SECTION 3
STORING, HANDLING AND SAMPLING

Through a long history of successful field use of asphalt emulsions, these handling, storing and sampling procedures have been established. These general guidelines should be followed. Any questions about the handling, storage or sampling of asphalt emulsions should be referred to your emulsion supplier.

3.1 Storing Asphalt Emulsions

Asphalt emulsion, a dispersion of fine droplets of asphalt cement in water, has both the advantages and disadvantages of the carrier medium, water. When storing emulsified asphalts:

DO store as you would fluid water — between 10°C (50°F) and 85°C (185°F), depending on the intended use and specific product.

DO store at the temperature specified for the particular grade and application. **Table 3-1 Storage Temperatures for Asphalt Emulsions** shows the normal storage temperature ranges.

DO NOT permit the asphalt emulsion to be heated above 85°C (185°F). Elevated temperatures evaporate the water, changing the characteristics of the asphalt emulsion.

DO NOT let the emulsion freeze. This breaks the emulsion, separating the asphalt from the water. The result will be two layers in the tank, neither of which will be suited for the intended use, and the tank will be difficult to empty.

DO NOT allow the temperature of the heating surface to exceed 100°C (212°F). This will cause premature breakdown of the emulsion on the heating surface.

DO NOT use forced air to agitate the emulsion. It may cause the emulsion to break.

Storage tanks should be insulated for protection from freezing and most efficient use of heat. A skin of asphalt can form on the surface of emulsions when exposed to air. Therefore, it is best to use tall, vertical tanks that expose the least amount of surface area to the air. Most fixed storage tanks are vertical but horizontal tanks are often used. for short-term field storage. Skinning can be reduced by keeping horizontal tanks full to minimize the area exposed to air.

Side-entering propellers located about one meter (three feet) up from the tank bottom may be used to prevent surface skin formation. Large diameter, slow-turning propellers are best and should be used to roll over the material. Over-mixing should be avoid-

ed. Tanks may also be circulated top to bottom with a pump. Over-pumping is to be avoided.

Table 3-1 Storage Temperatures for Asphalt Emulsions

Grade	Temperature, 0°C (0°F)	
	Minimum	Maximum
RS-1	20° (70°)	60° (140°)
RS-2, CRS-1, CRS-2, HFRS-2	50° (125°)	85° (185°)
SS-1, SS-1h, CSS-1, CSS-1h, MS-1, HFMS-1	10° (50°)	60° (140°)
CMS-2, CMS-2h, MS-2, MS-2h, HFMS-2, HFMS-2h, HFMS-2s	50° (125°)	85° (185°)

3.2 Handling Emulsified Asphalts

DO when heating asphalt emulsion, agitate it gently to eliminate or reduce skin formation.

DO protect pumps, valves, and lines from freezing in winter. Drain pumps and service according to the manufacturer's recommendations.

DO blow out lines and leave drain plugs open when they are not in service.

DO use pumps with proper clearances for handling emulsified asphalt. Tightly fitting pumps can bind and seize.

DO warm the pump to about 65°C (150°F) to facilitate start-up.

DO when diluting asphalt emulsion, check the compatibility of the water with the emulsion by testing a small quantity.

DO if possible, use warm water for diluting, and always add the water slowly to the emulsion (not the emulsion to the water).

DO avoid repeated pumping and recirculating, as the viscosity may drop and air may become entrained, causing the emulsion to be unstable.

DO place inlet pipes and return lines at the bottom of tanks to prevent foaming.

DO pump from the bottom of the tank to minimize contamination from skinning that may have formed.

DO remember that emulsions with the same grade designation can be very different chemically and in performance.

DO haul emulsion in truck transports with baffle plates to prevent sloshing.

DO agitate emulsions that have been in prolonged storage. This may be done by recirculation.

DO NOT mix different classes, types, and grades of emulsified asphalt in storage tanks, transports, and distributors. See **Table 3-2 Guide for Condition of Emptied Tanks Before Loading Asphalt Emulsions** for recommendations.

DO NOT apply severe heat to pump packing glands or pump casings. The pump may be damaged.

DO NOT dilute rapid-setting grades of asphalt emulsion with water. Medium and slow setting grades may be diluted, but always add water slowly to the asphalt emulsion. Never add the asphalt emulsion to a tank of water when diluting.

