

AGGREGATES AND AGGREGATE MIXTURES**DOTD DESIGNATION: S 101-21**

I. General

A. Referenced Standards

1. ASTM Standard
 - a. D75/D75M, Standard Practice for Sampling Aggregates
2. AASHTO Standards
 - a. R 90-18, Sampling Aggregate Products

B. Equipment

1. Sample sacks, string.
2. Sampling devices:
 - a. Stockpiles
 1. Power equipment such as a front-end loader or backhoe
 2. Sampling shovel and shield (square tipped shovel with rolled outer edges)
 - b. Windrows - sampling shovel.
 - c. Railroad Cars and Trucks - same as stockpiles.
 - d. Roadways - hand augers, picks and shovels.
 - e. Conveyor Belts - template, brushes and catch pan.
 - f. Bins - template, brushes and catch pan.
 - g. Truck Dumped Material (before spreading) -sampling shovel and shield.

C. Segregation

Segregation is always a problem when sampling aggregates. It is critical to the validity of the sample that segregation be minimized. In general, the larger the aggregate and the steeper the angle of repose, the worse segregation will be. These sampling procedures include directions and tools (e.g., shields and shovels with sides) that are designed to minimize segregation during the sampling process. Failure to use these pieces of equipment or to follow the directions in these procedures may invalidate the samples. As part of the evaluation process for the quality of the material, aggregates in storage are to be inspected for segregation prior to sampling.

D. Moisture Content Testing

If the moisture content is to be determined, the sample must be protected from moisture loss prior to testing. When the sample is taken, place it in a clean, dry friction top can of a size sufficient to contain the needed quantity for moisture content testing. The can is to be sealed with the lid immediately. Failure to seal the can will invalidate the use of the sample for moisture content testing.

E. Safety Precautions

It is the responsibility of the user of this sampling method to establish appropriate safety practices including, but not limited to, handling heavy loads and sampling materials from stockpiles of loose materials.

F. Sample Sacks and Identification

Sample sacks are used to hold the sampled aggregate until testing in the lab. The sacks must be securely fastened with string in order to prevent loss of material during transport. A properly completed Aggregate Test Report form must be in an envelope fastened with string on the outside of the sample sack as well as an Aggregate Test Report form on the inside of the sack.

II. Stockpiles

Note 1: Every effort should be made to enlist the services of power equipment to develop a separate, small sampling pile. (Coordinate with Contractor's Personnel to verify Power Equipment will be available to help secure samples from the aggregate stockpile).

A. Option 1 - Sampling from Stockpiles with Power Equipment (Preferred see figure 1)

1. Direct the loader operator to enter the stockpile at the working face, keeping the bucket at a minimum of 1 foot above the ground. Never allow the front tires of the loader to ramp up on the pile. Discard the first bucketful.
2. Have the loader re-enter the stockpile, as before, tilt the bucket back and up only high enough for the loader to be able to back up slightly.
3. In order to minimize segregation due to transporting material, choose a location for the sampling pile that is near the original stockpile. Form the sampling pile by tilting the bucket to gently roll the material out of the bucket in a free-flowing manner. To avoid segregation, minimize the vertical drop. Do not raise the bucket more than necessary.
4. At this point the loader operator shall raise the bucket, reach across the small pile with the loader bucket, (without allowing the loader tires to ramp up on the sampling pile), lower the bucket to about half the height of the small pile, and back drag the material creating a flat surface for sampling. The loader shall only back-drag the small pile once.
5. Place the sample bucket(s) near the center of the sampling pad. Divide the sample pile into four sections and sample equal amounts of materials evenly across each section. Avoid sampling within 1 ft. of the sample pile edge. Fully insert the shovel as near vertical as possible. Gently roll the shovel back and lift slowly to avoid coarse material rolling off the sides of the shovel. Obtain additional shovelfuls from different sections of the sampling pile, avoiding previous shovel holes.



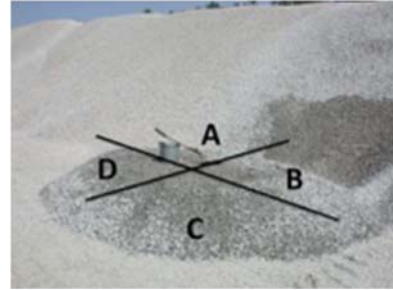
Step 1: Enter stockpile with bucket at minimum 1 ft. above ground level



Step 2: Loader reaches across pile and back drags pile to form sampling pad



Step 3: Sampling Pad



Step 4: Draw sample portions for each pile

Figure 1: Order of Establishing Sampling Pile from Aggregate Stockpile (five-steps)

B. Option 2 – Sampling Stockpiles without Power Equipment

1. When power equipment is not available, samples from stockpiles shall be made up of at least three increments taken from the bottom third, middle third, and the top third of the stockpile.
2. Estimate the volume of the material in order to determine the number of samples needed. Divide the quantity into increments of equal size, conforming to the minimum frequency requirements of the specifications.
3. All sampling shall be performed using a shield and shovel (Figure 2). The board shall be of sufficient size to prevent material from flowing down into the sampling area. Shove the board vertically into the pile just above the sampling point to prevent loose material from sliding into the sampling area.
4. Remove 3 - 6 in. of material just below the sample shield by scraping the surface with the shovel. Be sure to expose undisturbed, representative material.
5. Holding the shovel perpendicular to the face of the stockpile, insert shovel into the exposed material. Do not overfill or allow material to spill over the sides. Pull out the shovel and place material into a sample sack.
6. Repeat until sufficient material (1/3 of sample size) has been obtained. Move to the next location in the increment and repeat.
7. Composite samples from each increment by obtaining material from three different levels of the increment (top 1/3, middle 1/3, and bottom 1/3). Blend material obtained from each level into a single sample meeting the required sample size. If the quantity of material obtained is greater than the quantity required reduce the sample in accordance with DOTD TR 108. Place material in a sample sack with the Aggregate Test Report form.

