

## Colorado Procedure 30-09

*Standard Practice for*

### Sampling of Aggregates

(This procedure is based upon AASHTO T 2-91. AASHTO T 2-91 or any subsequent revision may not be used in place of this procedure.)

#### 1. SCOPE

1.1 These methods are intended to apply to the sampling of aggregates used in acceptance and quality control from the points of acceptance designated in the Schedule for Minimum Materials Sampling, Testing, and Inspection for the following items:

- Item 206 - Structure Backfill, Filter Material, Bed Course Material
- Item 304 - Aggregate Base Course
- Item 308 - Aggregate for Portland Cement Treated Base
- Item 403 - Aggregates for Hot Mix Asphalt
- Item 409 - Cover Coat Material
- Item 412 - Aggregate for Portland Cement Concrete Pavement
- Item 601 - Aggregate for Structural Concrete
- Item 608 - Aggregate for Concrete Sidewalk, Bituminous Sidewalk, Concrete Bikeways and Bituminous Bikeways
- Item 609 - Aggregate for Concrete Curbing and Bituminous Curbing
- Item 610 - Aggregate for Median Cover Material

**NOTE 1:** Sampling plans and the acceptance and control tests vary with the type of construction in which the material is used.

1.2 The values stated in English units are to be regarded as the standard. The values in parentheses are provided for information purposes only.

1.3 This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

#### 2. REFERENCED DOCUMENTS

- 2.1 *Colorado Procedure:*  
CP 75 Stratified Random Sampling of Materials

#### 3. SIGNIFICANCE AND USE

3.1 Sampling is equally as important as the testing, and the sampler shall use every precaution to obtain samples that will show the nature and condition of the materials which they represent.

3.2 Samples of all aggregates used in HMA and being tested by the Colorado Department of Transportation (CDOT) or its representative shall be taken by the contractor or his representative with an authorized representative of CDOT present during the sampling procedure. Samples of all non-HMA aggregates being tested by CDOT or its representative shall be taken by or, at CDOT's option, witnessed by an authorized representative of CDOT. The CDOT representative present shall take immediate possession of all samples taken. CDOT reserves the right to designate the locations to be sampled and the procedure to be used.

#### 4. SECURING SAMPLES

4.1 *General* - Where practicable, a minimum of one sample per stockpile to be tested for quality shall be obtained from the finished product. Samples from the finished product to be tested for abrasion loss shall not be subject to further crushing or manual reduction in particle size in preparation for the abrasion test, unless the size of the finished product is such that it requires further reduction for testing purposes.

4.2 *Sampling Equipment*. The contractor shall provide suitable equipment needed for proper sampling.

### 4.3 Procedure:

4.3.1 *Sampling from a Flowing Aggregate Stream* - Samples shall be selected from all of the material produced using CP 75. Use extreme care to avoid segregation when sampling. Sampling the initial discharge or the final few tons from a bin or conveyor belt increases the chances of obtaining segregated material and should be avoided.

#### 4.3.1.1 *Belt Discharge:*

4.3.1.1.1 *Belt Discharge using Hand Tools* - If it is safe and practical to sample directly from the belt discharge, hand tools may be used. Obtain one or more approximately equal increments, selected at random. Combine to form a field sample whose mass equals or exceeds the minimum recommended in Subsection 4.4.2. Take each increment from the entire cross section of the material as it is being discharged using a container at least 12 in. (30 cm) in diameter (or minimum lateral dimension) and having sufficient capacity to hold the sample increment. Make several quick passes through different sections of the material rather than one slow pass. A sampling platform or other means are required to enable the sampler to safely stand within 2 ft. (0.6 meters) of the belt discharge.

4.3.1.1.2 *Belt Discharge using an Automatic Belt Sampler* - Belt discharge samples may be taken using an automatic belt sampler designed to cut the full discharge of the belt without loss of any portion of the material. Take one or more field samples whose combined mass equals or exceeds the minimum recommended in Subsection 4.4.2.

