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METHOD OF TESTS FOR SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES

A. SCOPE

This test method describes the procedures for determining the particle-size distribution of fine and coarse aggregates.

Special procedures for testing aggregate from extracted bituminous mixtures, supplemental fine aggregate, glass spheres, and granular quicklime are included in Appendices A, B, C, and D, respectively. A procedure for expediting testing and providing an approximate particle-size distribution for processed fine aggregate is included in Appendix E.

B. REFERENCES

California Test 201 —	Soil and Aggregate Sample Preparation
California Test 226 —	Determination of Moisture Content by Oven Drying
California Test 310 —	Determination of Asphalt and Moisture Contents of Bituminous Mixtures by Hot Solvent Extraction
California Test 362 —	Determining Asphalt Content in Bituminous Mixtures by Vacuum Extraction
California Test 382 —	Determination of Asphalt Content of Bituminous Mixtures by the Ignition Method
AASHTO M 92 —	Wire-Cloth Sieves for Testing Purposes
AASHTO T 11 —	Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
AASHTO T 27 —	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T 30 —	Mechanical Analysis of Extracted Aggregate
AASHTO T 37 —	Sieve Analysis of Mineral Filler for Hot-Mix Asphalt

C. APPARATUS

1. Balance: a balance or scale reading to 1 g for samples weighing less than approximately 1000 g. For samples weighing more than 1000 g the balance or scale should read to 0.2 % or less of the sample weight.

2. Sieves: woven-wire cloth sieves that meet the designations required by the specifications and have square openings conforming to AASHTO M 92.

   Each sieve must be inspected visually for bent or distorted wires after each use. Replace defective sieves.

3. Sieve Shaker: any mechanical sieve-shaking device that accomplishes the same thoroughness of sieving as the hand-sieving procedure in accordance with Section F.1.a of this test method.

   a. It is essential that the sieve shaker be designed so that its motion includes a bumping or bouncing action sufficient to keep the aggregate particles in motion on the surface of the sieves.

b. In accordance with Section F.1.b of this test method for procedures to verify shaker efficiency.

4. Agitator (Figure 1): a mechanical device designed to hold the wash vessel in an upright position while subjecting it to a lateral reciprocating motion at a rate of 285 ± 10 complete cycles per minute. The reciprocating motion must be produced by means of an eccentric located in the base of the carrier, and the length of the stroke must be 1.75 in. ± 0.25 in. measured at the platform base. The clearance between the cam and follower of the eccentric must be between 0.001 in. and 0.004 in. Other types of agitators may be used provided the length of time and other factors are adjusted to produce the same results as those obtained using the agitator described above.

5. Combination Sieve Shaker - Agitator: a combination sieve shaker-agitator is allowable when it meets the requirements for shaking (in accordance with Section C.3 of this test method) while in the shaking mode and agitation (in accordance with Section C.4 of this test method) while in the agitation mode. A Tyler portable sieve shaker meets the above requirements when modified according to TL Drawing No. D536.

6. Mechanical Washing Vessel: a flat-bottom, straight-sided, cylindrical vessel conforming to the specifications and dimensions shown in Figure 2.

7. Oven: an oven or other suitable thermostatically controlled heating device capable of maintaining a uniform temperature of 230˚F ± 9˚F.

D. MATERIALS

Use distilled, deionized, or good-quality tap water for washing the fine-aggregate sample.

E. SIZE OF SAMPLE

1. The sample to be tested must be of sufficient size to ensure representation of the material. The exact amount of material required will vary according to the nominal size of the aggregate and the particle-size distribution.

2. The minimum sample weights for each aggregate size of processed aggregates (such as sized aggregates for concrete and hot mix asphalt) or composite aggregates (such as aggregate base and cement treated base) are listed in TABLE 1.

   NOTE: For fine aggregate sample size refer to Section H.2.

TABLE 1.

