



## **SECTION 22**

### **ASPHALT EMULSION EQUIPMENT: TANKS & HEAT SYSTEMS**

#### **22.1 Introduction**

The purpose of this brochure is to provide the asphalt emulsion end user with helpful information on asphalt emulsion storage tanks, heating systems, and tankers. Only general information is provided, therefore the emulsion user should contact their local AEMA emulsion supplier. For all installations, contact the appropriate local authorities and be guided by their recommendations and requirements.

#### **22.2 Storage Tanks**

The following information will aid the emulsion end user in selecting the proper storage tank.

##### **22.2.1 Tank Foundations**

Emulsions usually weigh 1 kg/L (8.3 to 8.4 lb/gal). The tank foundation should be designed for the weight of the maximum volume to be stored plus the weight of the tank shell. Vertical tanks are best set on a concrete foundation while horizontal tanks require a saddle for each end and one in the middle, or as required by local building codes.

##### **22.2.2 Tank Design**

Emulsion storage tanks can be either vertical or horizontal.

###### **22.2.2.1 Vertical Tanks**

These type tanks are normally preferred over horizontal tanks because less of the emulsion is exposed to the atmosphere which causes a scum to form on top of it. Other advantages of vertical tanks are they occupy less land area, are easier to heat, easier to insulate if required and their emulsion level can be measured more easily.

###### **22.2.2.2 Horizontal Tanks**

These tanks offer the advantage of being less susceptible to high tension power lines because of their low profile, easier to recirculate completely and easier to drain completely since they are usually set on a slight slope.

###### **22.2.2.3 Tank Features**

All vertical tanks should have manholes for clean out located approximately 0.6 m (2 F) from their bottom. There should be a safety ladder on the outside and a manhole on top of the tank. Governing safety standards should be used at all times. Any tank should be properly vented and provided with a suitable electrical ground. Some type

of liquid level and measurement indicator can be installed if needed. Used tanks are acceptable, provided they are thoroughly cleaned, usually with steam, and the necessary tank features installed.



#### **NOTE**

Be extremely careful when cutting on used tanks especially if they have previously contained some type of petroleum product. Only certified personnel using accepted industry safety standards should modify these types of tanks.

#### **22.2.2.4 Tank Plumbing**

Proper plumbing of a tank is very important. Provide a 19 to 25 mm (3/4 to 1 in.) sample line for each tank. The line should be located approximately 0.6 m (2 ft) above the tank bottom with the line extending 0.6 m (2 ft) inside the tank.

Fittings should also be supplied for the installation of a tank thermometer or RTD. Usually 3/4".

Always provide a full-size suction line, that is, the same size as the transfer pump inlet or larger. Keep the suction line as short as possible and with as few bends as practical. Inside the tank, install an elbow at the suction inlet keeping the bottom of the elbow approximately 50 mm (2 in.) off the tank bottom.

Always provide a tank return or re-circulate line. This line should be the same size or no less than one size smaller than the suction line. Inside the vertical tank, turn the return line to the wall of the tank and away from the suction line. Allow the pipe to extend several feet inside the tank. Inside horizontal tanks, allow the return line to extend halfway into the tank. This permits better recirculation in both type tanks. It is best to always place the return line near the bottom of the tank. If the return line must enter higher in the tank bring the line inside the tank and back to the tank bottom. Never allow emulsion to drop through the air, always return it to a submerged outlet or one very near the tank bottom.

Arrange tank plumbing so the transfer pump can draw from more than one tank. Be sure the plumbing is arranged to permit the transfer pump to unload the supply tanker, recirculate the storage tank and load the user equipment. The emulsion can be loaded either through the top or bottom of a tanker. However, if loading through the top the loading hose or pipe should be lowered near the bottom of the tank.

#### **22.2.2.5 Location**

Tanks can be located as desired as long as they are approved by local authorities. Tanks should not be located near high tension electric power lines because of the electrical charge around the wires could affect the electrical charge on the emulsion particles causing instability or even cause an arc between the tank and the wires. Protection from spillage must be provided as required by local codes. Some standards call for a berm around the storage area that provides a volume from 1.10 to 1.25 times the volume of the largest tank.

