

## Method of Test for Scratch Hardness of Coarse Aggregate

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### 1. Scope:

This test is for determining the quantity of soft particles in coarse aggregate on the basis of scratch hardness.

**NOTE: Use the sample of coarse aggregate for SD 206 for this test, to eliminate the need for an additional sample.**

### 2. Apparatus:

- 2.1 Scale or balance having the capacity to weigh any sample which may be tested utilizing this procedure and readable to the nearest 0.1 gram.
- 2.2 Brass rod. 1/16" in diameter, with a rounded point, mounted in a device so a  $2 \pm 0.1$  lbs. is applied to the specimen tested. A suitable design for this apparatus is shown in figure 1. The brass rod shall be of suitable hardness so that when filed to a sharp point, it will scratch a copper penny (U.S. Lincoln design), but fail to scratch a nickel (U.S. Jefferson design). Brass rod may be purchased from Humboldt Mfg. part # H-3421.
- 2.3 Drying oven capable of maintaining a temperature of  $230^{\circ}\text{F} \pm 9^{\circ}\text{F}$ .
- 2.4 Sieves conforming to the requirements of ASTM E 11.
- 2.5 Pans suitable for holding the sample.

### 3. Procedure:

- 3.1 Obtain a sample in accordance with SD 201 which meets the minimum weight requirements outlined in 3.4 of this procedure.
- 3.2 Place the sample in the container and add water to cover it. Agitate the sample with sufficient vigor to result in complete separation of all particles finer than the #200 sieve from the coarser particles, and bring the fine material into suspension. Pour the wash water containing the suspended and dissolved solids over the #200 sieve. Avoid the decantation of coarser particles of the sample. Repeat the operation until the wash water is clear.
- 3.3 Weigh the material to the nearest 0.1 gram and dry it to a constant weight as per SD 108. Separate into a series of sizes using the 1 1/2", 1", 3/4", 1/2", 3/8", and #4 sieves. Weigh the material retained on each sieve to the nearest 0.1 gram.
- 3.4 The minimum weight of the material to be tested on the individual sieves shall conform to the following table.

Sieves Passing	Sieves retained	Minimum weight, grams
1/2"	3/8"	200
3/4"	1/2"	600
1"	3/4"	500
1 1/2"	1"	4500
2"	1 1/2"	12000

**NOTE: Should the sample contain less than 10% (Determined by SD 202) of any size prescribed above, that size shall not be tested; but for the purpose of calculating test results, it shall be considered to contain the same percentage of soft particles as the average of the next larger and next smaller size; or if one of these sizes is absent, it shall be considered to have the same loss as the next larger or next smaller size, whichever is present.**

**NOTE: On size 1 coarse aggregate, since the specification on the 1" sieve precludes having 10% retained, the percentage shown on the DOT-38, column C, will be the same as that shown for the 3/4".**

- 3.5 Subject each particle of aggregate (Except that removed for SD 216) to a scratching motion of the brass rod, using the device for applying weight. Particles are considered to be soft, if, during the scratching process, a groove is made in them without deposition of metal from the brass rod, or if separate particles are detached from the rock mass.

In case of question, make a scratch test on a freshly broken surface of the aggregate particle. (Use a hammer to lightly tap the particle to cause it to split.)

If the particle contains more than one type of rock and is partly hard and partly soft, it shall be classed as "Soft" only if the soft portion is one third or more of the volume of the particle.

- 3.6 Weigh the soft particles to the nearest 0.1 gram for each size tested.

**NOTE: The chocolate rock that is removed from each size tested is combined with the chocolate rock on the - 3/8", + #4 sieves, (SD 216).**

4. Report:

Report the total weighted percent of soft particles to the nearest 0.1 %, (See DOT-38, figure 2).