MINIMUM SAMPLE WEIGHT PER NOMINAL MAXIMUM AGGREGATE SIZE

Nominal Maximum Aggregate Size[1]	Minimum Weight of Sample
Over 2 ½ in.	30 000 g
2 ½ in.	25 000 g
2 in.	20 000 g
1½ in.	15 000 g
1 in.	10 000 g
¾ in.	5000 g
½ in.	2500 g
⅜ in.	1000 g

[1] Nominal maximum aggregate size is one sieve size larger than the first size to retain more than 10 %.

3. Sample size, for materials not adaptable in accordance with Section E.2 of this test method, should be sufficient to yield the amounts noted below for each coarse-size fraction that makes up 5 % or more of the total sample.

   a. At least 1000 g of coarse-size fractions equal to or larger than ¾ in.

   b. At least 500 g of coarse-size fractions smaller than ¾ in.

4. Samples containing more than 15 % passing the No. 4 sieve must be of sufficient size to yield at least 1000 g of material passing the No. 4 sieve.

F. SIEVING PROCEDURE

1. Separate the sample into a series of sizes using such sieves as are necessary to determine compliance with the specifications for the material being tested.

   Either the hand or mechanical method of sieving may be used.

   a. **Hand Method:** Perform the hand method of sieving by means of a lateral and vertical motion of the sieve accompanied by a jarring action, so as to keep the sample moving continuously over the surface of the sieve. Do not turn or manipulate particles through the sieve by hand. Continue sieving until not more than 0.5 % by weight of the total sample will pass any sieve during one additional minute of hand sieving.

   b. **Mechanical Method:** Mechanical sieving may be used only after it has been demonstrated that the shaker will separate a sample with the same effectiveness as the hand method. The effectiveness of the mechanical shaker and the minimum shaking time must be determined for each shaker by comparison with the hand-sieving method using the procedure described in Steps (1) through (10) below:

      (1) Obtain a sample of all crushed, clean, durable aggregate with a relatively uniform size distribution over the range of sieves to be included.

      (2) Determine the total weight of the sample and the tare weight of each sieve.

(3) Separate the sample into its various sieve sizes using the mechanical shaker operated for a trial period.

(4) At the end of the shaking period, determine the amount of material retained on each sieve by weighing the sieve plus retained material and subtracting the weight of the sieve.

(5) Reassemble the sieves plus retained material in the mechanical shaker, and shake for an additional period of time of not less than 1 min.

(6) Determine the amount of material on each sieve as in Step 4.

(7) Repeat Steps (4) through (6) until not more than 0.5 % by weight of the total sample passes through any of the sieves during the additional shaking time.

(8) Sieve each size fraction for one additional minute using the hand-sieving procedure.

(9) If more than 0.5 % by weight of the total sample passes through any sieve during the hand sieving, the mechanical shaker is not performing effectively and it must not be used.

(10) The required shaking time for the shaker must be at least 125 % of the minimum time required to accomplish the thoroughness of sieving described above. In no case will the shaking time for any shaker be less than 5 min.

c. When sieving, limit the amount of material retained on the No. 4 and coarser sieves to a single layer of aggregate. If necessary, sieve the sample in portions then combine all respective portions retained on the sieves before weighing.

d. In no case when sieving fine aggregate (material passing the No. 4 sieve), must the material retained on any sieve at the completion of the sieving operation exceed that weight specified in TABLE 2. To reduce the amount of material retained on a sieve, either use a sieve with openings slightly larger than the overloaded sieve, or split the entire sample into smaller portions prior to sieving, and then combine respective fractions prior to weighing.

TABLE 2
MAXIMUM WEIGHT IN GRAMS OF MATERIAL ALLOWED ON SIEVE* AT COMPLETION OF SIEVING OPERATION

Sieve Size	Wt. Per sq. in.	Total Weight for 8 in. Diameter Sieve
No. 8	4.0	200
No. 16	3.0	150
No. 30	2.5	125
No. 50	2.0	100
No. 100	1.5	75
No. 200	1.0	50

* For intermediate sieve sizes not listed in this table, the weight specified for the next smaller sieve size must apply.