4.3.1.1.3 *Belt Discharge using Power Equipment* - A belt discharge sample may be taken by positioning a front-end loader bucket, truck, or similar equipment beneath the belt discharge. The material obtained shall be placed in a separate, small sampling pile and sampled according to Subsection 4.3.3.2. Obtain a field sample whose mass equals or exceeds the minimum recommended in Subsection 4.4.2.

4.3.1.2 *Bin Discharge* - Test results obtained using bin discharge samples shall not be used for acceptance.

4.3.1.3 *Dry Batch* - When sampling a dry batch, an initial dry batch must be wasted. A second batch may then be sampled as follows. A front-end loader bucket, truck, or similar equipment is positioned under the pugmill to obtain a large

sample in one increment. Sample the material according to Subsection 4.3.3.2. Extreme care must be used to avoid segregation and loss of dust sized particles from the sample.

4.3.2 *Sampling from the Stopped Conveyor Belt* Samples shall be selected from all of the material being produced by CP 75. Obtain one or more approximately equal increments and combine to form a field sample whose mass equals or exceeds the minimum recommended in Subsection 4.4.2. Stop the conveyor belt while the sample increments are being obtained. To obtain each increment, insert two templates, the shape of which conforms to the shape of the belt into the aggregate stream on the belt, and space them such that the material contained between them will yield an increment of the required weight. Carefully scoop all material between the templates into a suitable container and collect the fines on the belt with a brush and dustpan and add to the container.

4.3.3 *Sampling from Stockpiles* - When sampling from stockpiles, it may be difficult to obtain representative samples. Sampling from stockpiles should only be done by or under the direction of experienced personnel. When sampling stockpiles of coarse or coarse and fine aggregates, power equipment, when available, should be utilized as described in Subsections 4.3.3.1 and 4.3.3.2. For general guidance in sampling from stockpiles, see Subsections 4.3.3.1 or 4.3.3.3. When sampling Cover Coat Material from the stockpile, the sample shall be taken from the last stockpile prior to delivery to the spreader. The material will be sampled by the random sampling procedure as it is being delivered to the stockpile, or as it is being removed and hauled to the spreader. This will assure that all portions of the material will be sampled.

4.3.3.1. When using power equipment, develop a separate, small sampling pile composed of materials drawn from various levels and locations in the main pile as follows. Remove material from the sides of stockpiles to expose a representative face for sampling. Judgment must be used to determine the number and locations of areas in the big pile to sample in order to represent the stockpile as accurately as possible. The number of portions required will depend on the size of the stockpile, the method of stockpiling, and the visual degree of segregation. Channel the faces thus exposed from bottom to top and sample the material obtained according to Subsection 4.3.3.2.

4.3.3.2 The power equipment should combine the material obtained in a separate small sampling

pile. Flatten the pile to form a pad having depth that is not thicker than approximately 1 ft. (0.3 meters). Use a flat, square end shovel and sample the pad from at least three locations, sampling through the full depth of the pad if possible. Several increments shall be combined to compose a field sample whose mass equals or exceeds the minimum recommended in Subsection 4.4.2.

4.3.3.3 Where power equipment is not available, samples from stockpiles should be made up of at least two sets of three increments (180 degrees apart) taken from the top third, at the midpoint, and at the bottom third of the volume of the pile. Place a board or metal shelf vertically into the pile just above the sampling point to prevent loose aggregate from sliding into the sampling area and to aid in preventing segregation. Remove approximately 6 inches (15 cm) of surface material. Use a flat, square end shovel or scoop with sides for sampling. In sampling stockpiles of fine aggregate (3/8 in. (minus 9.5 mm)), the outer layer, which may have become segregated, should be removed and the sample taken from the material beneath. The use of sampling tubes has proven to be satisfactory. Sampling tubes approximately 1 1/4 in. (30 mm) minimum in width by 6 ft. (2 m) in length may be inserted into the pile at random locations to extract a minimum of five increments of material to form the sample. Several increments shall be combined to compose a field sample whose mass equals or exceeds the minimum recommended in Subsection 4.4.2.

