

# CHAPTER 6

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## **6.00 Introduction**

While it is most economical to use local materials when possible in maintenance work, results will not be satisfactory unless suitable materials are used. Superintendents and Supervisors are not expected to be familiar with all materials tests or with the full details of sampling required on a major project. However, it is important that the person in charge of work be familiar with routine sampling procedures.

This chapter focuses on sampling and testing of materials. To learn more about products used, typical applications, and expected performance, refer to the “Maintenance Advisory Guide”, which is a complete technical document of materials and strategies.

## **6.01 Sampling**

It is critical that samples of materials submitted to the laboratory for testing is representative. Construction based on misleading test data may fail completely, or inexpensive suitable material may be unnecessarily excluded from use.

Use Chapter 6 of the Construction Manual as a guide to sampling procedures and sampling frequency.

Often, the quantities of some materials required on a maintenance project may be very small, or the intended use of the material may be such that strict quality controls are not feasible. Consult the district materials laboratory or the Office of Materials, Engineering, and Testing Services (METS) when questions arise regarding sampling and testing.

When materials are purchased in large volumes for stockpiling or when a local source of aggregate is being considered for use, it may be advantageous to request assistance from the district laboratory or METS. Proper equipment and trained personnel can often save both time and money in the sampling and testing program.

## **6.02 Sample Identification**

Each sample submitted to the laboratory for testing must be accompanied by a sample identification form. Three types of forms are used:

- Form TL-518 for cement samples
- Form TL-502 for field concrete samples
- Form TL-101 for all other materials

Instructions for using the forms are printed on the cover of the book containing the forms. Each item on the sample identification form should be filled out completely. A completed form provides the required information on the project, the material and where sampled, the type of tests to be performed, and the date test results are required.

Particular attention needs to be directed to the following details:

- (A) Use a black ball-point pen or pencil of sufficient hardness to produce clear carbon copies.
- (B) Submit the original (white) form to the laboratory where testing is being done. The original should accompany the sample, provided adequate precautions are taken to protect from mutilation or stains. Waterproof envelopes (Material Operations Catalog No. 7510-1140-6) will normally provide adequate protection. If adequate protection cannot be assured, the original (white) form should be mailed to the laboratory on the same day the samples are shipped. The normal procedure for reporting test results is to reproduce the laboratory work card with the identification form attached. Only the original (white) form, completed in black pencil or ball-point pen, will consistently provide readable reproductions.
- (C) The sample identification form should indicate the use for which the material is intended for so that the proper tests will be performed.

The Caltrans Maintenance representative should inform the laboratory of field conditions pertinent to the sample by entering such notes under "Remarks" on the same sample identification form. These conditions may involve difficulties with compaction, rolling, raveling, or degradation. If applicable, remarks should also include information regarding weather, moisture, traffic, and similar conditions to convey the Maintenance person's field observations to the laboratory. In cases where the Maintenance person is reasonably sure that the material is suspect in only one or two of the specification requirements, he or she should note this on the sample identification form. This will prevent the expense of unnecessary testing.

### **6.03 Priority Testing of Samples**

Schedule sampling of materials far enough in advance of the work to allow necessary testing prior to use of the material. It is inevitable that there will be occasions when advance testing is not possible. When situations arise where immediate testing is necessary to avoid delays in the work, the sample identification form should be marked “priority” under the entry for “Date Test Results Desired”. This will alert the laboratory to give the sample special handling. Be sure to include a telephone number in the remarks column of the form if a priority request includes telephone notification.

Do not enter “priority” on the form unless there is a true need to expedite the process. Plan ahead when possible to avoid the need to for special handling of samples.

### **6.04 Receiving of Materials**

The Maintenance Superintendent should assign someone the responsibility for checking shipments of materials when they are received and making sure that all have been properly inspected and released. Inspected material may be identified by inspection tags (Form TL-624) or a lot number on the package. An inspection report (Form TL-29) should be received within a week or ten days after receiving the delivery.

Contact METS promptly after receiving shipments not covered by releases so that the necessary investigation can be made.

If this investigation is delayed too long, the process of identifying and checking on the shipment may be extremely difficult.

### **6.05 Shipping of Samples**

When shipping samples from the job to the district laboratory and/or METS, use the most economical mode of transportation that will meet time frame requirements.

### **6.06 Sampling Failures of Existing Bituminous Surfaces**

To determine the causes of roadway failures on existing pavements, be sure to obtain samples from both stable and unstable areas. Pavement cores are sufficient samples in some cases. In other cases, additional material should be submitted in sealed containers to test for moisture content on existing material. Consult the METS Office of Roadway Materials Testing for assistance when making these decisions.