G. DETERMINATION OF COARSE-AGGREGATE PARTICLE-SIZE DISTRIBUTION

1. Prepare all materials in accordance with California Test 201. Be sure to clean all coatings from the coarse aggregate and break clods sufficiently to pass the No. 4 sieve.

2. If the coarse-aggregate particles contained in a sample are clean or are lightly coated with fines that can be removed easily by sieving, it will not be necessary to subject the coarse portion to a cleaning process prior to performing the coarse-sieve separation.

3. Separate the sample on the following sieves: 3 in., 2½ in., 2 in., 1½ in., 1 in., ½ in., ¾ in., ⅜ in., and No. 4. Other sieves may be added as required to determine compliance with specifications or to reduce the amount of material retained on certain sieves. It is permissible to include the No. 8 sieve with the coarse-sieve separation when it is not necessary to determine the distribution of material finer than the No. 8 sieve.

4. Place each coarse-size fraction in a separate container.

    a. When a sample has been divided into 2 or more portions to facilitate sieving, recombine all portions of the same size.

    b. Combine all portions of the material passing the No. 4 sieve obtained from the sample preparation and sieving phases.

5. Determine the total weight of material retained on each coarse sieve and the total amount of fine material passing the No. 4 sieve. The total weight retained on a given sieve is the sum of the material retained on the sieve plus the material retained on all larger sieves.

    a. Accumulate the weight of material retained on each successive sieve beginning with the coarsest size.

    b. When it is not necessary to keep the aggregate's size fractions separated, the sized portions may be combined in succession, and the accumulated weight may be determined directly.

H. DETERMINATION OF THE FINE-AGGREGATE PARTICLE-SIZE DISTRIBUTION

1. Sieve the entire sample in accordance with Section F of this test method.

2. Split or quarter a fine-aggregate sample weighing 500 g ± 25 g from the material passing the No. 4 sieve.

    a. If there is insufficient material passing the No. 4 sieve to obtain the required 500 g ± 25 g, use all of the material passing the No. 4 sieve for the fine-aggregate sample.

    b. If less than 10 % of the submitted sample is retained on the No. 30 sieve, it is permissible to reduce the fine-aggregate sample weight to approximately 125 g.

Obtain this smaller sample by carefully splitting the prepared 500 g portion into 4 quarters. Do not make any adjustments for weight during this splitting operation.

3. Oven-dry the fine-aggregate sample to constant weight in accordance with California Test 226. Then cool it to room temperature. Weigh and record the weight of oven-dried material as the sample's oven-dried weight.

   NOTE: When testing aggregate samples containing reclaimed asphalt pavement (RAP), the oven drying temperature must not exceed 100˚F.

4. Place the fine-aggregate sample in the mechanical washing vessel, add 1000 mL ± 5 mL of water and clamp the lid in place. Secure the vessel in the mechanical agitator. After 10 min ± 30 s have elapsed from the introduction of the wash water, agitate the vessel and contents for 2 min ± 5 s.

5. Following agitation, remove the vessel from the shaker, unclamp the lid, and pour the contents onto No. 8 and No. 200 sieves nested together with the No. 8 sieve on top. Rinse any remaining fines from the vessel onto the sieve.

   Direct water from a flexible hose attached to a faucet onto the sample until the water passing through the sieve comes out clear.

   NOTE: A nest of two sieves can be created by placing a No. 8 or No. 16 sieve on top of the No. 200 sieve to protect this sieve when pouring the contents of the vessel onto the No. 200 sieve. Do not place the entire contents of the wash vessel on the top sieve of the nested sieves at one time. The sample should be rinsed out of the wash vessel and onto the nested sieves in multiple cycles.

   It may be necessary to flood clayey or silty samples while it is still in the vessel to prevent clogging the No. 200 sieve. Repeated flooding may be necessary before all of the contents can be poured from the vessel into the sieve.

