Much of *LUSTLine* has centered on the subject of leaking underground storage tanks. Over the past six years or so, however, we have noted an increasing use of aboveground storage tanks (ASTs) to store hazardous and combustible liquids. AST systems have been the choice at many government facilities, military bases, schools, hospitals, and private fleet fueling facilities, and for storing chemical/industrial liquids.

The ASTs to which I refer are not those clusters of vertical tanks often seen at bulk storage facilities isolated far away from buildings and human activity. Rather, today’s most common AST applications consist of one or two horizontal tanks placed within 25 feet of important buildings, property lines, or public ways.

While many of these horizontal ASTs are cylindrical, some have more rectangular configurations. The flat tops of rectangular tanks provide more flexibility in locating the numerous fittings and components required for safe and proper operation. Maintaining these components is easier, as is accessing the fill opening, because the awkwardness of climbing ladders and balancing on catwalks is alleviated.

Most of these tanks are small — 2000-gallon capacity or less. Steel Tank Institute (STI) statistics over the past several years indicate that the average tank size is approximately 3,500 gallons. This is significantly smaller than the 10,000- to 12,000-gallon UST typically installed at retail service stations.

Our statistics also show that Class II combustible liquids (e.g. diesel fuel) account for nearly two-thirds of the AST applications. The least common AST application, retail service stations, accounts for less than 3 percent of AST purchases from STI Members.

**The Fire Code Wake-Up Call**

Using ASTs to store motor vehicle fuel at private fueling facilities has, without a doubt, been the most significant new trend. Prior to 1992 — prompted by several catastrophic fires back in the 1960s and early 1970s — the fire codes either restricted or prevented this type of usage, except in the case of smaller tanks in rural areas. Also, ASTs were occasionally overfilled, increasing the likelihood of a surrounding pool fire. Furthermore, if the tanks were not properly equipped with emergency vents, the flammable liquid would quickly vaporize inside the tank during a fire, leading to over-pressurization. Because these tanks were designed for atmospheric pressure only, excessive pressure could cause the tank heads to eject outward, like a missile.
As media attention focused on LUSTs, release detection, tank testing, and expensive soil and groundwater cleanup efforts, aboveground storage provided an attractive alternative.

Nevertheless, in the early 90s, tank owners seeking alternatives to underground tank storage began installing more aboveground tanks — even with the code limitations. As media attention focused on LUSTs, release detection, tank testing, and expensive soil and groundwater cleanup efforts, aboveground storage provided an attractive alternative. Tank owners could visually examine their storage system for releases, without the additional worry of UST financial responsibility. Some states began to consider legislation that would allow ASTs at fueling facilities in an effort to balance both tank owner and environmental concerns.

This wave of interest in ASTs was the wake-up call in the fire code arena; fire prevention associations sought to follow the same track in writing codes for aboveground storage tanks as they did for underground installations.

**Code Evolutions**

The National Fire Protection Association’s (NFPA’s) Automotive and Marine Service Station Committee modified NFPA 30A with a Tentative Interim Amendment (TIA) in 1992. The TIA provided code language for the safe installation of ASTs in a concrete vault or room. Each vault, whether below or above grade, enabled detection of liquids and vapors, allowed personnel access for physical inspection of the tank walls, and provided means to remove water and flammable liquids. For more hazardous Class I liquid (gasoline) storage, the code required a ventilation system within the vault.

By 1993, both the Uniform Fire Code and NFPA 30A had expanded or created means for aboveground storage of motorized fuels, in capacities of up to 10,000 or 12,000 gallons. The Building and Officials Code Administration’s National Fire Prevention Code and the Southern Building Code Congress International’s Standard Fire Prevention Code followed suit shortly thereafter. The Uniform Fire Code, which strictly prohibited this type of usage prior to 1993, added Appendix II-F to provide local jurisdictions with the option of allowing ASTs for fueling vehicles. The UFC required tanks be secondarily contained and insulated to meet a 2-hour fire rating. The NFPA allowed single-walled tanks in dikes, secondary contained tanks, or fire-resistant tanks. The fire-resistant tank could be installed closer to a building than the traditional UL 142 tank. NFPA has also increased the allowable AST storage capacities to 20,000 gallons at nonretail diesel dispensing facilities.

The codes have a number of requirements designed to prevent releases from ASTs — secondary containment is one consideration. However, because fire prevention is best addressed by simply eliminating the chance of a release, preventing overfills during deliveries was a high code priority. Obviously this concept is not much different from the
philosophy of preventing releases from UST systems. The codes generally require three controls: 1) a gauge on the tank, 2) an audio and/or visual high-level alarm, and 3) an automatic shut-off device.

The codes also require antisyphon devices, openings only at the top of the tank, thermal expansion relief devices, and emergency venting of the primary tank and all secondary containment areas. As stated earlier, the emergency vent is the most important device should a fire occur, regardless of whether the tank is fire-protected. Tank owners must make sure that both emergency and normal vents are operable and maintained. . .always!