Provision should be made for small spills that can occur at the loading site. A suitable drain or other method should be used to prevent tracking asphalt outside the loading area.



## 22.3 Heating Systems

Some grades of emulsion require heating during storage and use. Table III-1 from AEMA's *A Basic Asphalt Emulsion Manual* may be helpful. The end user should check with the local AEMA emulsion supplier for their suggestions on storage temperatures.

### 22.3.1 Heaters

Several types of heaters may be used for asphalt emulsion. The main requirement is that the heater be regulated to provide the desired temperatures and that it use indirect heat instead of direct heat, such as an open flame.

#### 22.3.1.1 Hot Oil Heaters

These self-contained heaters heat a special heat transfer fluid using gas or diesel burners or electricity. The heater pump circulates the hot oil through the system and emulsion tank coils (described later). The hot oil temperature must be kept 85° C (185° F) or below as required. Thermostatic controls can be used to set tank temperatures as required.

If the hot oil is used to heat other materials, (e.g., asphalt cement), that require higher temperatures, modifications must be made to the system. The hotter oil can first heat a tank of water and then the water can be circulated through the storage tanks or a special system can use a second recirculating pump and a thermostatically controlled mixing valve to keep the temperature of the oil for the emulsion at the desired level.

#### 22.3.1.2 Steam

Low pressure steam can be circulated through coils similar to the hot oil. This probably is the desired system where steam is already available. A method for moving the emulsion over the surface of the steam coils should be considered. A side entry tank mixer is preferred, but re-circulation by a pump may also be used. Note: Avoid over-pumping/shearing of emulsions.

#### 22.3.1.3 Water

Water can be heated by hot oil, steam or electricity, and circulated through tanks in the same manner as hot oil and steam. This is a safe method since water seldom gets hot enough to damage the emulsion.

#### 22.3.1.4 Solar

In recent years solar heaters have been used to heat hot oil or water which in turn heats the emulsion tanks.



### 22.3.1.5 Electrical

Electrical heaters are available to heat the emulsion. These heaters offer the advantage of eliminating tank coils and related plumbing required for hot oil, steam or water. Each tank heater is separately controlled, thus making it simple to set tank temperatures at different levels or individually cut off the heat to any tank. Again, some method for moving the emulsion over the heating surface should be considered. This will prevent the emulsion from localized over-heating and contribute to more even product temperatures.

### 22.3.2 Coils

Heating coils are placed in tanks as previously noted for circulation of hot oil, steam or water. Either thickwall or standard pipe or tubing are used. Finned tubing is not recommended for emulsion tank service. As an emulsion tank drains, emulsion gathers in the voids between the fins. As soon as the tank is empty, the emulsion will begin to break and coat the fins. Over time, the fins will become plugged and will not transfer heat very well. The only choice is to clean the coils by hand (difficult and time consuming), or use a solvent. This raises issues of cost, waste disposal, and product quality. The hot oil system uses black pipe or tubing.

The amount of coil required for each tank depends on size of tank, amount of tank insulation, wind velocity, lowest expected ambient air temperature, amount and type of insulation, type of emulsion, and how rapidly the emulsion temperature must be increased, if at all. Consult a heating specialist for information on this.

### 22.3.3 Other

Emulsion lines and transfer pumps must be heated, especially if emulsion is used during winter. This insures uniform emulsion temperature and trouble free pump starting. Lines and pumps must be heat jacketed or traced and then insulated.

## 22.4 Tankers

Asphalt emulsion tankers can be any suitable mobile tank such as a specially designed tanker for emulsion, an asphalt distributor or even a water tank. Any tanker should have a correct bottom fitting, usually 75 mm (3 in.), and a suitable top manhole to receive emulsion from the supplier. The manhole can also be used for cleaning, inspection, etc. The tanker should have suitable baffles to prevent undue sloshing. It should be properly vented, have a thermometer and sample line. The tanker should be properly cleaned to prevent contamination of the product being loaded. If possible use dedicated tankers that haul emulsion only. [Table 3-2 Guide for Condition of Emptied Tanks Before Loading Asphalt Emulsions](#) in AEMA's [A Basic Asphalt Emulsion Manual](#) lists suggested cleaning practices. This chart also is valid for storage tanks. Consult your local AEMA emulsion supplier for more specific local practices.