6. After rinsing, wash the material from the sieve into a drying pan then place the drying pan in a slanting position until the free water that drains to the lower edge is clear. Pour this water off taking care not to lose any material from the sample.

7. Oven-dry the fine-aggregate sample to constant weight in accordance with California Test 226. Then cool it to room temperature.

   NOTE: When testing aggregate samples containing RAP, the oven drying temperature must not exceed 100˚F.

8. Separate the sample on the No. 8, No. 16, No. 30, No. 50, No. 100 and No. 200 sieves. Other sieves may be added as required to determine compliance with specifications or to reduce the amount of material retained on certain sieves.

9. Determine and record the weight of material retained on each sieve. The following procedure normally is used for the fine-aggregate sample.

   a. Weigh the material retained on the coarsest sieve and record this weight. Do not remove the material from the scale or balance.

b. Add the material retained on the next finer sieve and record this weight. Do not remove the material from the scale or balance.

c. Continue accumulating weight until the material in the sieve pan is weighed.

I. CALCULATIONS

Calculate percentage of material retained or passing each sieve on the basis of the oven-dry weight of the sample prior to washing and sieving.

1. Convert weight to percentages as follows:

   a. Compute the percentage of material retained on each sieve by the following formula:

$$R = 100\frac{W_c}{W_t}$$

   Where: R = Cumulative of sample retained on the sieve.
   W_c = Cumulative weight of material retained on the sieve.
   W_t = Oven-dried weight of sample prior to washing.

   b. Compute the percentage of material passing each sieve as follows:

$$P = 100 - R$$

   Where: P = Percentage of sample passing the sieve.
   R = Percentage of sample retained on the sieve.

2. If a composite or sized sample has been separated into two or more aggregate-size fractions for testing, compute the grading of the entire sample by the method in Steps a through c shown below:

   a. Compute the percentage, by weight, represented by each aggregate-size fraction based on the total sample weight as received.

   Example:

Fraction	Aggregate Size		Weight in. Grams	Percent of Total Sample
	Pass	Retained		
A	1 in.	No. 4	6600	66 %
B	No. 4	Pan	3400	34 %
Total Sample	-	-	10 000	100 %

b. Then take each aggregate size in turn and multiply the percent passing (as determined by the sieve analysis on the sample) by the percentage of that aggregate size found to be present in the "as-received" sample.

Example for A fraction from table above:

Sieve Size	1 Grading of Aggregate Size Fraction "A"	2 Percent of Total Sample	3 Product of Items 1 and 2
1 in.	100	66 %	66
¾ in.	94	66 %	62
½ in.	72	66 %	48
⅜ in.	24	66 %	16
No. 4	3	66 %	2
No. 8	3	66 %	2
No. 16	3	66 %	2
No. 30	2	66 %	1
No. 50	2	66 %	1
No. 100	1	66 %	1
No. 200	0	66 %	0

c. Perform the same calculations for B fraction and then add the products thus obtained on corresponding sieve sizes as shown in the following example. These sums, as shown in the last column of the example, constitute the "as received" grading of the original sample.

Example for all fractions:

	Grading of Aggregate Size Fractions				"As Received" Grading of Original
Sieve Size	A 1 in. x No. 4 % Passing	B No. 4 x 0 % % Passing	A 66 %	B 34 %	Sample A + B Percent Passing
1 in.	100	100	66 +	34 =	100
¾ in.	94	100	62 +	34 =	96
½ in.	72	100	48 +	34 =	82
⅜ in.	24	100	16 +	34 =	50
No. 4	3	100	2 +	34 =	36
No. 8	3	70	2 +	24 =	26
No. 16	3	56	2 +	19 =	21
No. 30	2	41	1 +	14 =	15
No. 50	2	27	1 +	9 =	10
No. 100	1	17	1 +	6 =	7
No. 200	0	8.0	0 +	2.7 =	2.7

J. REPORTING OF RESULTS

Report the total percentage retained and passing each sieve to the nearest whole number. However, report the total percentage retained and passed with the No. 200 sieve to the nearest 0.1 %.

