ABOVE GROUND STORAGE TANK

GUIDANCE DOCUMENT

Revised 2010

Developed By:

Department of Environmental Protection

Division of Water and Waste Management

SECTION 1.0

APPLICABILITY

These instructions are applicable to municipal and private industries who presently maintain Above Ground Storage Tanks (AST). This document also provides details for the installation of new ASTs and the decommissioning of old ASTs.

Use of Above Ground Storage Tanks (AST) in West Virginia is regulated by 47CSR58, the Groundwater Protection Rule. Hazardous Waste (DWWM), Mining (DMR), Dept. of Agriculture, and other programs have taken the general requirements developed by the Groundwater Program and adapted them to their specific scenarios. AST owners who are regulated by other programs should ensure they meet the appropriate requirements of those programs.

NOTE: There is no certification program for AST installers in West Virginia.

SECTION 3.0

AST REQUIREMENTS

3.1 Secondary Containment

Secondary containment refers to a structure usually constructed of dikes or impervious walls to contain the tank contents in the event it is drained out. Section 4.8.a. of 47CSR58 requires that all ASTs have secondary containment that is appropriate to protect against groundwater contamination. This clause allows DEP to waive the secondary containment requirement for tanks containing a compressed gas such as propane. The secondary containment must be designed and constructed to contain the full contents of the largest tank within the containment unit until the spilled material can be removed without contamination of groundwater.

3.1.1 Secondary Containment Volume

The Groundwater Protection Rule does not specify the volume of secondary containment structures. Logic dictates that the secondary containment be able to hold the entire content of the largest tank within the containment field in case of a catastrophic failure.

3.1.2 Containment Waiver

West Virginia does not have a minimum tank volume below which secondary containment is not required. 47CSR58 section 11 does, however, provide a waiver for some or all of the requirements if the director determines they are not necessary to protect against groundwater contamination. When applying for a waiver from providing secondary containment for a small AST, explain how an alternative practice would be as protective of groundwater as secondary containment. For instance, a tank may be located so that its contents would drain to a waste water treatment facility if the tank were ruptured. Another alternative might be procedures to inspect a small tank hourly and maintaining a spill containment kit at the tank. Alternatives to secondary containment must be approved prior to placing the tank into service. If the waiver is not approved before the tank is placed in service, the tank is out of compliance with 47CSR58, Section 4.8.a.

3.1.3 Impermeable Barrier

ASTs which rest on the ground or are partially buried must have an impermeable barrier under the tank and a leak detection system between the tank and the barrier. The barrier acts as a liner to redirect leaks to a perimeter system where they can be visually observed.

SECTION 4.0

AST CONSTRUCTION

4.1 Materials & Standards

Above Ground Storage Tanks should be constructed in accordance with a national standard such as Underwriters Laboratory (UL) Standard #142, or one of the two standards developed by the American Petroleum Institute (API), Standard #620 or #650. The majority of ASTs are constructed in accordance with UL 142.

ASTs may be constructed of any material that is appropriate for its contents and is protective of groundwater. For instance, it would be inappropriate to store petroleum in a fiberglass or plastic AST. These tanks are easily punctured and would melt if exposed to fire.

4.2 Corrosion Control & Protection

Corrosion is one of the most prevalent and insidious causes of leaks. Because the large surface area of AST's cannot be easily inspected, leaks that develop tend to go on for long periods with large contamination pools resulting. Corrosion can be mitigated by proper foundation design and material selection, use of lining and coatings for topside and bottom side corrosion, cathodic protection and chemical inhibition. Some of the most common methods of corrosion control and prevention relate to:

- Linings
- Corrosion Allowance
- Design (avoidance of dissimilar metals, galvanic couples, improper materials, high fluid velocities in inappropriate places, caulking or seal welding of areas susceptible to crevice corrosion, roof design, etc.
- Sacrificial anodic systems
- Impressed current cathodic protection
- Use of high-alloy materials.

New piping should be installed above ground to avoid major corrosion problems. Underground piping should be made of non-corroding material such as fiberglass reinforced plastic (FRP) or cathodically protected steel which provides a minimum of thirty (30) years of corrosion protection.

