for DoD, we can communicate the DoD design guidance and preferences to optimize the design process. The tank still has to be engineered to fit site conditions, but by having a customized standard, we can list all the features we need. This reduces some of the design decision-making of project engineers, and can reduce design and construction costs.”

While FFEP intended for experts to use the revised standard for new construction, it also can be used to design the repairs of existing tanks, Zapata noted. The DoD design standard includes requirements for cathodic protection of the tank bottom. It also specifies a “clean” sand that is free of contaminants that can contribute to corrosion.

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The revised standard also includes provisions for the floor to be sloped to a central sump where water can be collected and removed. “The tank interior, and particularly the tank bottom, is prone to corrosion from water that drains from the fuel,” Zapata said. “Since water is heavier than fuel, it can become trapped in the pockets or edges of welded steel plate and can contribute to interior corrosion. DoD also requires that tank interior and exterior surfaces be coated with high-durability coatings to protect steel from corrosion.”

The revised design standard also includes the option to elevate the tank above the surrounding area to avoid ground water accumulations that can affect corrosion of the tank bottom. In addition, the standard includes material options for tanks that may be located in corrosive marine environments in close proximity to the sea or ocean. The standard’s provisions for alternative materials include stainless steel piping, valves, and fittings.

DoD Standard Design AW 78-24-27, Aboveground Vertical Steel Tanks with Fixed Roofs was updated in 2011 and is expected to be published on the Web site of the Army Corps of Engineers Facilities Standardization Program during the spring of 2012.

Editor’s Note: Cynthia Greenwood contributed to this report.