K. PRECAUTIONS

1. Proper care of the sieves is necessary for accurate sieving. Use the following procedure in removing particles stuck in the mesh of the fine sieves:

a. No. 4 and No. 8 sieves: clean by brushing with a brass wire brush. A rounded piece of wood, such as a brush handle, can be used if one hand is placed on the opposite side when pushing against the sieve in order to avoid stretching the sieve out of shape.

b. No. 16, No. 30 and No. 50 sieves: clean by brushing with a brass wire brush.

c. No. 100 sieves: clean by brushing with a stiff, short bristle brush such as a stencil brush.

d. No. 200 sieves: clean only by brushing with a small paintbrush. These sieves are damaged easily.

e. Do not use a sharp object to push out particles which are stuck in the mesh of the sieves because this will enlarge the openings.

2. Examine sieves each day for broken wires and solder any breaks. Discard any sieve that develops a break in the main body of the screen. Soldering decreases effective sieving area; therefore, sieves with large breaks or several small breaks should be discarded.

3. Check all sieves from No. 4 through No. 200 biannually with a standard sample of known grading made up from hard, clean aggregate that does not degrade from the sieve-shaking procedure. This is especially useful for checking No. 100 and No. 200 sieves, as small breaks and distortions are missed easily in these fine-mesh sieves.

4. Never sieve hot samples, as hot aggregate will distort the fine mesh of the No. 100 and No. 200 sieves.

5. Take care to avoid loss of material during transfer of sample from wash pot to sieves and also during rinsing.

6. Do not overload sieves.

   The "guard sieve" for the No. 200 sieve during transfer of sample from wash pot to sieves may make it more difficult to see that the No. 200 sieve is not being overloaded with material passing the guard sieve. Control the transfer to ensure the No. 200 sieve is not damaged or overloaded.

7. Take care to avoid loss of material due to volume or pressure of water when rinsing samples through the No. 200 sieve.

8. Always run the sieve shaker for the time specified in accordance with Section F.1.b. (10) of this test method. Particle breakdown can result from excessive agitation.

L. HEALTH AND SAFETY

It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Prior to handling, testing or disposing of any materials, testers must be knowledgeable about safe laboratory practices, hazards and exposure, chemical procurement and storage, and personal protective apparel and equipment.

Caltrans Laboratory Safety Manual is available at:

http://www.dot.ca.gov/hq/esc/ctms/pdf/lab_safety_manual.pdf

End of Text
(California Test on 202 contains 20 pages)