Metal ASTs should be painted to prevent exterior rusting of the shell. New ASTs should be protected by a primer coat, a bond coat, and two or more final coats of paint, or have an equivalent surface coating system. Most tanks are delivered with only a primer coat. The AST operator must make provisions for the rest of the coating system.

Earthen or compacted clay liners are prohibited in the following areas:

- Karst aquifer areas
- Aquifer areas as determined by the director to be vulnerable based on geologic or hydrogeologic information.
- Alluvial aquifers including, but not limited to the Ohio and Kanawha alluvial plains.

4.4 Specific Lining Applications

4.4.1 Potable Water Tanks

The United States Food and Drug Administration regulates the coatings that are acceptable for lining potable water tanks.

4.4.2 Diesel and Fuel Oil Tanks

Because these tanks are subject to sulfur-reducing bacteria and the related corrosion pitting that occurs, they are often coated with a thin film on the bottom and a few feet up the sides of the shell.

4.4.3 Motor Gas

Motor fuel tanks are often coated on the bottom only because of the water-phase-induced corrosion that generates pitting and product purity problems. However, many operators do not coat these tanks.

4.5 Storm Water

Storm water that collects within the secondary containment should be drained to a sump where it can be discharged using a siphon, pump or drain extended through the dike. Drains should be valved and kept locked in a closed position unless designed to drain directly to a wastewater treatment facility or a remote impoundment. Valves should be located outside the secondary containment area so they can be reached during a fire. It is important to keep the containment areas free of spilled material which might contaminate storm water. Contaminated storm water must be treated prior to discharge or disposed of properly. Appropriate analyses of storm water within a secondary containment must be conducted before discharge when the contaminants are water soluble and would not be visible. Contaminated water is prohibited from being discharged directly onto the ground by 47CSR58, Section 7.1. A West Virginia/National Pollutant Discharge Elimination System (WV/NPDES) permit is required for such discharges. A General Storm Water NPDES permit will not cover such discharges.

Alarms usually provide an audible (horn, bell, or whistle) or visual signal (light) when a tank is ninety (90) percent full. Shutdown devices are commonly designed to stop the product flow into the tank when it is ninety-five (95) percent full. The 5 to 10 percent of the tank volume is a safety and expansion factor. The tank owner should select the tank size based on the working capacity, not total capacity.

NOTE: Float vent valves which provide overfill prevention by slowing gravity deliveries to underground storage tanks are not appropriate for use with ASTs.

4.8 Valves

Tanks that have a pressure discharge through a remote pumping system should be equipped with a shear valve (impact valve) designed to close automatically if the dispenser is accidentally dislodged from the inlet pipe.

Gravity drained tanks should be equipped with both an operating valve to control the flow and a shutoff valve (such as a solenoid valve) to stop the flow if a piping or dispenser failure occurs.

Pump filled tanks should have fill pipes equipped with an operating valve and a check valve for protection against back flow.

4.9 Identification

ASTs should be identified with a tank number, design capacity, working capacity, and contents to help avoid overfill or product contamination. The label should be displayed at the gauge and on the tank.

Motor Fuel Dispensing Facilities and Repair Garages" should be consulted for guidance on the sizing of AST vents.

5.3 Static Electricity

Static electricity generated during filling, draining or routine pumping operations around ASTs can cause a spark which ignites a tank's contents. This could generate a fire or explosion, and result in the discharge of the tank contents. Four rules will help prevent static sparks:

- **Metallic equipment and other electrical conductors must be grounded where flammable atmospheres can exist.**

When an ungrounded vacuum truck is removing tank bottoms, the flow of flammable liquid can cause a significant static charge to develop on the truck and hose. The charge can then arc to the tank causing an explosion. The truck should use a grounding strap connected to an appropriate grounded object to prevent an accident.

Any hose that has a metal coupling or stiffener should be grounded and double checked. **DO NOT** assume the hose is grounded through the spiral metal stiffener. These wires are often broken internally or are not connected to the couplings. This ungrounded conductor is a dangerous source of sparks from static electricity.

