CHAPTER 14

GROUNDING OF TANKS, PIPELINES, AND TANK CARS

Potential differences between two objects will be eliminated by bonding them together by grounding one of them so that the static charges can drain away as fast as they are produced or by increasing the relative humidity. When the free charges collect on the grounded substance, they flow to the earth and are neutralized; therefore, the possibility of sparks is zero. A resistance to ground up to 1,000,000 ohms is sufficient to prevent the electric charges from building up to a sparking potential. A film of moisture provides a suitable path to ground and increases the conductivity also. A humidity of between 60% and 70% will usually prevent the accumulation of static electricity.

The shell of tanks intended to contain products that can produce a dangerous atmosphere should be permanently grounded. Tanks that do not contain flammable products but are located in a hazardous area should also be permanently and effectively grounded. The tanks should be grounded with ground anodes that are independently connected to the shell of the tank and spaced symmetrically around the tank. The resistance of these anodes in earth can be reduced by surrounding them by a backfill such as graphite, coke or carbon. Increasing the length of the diameter of the anode will reduce its resistance to earth. Ground wires are to be thermally welded or bolted to the tank shells. To avoid corrosion, each earth connection should be installed not less than 18 in. above ground level.

If the inner walls of the tanks are provided with a thick coating of insulating material, the tank must be protected either by a metal surface on the coating or the tank must be provided with a grounded earth plate in contact with the liquid to keep the contents at zero potential and reduce the accumulation of static electricity. With a thin epoxy coating, the static potential difference between the tank wall and the liquid is negligible and is, therefore, not considered hazardous. The possibility of a spark between the liquid surface and the tank wall is related to the static generating qualities of the product. When a tank is being filled, friction between the liquid and the feed pipe could cause the pipe to become charged, especially when the liquid is agitated in the tank. However, bonding and grounding may not be the total answer for a tank if it is being filled with a low conductivity liquid. The low conductivity liquid becomes charged during the
filling because of the friction between the liquid and the feed pipe. Therefore, in addition to the bonding and grounding, time must be allowed for the liquid to relax to allow the liquid charge to stabilize and dissipate. It is safe practice to introduce a relaxation time of about 60 seconds or to attain a reduced flow rate.

Normally, storage tanks are self-protecting and do not require lightning protection when the bottom of the tank is metal and in direct contact with earth of good conductivity. No additional grounding is then required. Metallic tanks with fixed or floating roofs have proven to remain in good condition and are well protected from damage from direct lightning strokes when all tank components are properly bonded and grounded. For tanks with floating roofs, the roof should be bonded to the shell of the tank. Floating internal blankets should also be effectively connected to the tank shell. Where metallic tanks are not in direct contact with earth, or where the tanks are resting on an oil prepared foundation and are isolated from the associated pipelines, the normal grounding of the tank shell will suffice.

No special grounding requirements are necessary for metal pipelines when they are electrically continuous and, therefore, part of the installation considered as properly grounded. However, non-conducting pipelines may become highly charged because of the movement of liquid or other substances flowing through them. Therefore, these pipes should be grounded by means of a ground wire wrapped around the pipe or by increasing the conductivity of the substance flowing through it, i.e., by using antistatic additives in the liquids.

All pipelines terminating at a platform should be permanently and effectively grounded. Hoses are to be electrically continuous and the pipeline to the nozzle, including any swivel joints. When an open filling hatch is used, the hose should be lowered in the tank until the nozzle touches the bottom of the tank. Hoses that are semi-conducting can be considered electrically continuous. The pipelines should be made electrically continuous with the platform framework, which is to be directly grounded, preferably to a grounding grid. Bonds or jumpers are not required around flexible joints or swivel joints.

The platform should be provided with an adequate flexible grounding cable for connection to a road vehicle prior to any loading or unloading procedure. A grounding clamp for the rail car is not necessary since the grounding of this car is obtained by contact of the wheels with the rails, which are bonded to the platform structure. It is recommended that a road vehicle that carries petroleum products be grounded in a safe area to release the electrostatic charge before it enters a platform. In addition, insulating couplings should be placed in the rail joints of the spur tracks to eliminate stray currents. Stray currents may flow in the pipeline or in the rails and may produce an arc when tank car connections are broken. The insulating joints should not be bridged by a tank car during filling with flammable liquids. Hoses that are used for filling containers, other than those mentioned above, should also be of the semi-conducting type or be provided
with an externally mounted, continuous metal bonding wire that is visible to the operator.

The bonding and grounding of tank cars and unloading platforms are shown in Fig. 1-24.

Bonding or grounding for motor vehicles is not required during delivery of gasoline from service stations. Tests and experiences indicate that no ignition hazard is created during fueling operations.
FIG. 1-24. GROUNDING AND BONDING AT SHIPPING WHARVES AND LOADING RACKS

INSTRUCTIONS FOR BONDING LOADING RACK

1) Attach bonding clip to bonding skid or to clean metal part of truck in metallic contact with the tank.

2) Remove cap or dome cover and insert fill spout.

3) Do not detach bonding cable until filling operation has been completed and cap or dome has been replaced on the tank.

DETAIL 2

SIGN TO BE PLACED AT EACH BONDING CABLE LOCATION