FIGURE 1. Standard Mechanical Agitator

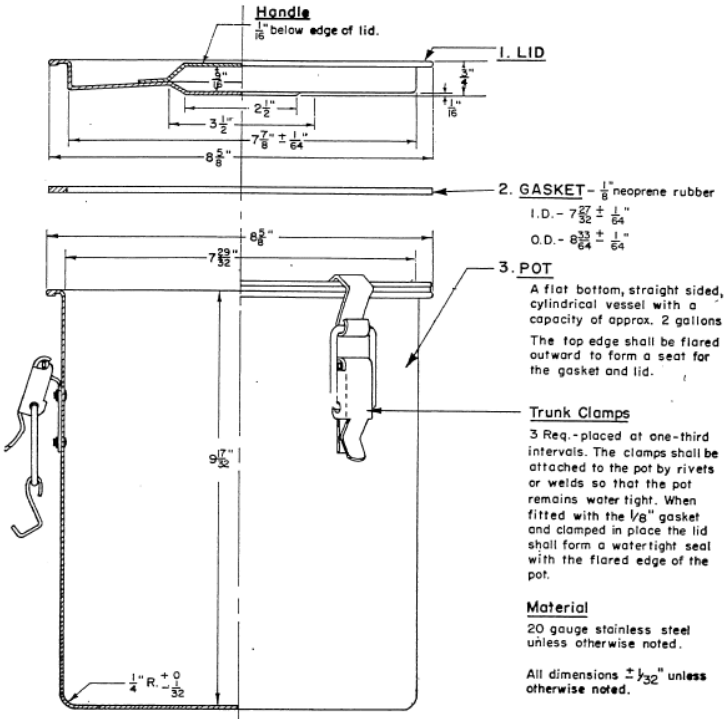

FIGURE 2. Mechanical Washing Vessel

APPENDIX A

SIEVE ANALYSIS OF AGGREGATE FROM EXTRACTED BITUMINOUS MIXTURES

A. SCOPE

This appendix specifies modifications that must be made to the basic California Test 202 when determining the particle-size distribution of aggregate from extracted bituminous mixtures.

B. APPARATUS

Use the apparatus described in the basic test method.

C. MATERIALS

1. Washing Solution: a solution consisting of 125 mL denatured alcohol and 875 mL of distilled, deionized, or good quality tap water for washing the sample.

2. Wetting Agent: any dispersing agent, such as Calgon, Joy, or other detergent, that will promote separation of the fine materials can also be used.

   A sufficient amount of wetting agent must be used to assure a thorough separation of the material finer than No. 200 sieve from the coarser particles. There should be enough wetting agent to produce a small amount of suds when the sample is agitated.

   NOTE: Sudsing will depend on the hardness of the water and the detergent. Excessive suds may overflow the sieves and carry some materials with them.

D. PROCEDURE

1. The sample to be tested by sieve analysis must be the entire aggregate sample recovered from the asphalt extraction test (California Test 310, 362, or 382).

2. Weigh the oven-dried sample and record this as the sample's weight.

3. Place the sample in the mechanical washing vessel, add 1000 mL of washing solution and clamp the lid in place. Secure the vessel in the mechanical agitator. After 1 min ± 10 s have elapsed from the introduction of the washing solution, agitate the vessel and contents for 2 min ± 5 s.

4. Following agitation, remove the vessel from the shaker, unclamp the lid, and pour the contents onto No. 8 and No. 200 sieves nested together with the No. 8 sieve on top. Rinse any remaining fines from the vessel into the sieves.

   Direct water from a flexible hose attached to a faucet onto the aggregate until the water passing through the sieves comes out clear.

   NOTE: A nest of two sieves can be created by placing a No. 8 or No. 16 sieve on top of the No. 200 sieve to protect this sieve when pouring the contents of the vessel onto the No. 200 sieve.

5. After rinsing, wash the material from the sieves into a drying pan then place the drying pan in a slanting position until the free water that drains to the lower edge is clear. Pour this water off taking care not to lose any material from the sample.

6. Oven dry the washed sample to a constant weight at a temperature of 230˚F ± 9˚F and cool it to room temperature. Spreading the material as thin as possible in large, mustow drying pans will decrease the drying time.

7. Perform the sieving and determine the weight retained on each sieve as prescribed in the basic test method.

E. CALCULATIONS

Determine the grading of the sample as prescribed in the basic test method.

F. PRECAUTIONS

Observe the precautions listed in the basic test method.

G. REPORTING OF RESULTS

Report as prescribed in the basic test method.

APPENDIX B

SIEVE ANALYSIS OF SUPPLEMENTAL FINE AGGREGATE FOR HOT MIX ASPHALT

A. SCOPE

This appendix specifies modifications that must be made to the basic California Test 202 when determining the particle-size distribution of supplemental fine aggregate.

B. APPARATUS

Use the apparatus described in the basic test method.

C. MATERIALS

Use distilled, deionized, or good-quality tap water for washing the sample.

D. PROCEDURE

1. From the submitted sample, split or quarter the material to a weight of 500 g ± 25 g. Without further adjustments, split or quarter the portion to obtain a sample of approximately 125 g.

2. Oven-dry the sample to constant weight at a temperature of 230 °F ± 9°F and cool it to room temperature. Weigh the oven-dried material and record as the sample's weight.

3. Place the sample on the No. 200 sieve and direct water from a flexible hose attached to a faucet onto the sample until the water passing through the sieve comes out clear.