The following samples should be sufficient for tests to analyze the average surface failure:

- (A) From a stable area:
  - (1) One (1) gallon can (sealed).
  - (2) Approximately 25 pounds in canvas bag or other container or sufficient cores.
  
- (B) From an unstable area:
  - (1) One (1) gallon can (sealed).
  - (2) Approximately 25 pounds in canvas bag or other container or sufficient cores.

Indicate the type of failure such as raveling, instability or cracking of the surface on the sample identification form (Form TL-101). Provide a letter giving additional details such as intensity of traffic, condition of base material, and date and weather conditions at time of construction. This will greatly help to properly analyze the cause of failure.

### **6.07 Paving Asphalts**

A sample representative of the paving asphalt actually entering into the mix shall be taken from the asphalt line leading from the storage tank to the mixer, or from the storage tank by means of an oil thief. The following procedure shall be followed when obtaining the samples.

All sampling operations involving hot asphalt must be performed with care using appropriate personal protective equipment to avoid burns from spilled material or a possible flash from vapors collecting in storage tanks. There is always the possibility that pavement asphalt may be delivered to the job site at temperatures sufficiently high to cause the collection of flammable vapors in the storage tank. These vapors may flash if the correct mixture with air should occur, and a spark or other ignition source is present. No smoking is permitted while sampling asphalt regardless of procedure used.

No sampling shall be done during transfer operations. Gloves shall always be worn, and sleeves rolled down and fastened at the wrists while sampling.

The recommended method of obtaining the sample is from a valve placed in the line leading from the storage tank to the mixer. The sample shall be drawn from the valve after completion of transfer and sufficient circulation of the contents of the storage tank. This assures that the sample represents the contents of the tank. At least one-half gallon of asphalt shall be drawn from the valve prior to obtaining the sample. Sample from the spigot only, using a one-quart sample can supplied by the district laboratory.

The above described procedures shall be followed for each truck delivery that occurs when a State representative is present at the plant. When a number of loads are transferred to the storage tank during the night, a sample shall be obtained shortly after the start of plant operations on the following day. If such loads are discharged into more than one storage unit, then each tank should be sampled after the plant begins to draw from the storage unit.

After obtaining a sample from the plant storage tank, the sampler shall write the shipment number representing the loads placed in the tank prior to sampling on the TL-101 form. If the sample represents more than one load, be sure that all of the DL-TL-331 shipment numbers are shown on the TL-101 form. This is very important because the shipment can be identified only when the shipment number is known.

See test #125 and Chapter 6 of the Construction Manual.

In cases where paving asphalts are being used for seal coat work, a sample shall be drawn after one-half of the contents of the distributor have been placed. The sample may be drawn from either the spreader bar or from the dome opening. Under no circumstances shall a sample be taken from any loading lines, hoses, etc., until sufficient material has flowed through such lines. Small amounts of fuel oil or other grades of asphalt remaining in the lines from previous loads will badly contaminate a small sample withdrawn when discharging begins.

All samples of paving asphalt, together with the necessary forms and tickets, shall be packed and shipped to the appropriate laboratory each day, or as they are taken. The sample cans may be packed and shipped two at a time in the cardboard cartons used for shipping samples of the completed mix.

### **6.08 Liquid Asphalts**

Sampling of liquid asphalts shall be performed in the same manner as detailed for the paving asphalts, with the following added precautions:

Extreme care should be taken in sampling transport or spreader units loaded with cutbacks or slow-curing products. No smoking should be permitted by anyone in the immediate vicinity while the sample is being taken.

After sampling of cutbacks, the top of the sample can shall be screwed on tightly and checked for tightness after the sample has cooled off prior to shipment. A small loss of volatiles from a 1 quart sample will cause marked changes in the consistency of the material.

### **6.09 Asphaltic Emulsion**

Asphaltic emulsion should be sampled in the same manner as other asphalts, except for the following:

Before lowering the thief into the material to be sampled, the sampler should push any scum on the surface of the asphaltic emulsion away from the area where the thief is lowered.

The sample should always be poured into a clean plastic container for shipment to the laboratory. One-half gallon of emulsion is ordinarily sufficient for routine tests; however, when difficulty is experienced with the asphaltic emulsion on the job, or there is some reason to believe that the material does not comply with specifications, submit two one-half gallon samples. This quantity will be sufficient material for any special tests that may be desired. Use one-half gallon containers supplied by the District laboratory for sampling emulsion.

### **6.10 Asphalt Concrete**

Obtain a representative sample of the asphalt concrete from the mat behind the paving machine. The frequency of such testing is shown in Chapter 6 of the Construction Manual.