DO NOT load asphalt emulsion into storage tanks, tank cars, tank transports, or distributors containing remains of incompatible materials. See **Table 3-3 Haulers and Hauling Vehicles**, **Table 3-4 Mixing Plant Storage Tank and Equipment** and **Table 3-5 Non-Representative or Contaminated Sample**.

DO NOT subject emulsified asphalt or air above it to an open flame, heat, or strong oxidants. Adequate ventilation is required.

DO avoid breathing fumes, vapors, and mist.

DO obtain a copy of the supplier's material safety data sheet (MSDS). Read the MSDS carefully and follow it.

Table 3-2 Guide for Condition of Emptied Tanks Before Loading Asphalt Emulsions

Last Product In Tank						
Product To Be Loaded	**Asphalt Cement (Includes Industrial Asphalt)**	**Cutback Asphalt and Residual Oils**	**Cationic Fuel Emulsion**	**Anionic Emulsion**	**Crude Petroleum**	**Any Product Not Listed**
Cationic Emulsion	Empty[1]	Empty to no measurable quantity	OK to load	Empty to no measurable quantity	Empty to no measurable quantity	Tank must be cleaned
Anionic Emulsion	Empty[1]	Empty to no measurable quantity	Empty to no measurable quantity	OK to load	Empty to no measurable quantity	Tank must be cleaned

NOTES:
1. Any material remaining will produce dangerous conditions

3.3 Possible Causes of Contamination of Asphalt Material or Samples and Suggested Precautions

Table 3-3 Haulers and Hauling Vehicles[1]

Possible Causes	Precautions
(a) Previous load not emulsion being loaded.	Examine the log of loads hauled or check with the supplier to determine if previous material hauled is detrimental. If it is, make sure compatible with vehicle tanks, unloading lines, and pump are properly cleaned and drained before being presented for Provide a ramp at the unloading point at the plant to ensure complete drainage of vehicle tank while material is still fluid.
(b) Remains of diesel oil or solvents used for cleaning and flushing of tanks, lines, and pump.	When this is necessary, make sure all solvents are completely drained.
(c) Flushing of solvents into receiving storage tank or equipment tanks.	Do not allow even small amounts to flush into storage tank; contents may be contaminated.

NOTES:
1. Field observations and studies of test results have indicated that contamination of materials during transportation often occurs

Table 3-4 Mixing Plant Storage Tank and Equipment[1]

Possible Causes	Precautions
(a) Previous material left over in tank when changing to emulsion.	Any material allowed to remain must be compatible with the emulsion, and the amount remaining in the tank must be insufficient to cause emulsion to become out of specification. If in doubt, check with your supplier. To be on the safe side, tank should be drained or cleaned prior to using tank for each different type or grade of asphalt. Be sure discharge line connects at low point of storage tank to ensure complete emptying when changing type or grades of asphalt or cleaning tank.
(b) Solvents used to flush hauling vehicle tank discharged into storage tank.	Observe unloading operations, caution driver about flushing cleaning materials into storage tank. If possible, provide place for hauler to discharge cleaning materials.
(c) Flushing of lines and pump between storage tank and mixing plant with solvents and then allowing this material to return to tank.	If necessary to flush lines and pump, suggest providing bypass valves and lines to prevent solvents from returning to tank. A better solution is to provide insulated, heated lines and pump, thereby eliminating the necessity of flushing.
(d) Cleaning of distributor tank, pump, spray bar, and nozzles with solvents.	Be sure all possible cleaning material is drained off or removed prior to loading.
(e) Dilutions from hot oil heating systems.	Check reservoir on hot oil heating system. If oil level is low, or oil has been added, check system for leakage into the asphalt supply.

NOTES:

1. Many investigations and test results point to mix plant storage tanks and associated equipment as the source of contamination.

Table 3-5 Non-Representative or Contaminated Sample[1]