   NOTE: A nest of two sieves can be created by placing a No. 8 or No. 16 sieve on top of the No. 200 sieve to protect this sieve when pouring the contents of the vessel onto the No. 200 sieve.

4. After rinsing, wash the material from the sieve into a drying pan then place the drying pan in a slanting position until the free water that drains to the lower edge is clear. Pour this water off taking care not to lose any material from the sample.

5. Oven dry the washed sample to constant weight at a temperature of 230°F ± 9°F and cool it to room temperature.

6. Perform the sieving using the No. 30 and No. 200 sieves. Determine the weight retained on each sieve as prescribed in the basic test method to the nearest whole number.

E. CALCULATIONS

Determine the grading of the sample as prescribed in the basic test method.

F. PRECAUTIONS

Observe the precautions listed in the basic test method.

G. REPORTING OF RESULTS

Report the total percentages passing the No. 30 and No. 200 sieves as prescribed in the basic test method.

APPENDIX C

SIEVE ANALYSIS OF GLASS SPHERES

A. SCOPE

This appendix specifies the modifications that must be made to the basic California Test 202 when determining the particle-size distribution of glass spheres (beads) for reflectorizing paint markings on pavements.

B. APPARATUS

Use the apparatus described in the basic test method, except that the balance must read to 0.1 g.

C. MATERIALS

No special materials are required for this test.

D. SIZE OF SAMPLE

1. Provide duplicate, representative samples (at least 1 quart volume each) of each lot of glass beads submitted for testing.

2. When sampling glass beads in the field, take at least 4 samples of approximately ½ quart each of the glass beads directly from the applicator gun at approximately equal intervals throughout the duration of the striping operation. Combine the 4 samples to produce a composite sample. Split this composite sample into duplicate samples.

   Alternatively, an unopened 50 lb bag of glass beads, of the same lot used in the striping operation, may be used as a representative sample. Split this 50 lb sample into duplicate samples (of at least 1 quart volume each) using an appropriately sized sample splitter.

E. PROCEDURE

1. Select one of the duplicate samples for testing. If the first sample fails the gradation requirements then the second sample must be tested to confirm the failure of the lot.

2. Pour the entire sample into the hopper of an appropriately sized sample splitter. Run the entire sample through the sample splitter at least 3 times to mix the sample. Split the mixed sample to obtain a 400 g ± 20 g portion. Then split this portion, in 2 operations, to obtain a sample of approximately 100 g.

3. Oven-dry the sample at a temperature of 230˚F ± 9˚F to a constant weight and cool it to room temperature. Weigh and record the oven-dried material as the oven-dried test weight. Do not wash glass spheres.

4. Perform the sieving as prescribed in the basic test method.

F. CALCULATIONS

Determine the grading of the sample as prescribed in the basic test method.

G. PRECAUTIONS

Observe the precautions listed in the basic test method.

H. REPORTING OF RESULTS

Report as prescribed in the basic test method.

APPENDIX D

SIEVE ANALYSIS OF GRANULAR QUICKLIME

A. SCOPE

This appendix specifies modifications that must be made to the basic California Test 202 when determining the particle-size distribution of granular quicklime.

B. APPARATUS

1. Use the apparatus described in the basic test method.

2. An immediate supply of tap water for emergency washing of eyes or skin.

C. MATERIALS

No special materials are required for this test.

D. SIZE OF SAMPLE

The total weight of quicklime submitted for testing must be not less than 5 lbs.

E. PROCEDURE

1. Split or quarter the material to a weight of 2000 g ± 100 g. Without further adjustments, split or quarter the portion to obtain a sample of approximately 250 g.

2. Weigh and record the weight of the sample.

    a. Test the granular quicklime in its "as-received" condition. Do not wash or oven dry.