- **Do not open, sample, gauge, disturb, or insert anything into a tank while it is being filled or emptied.**

Liquids or vapors flowing through pipes may generate static electricity by a phenomenon known as streaming currents. The greater the velocity of flow, the greater the potential for static charge build up. Streaming currents are not the only source of static charges. Air bubbles or water droplets in a liquid, a mist, bubbling compressed gasses through liquids, and agitation can also create static electricity. A common tank cleaning operation that involves applying steam through nozzles is notorious for generating static charges.

Another common source of static buildup is splash filling, which causes turbulence and droplet formation. Splash filling is defined as dropping liquid from the top of a tank through an open pipe at a velocity greater than one meter per second. The energy of pumping, flowing or agitating liquids may create static charges regardless of whether or not the fluid is conductive.

- **Minimize the delivery rate to reduce static buildup.**

Filling tanks, trucks, or other containers at a low flow rate reduces the possibility of generating sufficient static charge to be an ignition source. The rule for filling is that the velocity of the liquid should not exceed one meter per second unless the fill line is submerged. (A flow rate of one meter per second is equivalent to 32 gallons per minute (GPM) through a

5.4 Underground Storage Tanks (USTs)

Underground storage tanks must not be used above ground without the advice of a structural engineer or the tank manufacturer. USTs gain structural support from the surrounding backfill or soil and are designed to a lower standard than above ground tanks which must support the weight of the stored product. A two thousand (2,000) gallon tank filled with gasoline weighs more than seven tons. In addition, tanks designed for underground use do not have emergency vents as required for ASTs.

- De-gas Tank Atmosphere
  - Purge with air.
  - Displace vapors with heavy inert gas.
  - Monitor tank atmosphere for Lower Explosive Limit (LEL)

- Clean tank and dispose of tank cleaning residue properly – continue to monitor tank atmosphere.

- Prepare tank for transport – Use API procedures including warning sign on tank.

- Obtain written certification by contractor and waste hauler material disposal documentation.

- Soil Assessment – Sample soil where identified by staining, soil screening device, or DEP inspector. See Groundwater and Soil Limits table in **Appendix A.**

- Report soil sampling results to inspector and appropriate DEP office.

- Additional soil and groundwater monitoring and cleanup as required.

6.2 Post Fuel Storage

Above Ground Storage Tanks that have been properly decontaminated may be used for other purposes such as water storage. Analytical sampling should be conducted and the analyses submitted to verify decontamination prior to post fuel storage use.

- Sampling of rinse water for TPH – DRO should be submitted prior to the use of ASTs which have contained diesel fuel or other low volatility petroleum products.

- Sampling of rinse water for TPH – GRO and Lead should be submitted prior to the use of ASTs which have contained gasoline.

Submit all decontamination verification analyses to:

WVDEP – Division of Water and Waste Management
Groundwater Program
601 57th St.
Charleston, WV 25304
304-926-0499, ext. 1052

GROUNDWATER AND SOIL LIMITS

Parameter	*Groundwater*		*Soil*	
TPH-GRO	1.0 mg/L	DEP Action Level	100 mg/kg	DEP Action Level
TPH-DRO	1.0 mg/L	DEP Action Level	100 mg/kg	DEP Action Level
TPH-ORO	1.0 mg/L	DEP Action Level	100 mg/kg	DEP Action Level
Benzene	0.005 mg/L	47-CSR-12	50 ug/kg	DEP Action Level
Ethylbenzene	0.7 mg/L	47-CSR-12		
Toluene	1.0 mg/L	47-CSR-12		
Total Xylenes	10.0 mg/L	47-CSR-12		
Total BTEX			10 mg/kg	DEP Action Level
Total PAHs			1 mg/kg	DEP Action Level
MTBE	20 µg/L	DEP Action Level		
Napthalene	20 µg/L	Health-Based Limit		
Dissolved Lead	0.015 mg/L	47-CSR-12		

Those limits set by Title 47, Series 12, The Requirements Governing Groundwater Standards, are set by the West Virginia legislature and, as such cannot be deviated from. However, those limits that are DEP Action Levels are guideline concentrations used by our office and the Office of Environmental Remediation, and these may be adjusted site by site, as needed.