Each sample shall be taken before breakdown rolling is performed. The sample shall be obtained by removing a minimum of four shovels full from the full depth of the mat. Each shovel full is to be taken from a random point in a line transversely across the mat. The material should be thoroughly combined while it is still hot, and then quartered to obtain the required 15- pound sample. Fifteen pounds of asphalt concrete is the approximate weight of one full cardboard carton of the size furnished in the field for the purpose. Open graded asphalt concrete and asphalt treated permeable base shall be obtained from the paver receiving hopper.

Under no circumstances should the sample be taken from the top or edges of the pile in the truck, the windrow, or from the hopper of the paving machine.

Identify the samples to indicate both the station where they were taken and the approximate area they represent. Mark all "Acceptance Sample" for priority testing. Complete the Form TL-101, adhering to the instructions printed in the book containing the forms and information on "Sample Identification" contained in Chapter 6 of the Construction Manual.

It is essential to record the type of mix, grade and source of asphalt, and percent of asphalt used in the mixture. Do not forget to include whether the sample is for "Acceptance", "Independent Assurance", or "Special" testing.

Contact Construction if nuclear gages are to be used for in-place densities. Nuclear gages (California Test 375) are often used to determine the in-place density and relative compaction of asphalt concrete pavements. If a nuclear gage is not available, samples of the compacted pavement may be taken from the street at the discretion of the engineer. Samplers shall use extreme care in removing the sample and packing it for shipment in order to prevent the sample from breaking or falling apart. Wherever facilities are available, the density of the sample should be obtained in the field and noted on the TL-101 form, to eliminate the necessity for careful packing.

It is essential that the compacted sample and the un-compacted sample of the mix, be obtained from the same load in order to compare the density of the compacted field mix and the laboratory compacted specimens.

### **6.11 Road-Mixed Asphalt Surfacing**

Road-mixed surfacing material should be sampled after the material has been laid out. Sampling from the windrow is permissible if the sampler is certain that the oil is thoroughly mixed with the aggregate, and that the sample will be truly representative.

### **6.12 Paint**

See Chapter 6 of the Construction Manual.

All paint manufactured under State specifications is sampled at the factory, tested by the laboratory, and properly identified by lot numbers before being shipped to the job. Occasionally, when shipment is required to the job before tests can be completed, the manufacturer is allowed to make shipments at their own risk pending laboratory report. The shipment of paint under these circumstances is not to be construed as an acceptance. It is merely an expedient way to



save time when necessary. Report of Inspection of Material (Form TL-29) will be issued to interested parties if acceptance is made by the laboratory.

Some of the paint manufacturers stock a limited supply of laboratory approved paints identified by lot numbers ready for immediate shipment on order from the contractor. Report of Inspection of Material (Form TL-29) will be issued whenever shipments of this nature are made.

Samples of paint from the field should be sent to the laboratory as soon as the paint is received on the project. This is to determine if any change has developed in the product since its inspection by the laboratory. During the progress of the job, take special check samples of the paint when the paint exhibits hard settling, when the engineer suspects tampering with the paint, or at any other time at the discretion of the engineer.

Proper sampling to obtain a representative portion of the paint is absolutely mandatory. Sampling in the field must follow this method:

- (A) For bridges and other major structures, or whenever large quantities are involved, send an unopened 5 gallon can to METS for testing. Unused portions will be returned to the job.
- (B) For smaller samples:
  - (1) Pour the top liquid into a clean container as large as the one being sampled.
  - (2) Stir the settled portion of the paint with a paddle, gradually reincorporating the decanted liquid a little at a time until all has been added.
  - (3) "Box" the paint by pouring it back and forth between the two containers at least five (5) times, or until the paint is mixed thoroughly.
  - (4) Take a quart sample immediately.

Send all samples to the laboratory promptly, along with all pertinent information regarding them. Use Form TL-101. Paint which has thickened due to low temperature shall not be thinned. The contractor should warm the paint to thin it for proper application.

When the paint is State-furnished, checking of the samples will not be required.

Samples of paint from the field should be sent to the laboratory without delay when:

- (A) The paint has not been previously tested, in which case it should not be used until release is made by the laboratory.
- (B) The paint has been purchased locally.
- (C) At the beginning of the job for check purposes unless the paint is State-furnished,
- (D) During the progress of the job, check samples may be taken at the discretion of the engineer. Samples taken from the painter's bucket or from the spray nozzle are normally not suitable for accepting or rejecting paints.

A limited amount of field inspections to determine if the paint is properly mixed may be made by obtaining the weight of a calibrated container of paint and comparing this weight with the specified weight per gallon. It is difficult to detect the addition of small amounts of thinner by field tests. If the addition of thinner is suspected, field samples should be forwarded to the laboratory.

All essential data should be included with the sample on Form TL-101 covering identification, lot number, manufacturer's formula number, and manufacturer's brand, whether or not purchased locally, nature of trouble, and any other pertinent data.