Possible Causes	Precautions
(a) Contaminated sampling device (commonly called a “sample thief”).	If sampling device (described in ASTM D 140 or AASHTO T 40) is cleaned with diesel oil or solvent, make sure that it is thoroughly drained and then rinsed out several times with emulsion being sampled prior to taking sample.
(b) Samples taken with sampling device from top of tank where, under certain conditions, contaminants can collect on the surface.	In taking a sample from the top of a tank, lower the sampling device below the extreme top before opening. Note: This sample may come from the top one-third of the tank.
(c) Contaminated sample container.	Use only new clean containers. Never wash or rinse a sample container with solvent. Wide-mouthed plastic jars or bottles or plastic-lined cans should be used.
d) Sample contaminated after taking.	**DO NOT** submerge container in solvent or wipe the outside of thecontainer with a solvent-saturated rag. If necessary to clean spilled emulsion from outside of container, use a clean dry rag. Make sure container lid is tightly sealed prior to storage or shipment. Ship to testing laboratory promptly.
(e) Samples taken from spigot in and mixing plant.	If the sampling spigot is in a suction line between the tank and pump, this requires stopping the pump prior to taking a sample. Samples thus taken are by gravity and only representative of emulsion localized in the pipe area of the spigot. Instead, the spigot should be between the pump and spigot. **DO NOT** take a sample while the hauling vehicle is pumping into storage tank. **DO NOT** take a sample without allowing enough time lines between storage tank for circulation and thorough mixing of emulsion. **DO** drain off sufficient material through spigot prior to taking a sample to ensure removal of any material lodged in spigot. **DO** take a sample slowly during circulation to be more representative of the emulsion being used. **DO** take a sample slowly during circulation to be more representative of the emulsion being used.
(f) Samples taken from unloading line of hauling vehicle.	Drain off sufficient emulsion through spigot prior to taking a sample to ensure removal of any material lodged there. Sample should be taken after one-third and not more than two-thirds of the load has been removed. Take the sample slowly to be sure itis representative of the emulsion being used.

NOTES:

1. Test results are greatly dependent upon proper sampling techniques. Extra care is required by the sampler to obtain samples that are truly representative of the material being sampled and will do much to eliminate the possibility of erroneous test results by reason of improper sampling. Make sure samples are taken only by those authorized persons who are trained in sampling procedures.

3.4 Sampling Asphalt Emulsions

The purpose of any sampling method is to obtain samples that will show the true nature and condition of the material. The general procedure is described below. The standard procedure is further detailed in “Standard Methods of Sampling Bituminous Materials,” ASTM D140 or AASHTO T 40.

Containers for sampling asphalt emulsion shall be wide-mouth jars or bottles made of plastic, or widemouth plastic-lined cans with lined screw caps, or plastic-lined triple-seal friction-top cans. The size of samples shall correspond to the required sample containers, which is generally 4 liters (1 gallon). Whenever practical, the asphalt emul-

sion shall be sampled at the point of manufacture or storage. If that is not practical, samples shall be taken from the shipment immediately upon delivery. Three samples of the asphalt emulsion shall be taken. The samples shall be sent as soon as possible to the laboratory for testing.

3.4.1 Sampling Precautions

- Sample containers shall be new. They shall not be washed or rinsed. If they contain evidence of solder flux, or if they are not clean and dry, they shall be discarded. Top and container shall fit together tightly.
- Care shall be taken to prevent the samples from becoming contaminated. (See **Table 3-3 Haulers and Hauling Vehicles**, **Table 3-4 Mixing Plant Storage Tank and Equipment** and **Table 3-5 Non-Representative or Contaminated Sample**.) The sample container shall not be submerged in solvent, nor shall it be wiped with a solvent saturated cloth. Any residual material on the outside of the container shall be wiped with a clean, dry cloth immediately after the container is sealed and removed from the sampling device.
- The sample shall not be transferred to another container.
- The filled sample container shall be tightly and positively sealed immediately after the sample is taken.

3.4.2 Safety Precautions

Safety precautions are mandatory at all times when handling asphalt materials. These safety precautions include, but are not limited to:

- Gloves shall be worn and sleeves shall be rolled down and fastened over the gloves at the wrist while sampling and while sealing containers.
- Face shields should be worn while sampling.
- There shall be no smoking while sampling asphalts.
- Avoid prolonged breathing of fumes, vapors and mists.
- During sealing and wiping, the container shall be placed on a firm level surface to prevent splashing, dropping or spilling the material.

3.4.3 Protection and Preservation of Samples

- Immediately after filling, sealing, and cleaning, the sample containers shall be properly marked for identification with a permanent marker on the container itself, not on the lid.
- Samples of emulsions shall be packaged, labeled, and protected from freezing during shipment. All samples should be packaged and shipped to the laboratory the same day they are taken. The containers should be tightly sealed and packed in protective material to reduce the probability of damage during shipment.

- Each sample should be identified with this information:
  - — Shipper's name and bill of lading or loading slip number
  - — Date sampled
  - — Sampler's name
  - — Product grade
  - — Project identification
  - — Other important information as necessary.