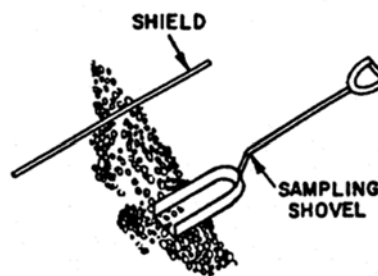


Figure 2: Sampling Shovel and Shield

III. Windrows

- A. Estimate the volume of the material in order to determine the number of samples needed. Divide the quantity into contiguous increments of equal size, conforming to the minimum frequency requirements of the specifications. Randomly select three locations in the increment to be sampled.
- B. Remove 3 - 6 in. of loose material by scraping the surface with the shovel. Be sure to expose undisturbed, representative material. Sample the entire cross section of the windrow and place in a sample sack.
- C. Sample the entire cross section of the windrow and place in sample sack.
- D. Move to the next location in the increment and repeat until three samples in the increment have been obtained.
- E. If the quantity of material obtained needs to be reduced, reduce the sample in accordance with DOTD TR 108. Place material in a sample sack with appropriate SMM identification forms.

IV. Railroad Cars and Trucks

- A. Estimate the volume of the material in order to determine the number of samples needed. Select a car or truck to represent that quantity.
- B. Select three locations, near both ends and the middle of the car or truck.
- C. If the material in the conveyance is level, remove 3 - 6 in. of loose material by scraping the surface with the shovel. Be sure to expose undisturbed, representative material.

Note 2: If the material is in peaks, follow the procedure described in Step B with the following additional steps: Select sampling locations at the midpoint of the piles, not at the peaks or valleys. Insert a shield (such as used for stockpiles) upslope from the point of sampling to prevent loose material from sliding into the sampling area.

- D. Repeat until sufficient material (1/3 of sample size) has been obtained. Move to the next location and repeat.
- E. Blend material obtained from each location into a single sample meeting the required sample size. If the quantity of material obtained is greater than the quantity required, reduce the sample in accordance with DOTD TR 108. Place material in a sample sack with appropriate SMM identification forms.

V. Roadways

- A. Determine how many linear feet contain the quantity of material representing the minimum frequency.
- B. Randomly select three staggered sampling locations by station number within this area.
- C. Obtain 1/3 of each sample from each location. Use the appropriate sampling device to dig a vertical hole the full depth of the course. Remove all material from the hole and place in a sample sack.
- D. Move to the next location and repeat.
- E. Blend material obtained from each location into a single sample meeting the required sample size. If the quantity of material obtained is greater than the quantity required, reduce the sample in accordance with DOTD TR 108. Place material in a sample sack with appropriate SMM

identification forms.

VI. Conveyor Belts

- A. Determine the proper frequency for sampling in terms of flow rate, time and quantity.
- B. After the flow of material onto the belt has stabilized, stop the belt at the randomly selected time.
- C. Select a template of proper length and cross section to obtain a representative sample of proper size. The cross section of the template must match that of the belt.
- D. Place the template through the material, making sure the template is in contact with the belt for the full cross section of the belt.
- E. Remove all material within the template using a brush and pan to retrieve all fines.
- F. If the quantity of material obtained is greater than the quantity required, reduce the sample in accordance with DOTD TR 108. If the quantity of material obtained is less than the quantity required, obtain another sample in accordance with Steps A – E. Place material in a sample sack with appropriate SMM identification forms.

VII. Bins

For sampling of bins, allow the material to discharge onto the conveyor belt and sample in accordance with Section VI.

VIII. Truck Dumped Material- Before Spreading

- A. Estimate the volume of the material in order to determine the number of samples needed. Divide the quantity into increments of equal sizes, conforming to the minimum frequency requirements of the item in the sampling schedule.
- B. Randomly select three separately dumped loads. Randomly select three sampling locations, one near the top of one load, near the middle of another load, and near the bottom of third load.
- C. Insert the shield upslope from the point of sampling to prevent loose material from sliding into the sampling area.
- D. Remove 3 - 6 in. of material downslope from the shield by scraping the surface with the shovel. Be sure to expose undisturbed, representative material.
- E. Holding the shovel horizontally, insert shovel into the exposed material. Do not overfill; do not allow material to spill over the sides. Withdraw shovel and place material into a sample sack.
- F. Repeat until sufficient material (1/3 of sample size) has been obtained. Move to the next location in the increment and repeat.
- G. Blend material obtained from each location into a single sample meeting the required sample size. If the quantity of material obtained is greater than the quantity required, reduce the sample in accordance with DOTD TR 108. Place material in a sample sack with appropriate SMM identification forms.