4.3.4 *Sampling from Roadway (Bases and Sub-bases)* - Select material to be sampled from all of the material produced (e.g. A station or tonnage) by utilizing CP 75. Obtain at least three approximately equal increments, selected at random from the unit being sampled, and combine to form a field sample whose mass equals or exceeds the minimum recommended in Subsection 4.4.2. Using a flat, square end scoop or shovel, take all sample increments from the roadway for the full depth of the material, wherever possible, taking care to exclude any underlying material.

4.3.5 *Sampling Aggregates from Processed Windrows* - Select material to be sampled from all of the material produced using CP 75. For processed material containing sufficient moisture to maintain a near vertical face, remove material from one side toward the center to the full depth until a representative face is exposed. Channel the face just exposed from bottom to top and obtain a sample whose mass equals or exceeds

the minimum recommended in Subsection 4.4.2 by combining portions from at least three equally spaced locations on the exposed face. Use a flat, square end shovel and, exercising care, remove the portions making sure that particles do not roll off the shovel.

4.3.6 *Sampling Aggregates from a Cover Coat Material Spreader* - Samples shall be taken at the last possible location prior to placement on the pavement. With the spreader stopped, samples will be taken from a minimum of three of the individual chip spreader gates as the aggregate is falling from the spreader to the sample container placed on the pavement. These samples will be combined into one sample whose mass equals or exceeds the minimum requirements shown in Subsection 4.4.2. If there is a belt transfer device on the spreader, the Engineer may approve obtaining a representative sample from the belt when the machine is at rest as detailed in Subsection 4.3.2. If neither of these sampling methods are possible, the Engineer may allow random sampling from the stockpile as detailed in Subsection 4.3.3.

**4.4 Number and Mass of Field Samples:**

4.4.1 The minimum number of field samples required is specified in the CDOT Field Materials Manual under the Schedule for Minimum Materials Sampling, Testing, and Inspection.

4.4.2 The minimum mass for lab samples is given in the CDOT Field Materials Manual in the Schedule for Minimum Materials Sampling, Testing, and Inspection. The minimum mass for field samples is given in Table 30-1. The sample must be large enough to include representative portions of each component of the material. The mass must be predicated on the type and number of tests to which the material is to be subjected and with sufficient material obtained to provide for the proper execution of these tests.

**TABLE 30-1: Size of Field Samples**

Nominal Maximum Size of Aggregates <sup>A</sup>		Approximate Minimum Mass of Field Samples, lbs. (kg)	
<u>Fine Aggregate:</u>			
No. 8	(2.36 mm)	10	(5)
No.4	(4.75 mm)	10	(5)

Coarse Aggregate:

3/8 in. ( 9.5 mm)	15	(7)
1/2 in. (12.5 mm)	20	(10)
3/4 in. (19.0 mm)	25	(12)
1 in. (25.0 mm)	30	(15)
1 1/2 in. (37.5 mm)	40	(20)
2 in. (50.0 mm)	45	(22)
2 1/2 in. (63.0 mm)	50	(25)
3 in. (75.0 mm)	55	(27)
3 1/2 in. (90.0 mm)	60	(30)

<sup>A</sup> For processed aggregate, the nominal maximum size is defined in the Appendix to the CDOT Field Materials Manual.

**5. SHIPPING SAMPLES**

5.1 Transport aggregates in bags or other containers so constructed as to preclude loss or contamination of any part of the sample, or damage to the contents from mishandling during shipment. Do not ship more than 60 lbs. (30 kg) per bag to allow for easier handling of samples. When moisture content is being measured in the aggregate sample, the representative sample must be stored in a sealed container that will prevent any moisture loss.

5.2 Shipping containers for aggregate samples shall have suitable individual identification attached and enclosed so that field reporting, laboratory logging, and test reporting may be facilitated. **Utilization of CDOT Form #633, Sample Tag (for Sacks), is required for all submitted samples.**