5. References:

- ASTM E 11
- SD 201
- SD 202
- SD 206
- SD 216
- DOT-38

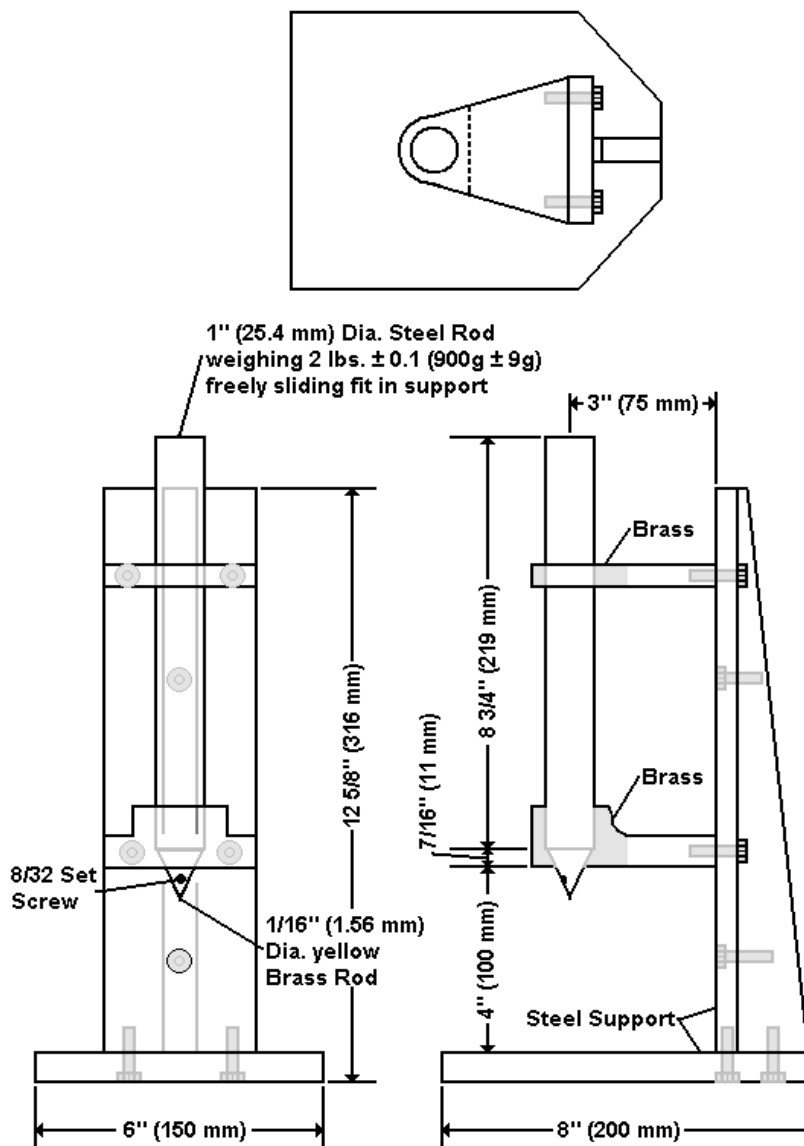


Figure 1

SCRATCH HARDNESS OF COARSE AGGREGATE PARTICLES

FILE # 30.2

PROJECT IM 90-2(27) 309 COUNTY Aurora PCN 1234

SAMPLE NO. 25 SAMPLE WEIGHT 7180 DATE 4-9-14

TESTED BY Mary C. Clauson CHECKED BY Carl Waddington

		A.	B.	C.	D.	E.
SIEVE SIZES		Total Retained (Grams)	Soft Rock (Grams)	Percent Soft Rock	% Retained From Total Sample	Weighted % of Each Sieve
mm	Passing	mm	Retained			
50	2"	37.5	1 1/2"			
37.5	1 1/2"	25.0	1"	254	3.91	0.14
25.0	1"	19.0	3/4"	1510	3.91	0.43
19.0	3/4"	12.5	1/2"	3116	1.41	0.40
12.5	1/2"	9.5	3/8"	1208	1.08	0.21
9.5	3/8"	4.75	# 4	633		
PAN				459		
TOTAL				7180		1.18

FORMULA:  $B / A \times 100 = C$   
 $(C \times D) / 100 = E$

Light Weight Particles - SD 214	=	<u>0.3</u>	%
Chocolate Rock - SD 216	=	<u>0.1</u>	%
Soft Rock (Total from above Test)	=	<u>1.2</u>	%
TOTAL Deleterious	=	<u>1.6</u>	%

NOTE: Column D taken from the DOT-3

Attach this sheet to DOT-3

Comments: 25.0 mm - 1" sieve not tested because less than 10% was retained. M.C.C.

Figure 2