3. Perform the sieving and determine the weight retained on each sieve as prescribed in the basic test method and the following instructions:

    a. Use the sieves necessary to determine compliance with the specifications and additional intermediate sieves as needed to prevent overloading.

    b. Sieving must be accomplished by the mechanical sieving method. The sieving time must be 10 min ± 30 s.

    c. Take care that the quicklime particles are not crushed or abraded by excessive handling.

F. CALCULATIONS

Determine the grading of the sample as prescribed in the basic test method.

G. PRECAUTIONS

Observe the precautions listed in the basic test method and these special precautions:

1. A heat-producing chemical reaction occurs as water combines with quicklime. Burns can result from allowing quicklime to contact the body when it is wet from perspiration or other moisture.

2. If quicklime gets into the eyes, rinse them immediately with a heavy flow of water and seek medical assistance.

H. REPORTING OF RESULTS

Report as prescribed in the basic test method.

APPENDIX E

APPROXIMATE SIEVE ANALYSIS OF PROCESSED FINE AGGREGATE

A. SCOPE

This appendix provides a procedure for expediting testing and determining an approximate particle-size distribution for processed fine aggregates. Washing the sample is not required; however, the test results must be correlated with tests done in accordance with the basic California Test 202.

B. APPARATUS

Use the apparatus described in the basic test method.

C. MATERIALS

Use the materials described in the basic test method.

D. PROCEDURE

1. Sieve the entire sample in accordance with Section F in the basic California Test 202.

2. From the material passing the No. 4 sieve, split or quarter the fine-aggregate to a weight of 500 g ± 25 g.

3. Aggregate sampled from a hot bin need not be dried further. Dry aggregate obtained from any other location in a forced draft oven at 230˚F ± 9˚F for 15 min or in a microwave oven for 5 min.

4. Weigh and record the weight of the sample.

5. Separate the sample on the No. 8, No. 16, No. 30, No. 50, No. 100 and No. 200 sieves. Other sieves may be added as required to determine compliance with specifications or to reduce the amount of material retained on certain sieves.

6. Determine and record the cumulative weight of material retained on each sieve.

    a. Weigh the material retained on the coarsest sieve and record this weight on the appropriate work sheet. Do not remove the material from the balance.

    b. Add the material retained on the next finer sieve and record this weight on the appropriate work sheet. Do not remove the material from the balance.

    c. Continue accumulating weight until the material in the pan is weighed.

7. Save the entire sample.

8. Calculate the percentage of material passing each sieve in accordance with Section I of the basic test and using the weight recorded in Step 4 above as the total sample weight.

9. Retest selected samples for sieve analysis in accordance with the procedure in the basic California Test 202.

   a. A sufficient number of samples must be retested to establish the correlation between the washed and unwashed samples.

   b. Additional retests should be performed whenever there is an indication that the previous correlation is no longer valid.

   c. Any material subject to rejection because of excessive material retained on any sieve, by the approximate method, must be retested one time.

E. CALCULATIONS

1. Establish a correction factor for each sieve size by dividing the percent passing the sieve after washing by the percent passing the sieve before the sample was washed.

   Example:

Sieve Size	Washed Grading % Pass	Unwashed Grading % Pass	% Wash / % Without Wash	Correction Factor
No. 4	100	100	$^{100}/_{100}$	1.00
No. 8	71	67	$^{71}/_{67}$	1.06
No. 16	56	50	$^{56}/_{50}$	1.12
No. 30	25	18	$^{25}/_{18}$	1.39
No. 50	10	6	$^{10}/_{6}$	1.67
No. 100	5	3	$^{5}/_{3}$	1.67
No. 200	3	2	$^{3}/_{2}$	1.50

2. Determine the approximate washed sieve analyses of subsequent unwashed samples by multiplying the percent passing, as determined by the unwashed sample, by the correction factor for each respective sieve.

F. PRECAUTIONS

1. Observe the precautions listed in the basic test method.

2. If the source of material changes, new correction factors must be established.

G. REPORTING OF RESULTS

Report the total percentages passing each sieve to the nearest whole number. Identify the reported results as being “approximate.”