By the way, the goal in pointing out these code changes is to give you an idea of how the industry has evolved and continues to evolve in terms of accommodating ASTs. If you really need to know the specifics about a particular code, you’ll need to roll your sleeves up and dig into the code itself.

**New Fabrication Standards**

Along with the code changes, fabrication standards also experienced significant activity. Underwriters Laboratories increased the length of its UL 142 standard covering storage of flammable liquids in aboveground tanks by two-or threefold. New language to cover secondary containment tanks, steel-diked tanks, and rectangular tanks was added. UL also introduced a new standard for insulated tanks in December 1994. The standard covered 2-hour fire testing of both UFC-mandated "protected tanks" and NFPA-optioned "fire-resistant tanks." On December 30, 1997, UL released the second edition of UL 2085 for protected tanks only and a UL 2080 outline for fire-resistant tanks. In addition, UL has issued an outline UL 2245 for below-grade vaults.

Insulated tanks come in various forms, but presently three designs are the most common; one that places the insulation between two walls of steel; one that places a steel tank within a concrete encasement; and a third that places a plastic membrane over the steel tank and encases the entire assembly in concrete.

The most recent standard development came in October 1997, when UL provided its first two listings to a new UL standard — UL 2244. This standard covers complete factory-assembled AST systems. In other words, all important core components of a tank used for motor vehicle fueling, aviation fueling, generator tanks, and so on are evaluated by UL at the factory prior to shipment. The goal is to remove the concerns that authorities having jurisdiction (AHJs) might have about missing emergency vents and other accessories that prevent releases and system failure during fires. After all, what good is 2-hour fire-rated tank if important components are not attached? The merits and drawbacks of a systems concept are still being debated.

The Steel Tank Institute has also developed several important new AST standards over the past several years; the F911 steel dike ST, the F921 double-walled AST, and the F951 protected aboveground secondary containment tank (called "Fireguard"). STI statistics show a tremendous growth rate in F921 and Fireguard tank installations. In 1997 alone, the 64 shops eligible to build Fireguard tanks increased their production by
approximately 40 percent over 1996.

The inclusion of secondary containment for ASTs has justifiably received a great deal of attention lately. In 1991, EPA proposed an amendment to the SPCC (Spill Prevention Control Countermeasure Plan) requirements for ASTs suggesting that secondary containment be impermeable for 72 hours. This proposal, coupled with the fire code activity, has created a tremendous demand for aboveground tanks with built-in secondary containment. These tanks can take the form of integral dikes, double-walled construction, or insulated tanks with secondary containment. The NFPA Flammable and Combustible Liquid Code, NFPA 30, allows any tank 12,000 gallons and under with overfill prevention devices and emergency venting devices to be secondarily contained, as an alternative to a traditional dike. Today, nearly one-third to one-half of STI member-labeled ASTs are being built with secondary containment. Compare this to 10 years ago, when that statistic was closer to 0 to 5 percent.

Other Considerations

Finally, I should mention some basic installation requirements. Tanks must be installed on a firm foundation. In areas prone to flooding or earthquakes, tanks may require further anchoring (or seismic considerations) in accordance with local fire or building codes. When tanks arrive at a site, the NFPA 30 code requires that both primary and secondary containment tanks be tested to ensure that tank system integrity has remained intact throughout shipment.

Piping considerations are another big factor. Many AST motor vehicle fueling facilities do not require underground piping, as the dispensers are mounted directly atop or to the side of the protected tank. While eliminating another cause of release common to old UST systems, aboveground piping must be protected against potential damage by vehicular impact at fueling facilities.

Aboveground tanks do have their pitfalls, however. More maintenance is required to keep the tank aesthetically acceptable, such as painting steel or patching cracks in the concrete. Evaporation and condensation are a bigger factor in aboveground storage tanks. The operator needs to check for water at the bottom of the tank on a monthly basis, and all water should be removed. Also, Stage II vapor recovery can sometimes be a problem.

Spill prevention plans are required for aboveground storage tank systems larger that 660 gallons that are located such that a release into a navigable waterway can potentially occur. Also, the tanks must be protected from vehicle impact. Extra security measures (e.g., a fence enclosure) are necessary to guard against vandalism.

In Summary...

Motor vehicle fuel storage systems are no longer confined to the underground. Existing model fire codes have been changed to allow aboveground fuel storage. A number of third-party listed AST construction options exist for dispensing motor vehicle fuels. Secondary containment and other important environmental and safety appurtenances are
now incorporated into tank designs.

As with any growing market, new technologies and new listings are being introduced to expand safe and environmentally-friendly options available to buyers and users at retail operations. The nonretail sector of tank system operators who store motor vehicle fuels has chosen ASTs over USTs because of convenience, cost, and the ability to see the tank at all times.

Wayne Geyer is Executive Vice President for the Steel Tank Institute. For more information about ASTs, contact Wayne at (847) 438-8265 or at wgeyer@steeltank.com

REPRINTED WITH PERMISSION FROM LUSTLINE