

Method of Test for
SAND EQUIVALENT OF SOILS AND FINE AGGREGATE
DOTD Designation: TR 120
(AASHTO T 176)

I. Scope

- A. This method of test is designed to determine the relative proportion of dust or clay material in fine aggregates using a mechanical shaker.
- B. Reference Documents
 - 1. DOTD TR 108 – Splitting and Quartering Samples.
 - 2. DOTD TR 411 – Dry Preparation of Disturbed Samples for Test.
 - 3. AASHTO T 176 – Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test.

II. Apparatus

- A. Sand Equivalent Test Equipment – graduated plastic cylinder, rubber stopper, irrigator tube, weighted foot assembly, and siphon assembly, with mechanical shaker, all conforming to specifications, dimensions, and setup as designated in AASHTO T 176.
- B. Holding cans – four 6-oz. No. 2 cans.
- C. Tin cans – specimen cups, DOTD Stock No. 16-16-2320.
- D. Sample splitter.
- E. Catch pan.
- F. Oven – capable of maintaining a temperature of $230 \pm 9^{\circ}\text{F}$.
- G. Straightedge.
- H. Asphaltic Concrete Job Mix Formula – DOTD Form No. 03-22-0730. (Figure 1)
- I. Sand Equivalent for Asphaltic Concrete Sands – DOTD Form No. 03-22-0747. (Figure 2)
- J. Thermal gloves, apron, and other tools – for handling hot materials.
- K. Calcium Chloride Stock Solution – a stock solution of Calcium Chloride, formulated containing formaldehyde, glutaraldehyde, or Kathon CG/ICP, prepared in accordance with AASHTO T 176. This solution may be purchased directly from commercial sources, rather than mixed from individual components.

III. Health Precautions

- A. Handling heated materials and equipment can cause severe burns. Always use proper caution and safety equipment when working with hot material or equipment.

IV. Sample Preparation

- A. Obtain approximately 30 lb. each of fine and coarse sand.
- B. Place the fine and coarse sand in the oven and dry to constant weight at 230°F .

Note 1: *Constant weight for drying purposes is defined as less than 0.1% weight loss between successive weighing no less than 5 minutes apart.*

- C. Prepare both fine and coarse sands in accordance with DOTD TR 411 by pulverizing all lumps of fine-grained soil material to pass the No. 4 sieve. Discard all material retained on the No. 4 sieve.
- D. Split the material passing the No. 4 sieve to approximately 2.20 lb. each of fine and coarse sand in accordance with DOTD TR 108.

- E. Combine and thoroughly blend the fine and coarse sands in the same proportions as the bin percentages from the JMF based on total aggregate to create approximately 2.20 lb. of blended material, in accordance with Steps VI. A and B.
- F. Split the 2.20 lb. blended material obtained from Step E to obtain four test specimens weighing approximately 0.55 lb. Put each of the test specimens into a No. 2 holding can with a sample identification marked on the side.
- G. Place three of the four specimens obtained in Step F into 3-oz specimen cups. While filling each specimen cup, tap the bottom of the specimen cup on the worktable to consolidate the material. Allow the material to overflow the specimen cups.
- H. Strike off the material to the top of the cups with the straightedge over a catch pan. Return extra material to the holding can.

Note 2: *The fourth test specimen is used as a reserve, if a clear clay reading cannot be obtained on any of the three original specimens.*

V. Calcium Chloride Working Solution Preparation

- A. Prepare a working solution of calcium chloride by diluting $2.87 \pm .16$ fl. oz. of the stock calcium chloride solution with distilled water to 1 gal (3.8 L). Fill the container with approximately $\frac{1}{2}$ gal (2 L) of water. To ensure mixing, add the stock solution, and agitate for 1 – 2 min. Add the remaining water and agitate once again for 1 -2 min.

Note 3: *Do not use Calcium Chloride Stock Solution that has expired. Dispose of the “working” calcium chloride solution after 30 days.*

VI. Procedure

Note 4: *When performing this test in rapid sequence, proper time references must be established. You must allow enough time between each test specimen in order to be able to mechanically shake one test specimen before the 10-minute soaking period has expired on the next test specimen. If a complete set of 3 specimens is to be run, the recommended time period between test specimens is 3 minutes. If each test specimen is to be individually completed before the next one is begun, the time sequence is not necessary.*

Note 5: *Perform this test in a vibration free location; vibrations may cause the suspended material to settle at a rate greater than normal.*

- A. Pour calcium chloride (CaCl_2) working solution into each of three plastic cylinders filling to 4 ± 0.1 in., reading at the bottom of the meniscus.
- B. Pour the test specimen from the sample cup through a funnel into the plastic cylinder.
- C. Tap the bottom of the cylinder sharply on the heel of the hand until the solution penetrates the test specimen and air bubbles stop. Record as **Time Soaking Period Started** on the worksheet.
- D. Allow the test specimen to soak for 10 ± 1 minute.
- E. At the end of the 10-minute soaking period, place a rubber stopper over the top of the plastic cylinder.

- F. Agitate the test specimen by vigorously shaking the cylinder around the horizontal pivot point, making sure that the test specimen is dislodged from the bottom and thoroughly mixed with the water.
- G. Place the cylinder in the mechanical shaking machine; set the time at 45 ± 1 second and turn on the machine.
- H. After completion of the shaking operation, set the cylinder upright on the working table and remove the rubber stopper. Using the CaCl_2 working solution, wash the fines from the rubber stopper back into the cylinder.
- I. Insert the irrigator tube into the cylinder and, using the CaCl_2 working solution, wash the material from the cylinder walls while lowering the irrigator toward the bottom of the cylinder.
- J. Force the irrigator tube through the material to the bottom of the cylinder by applying a light stabbing and twisting action while the working solution flows from the holes in the sides of the irrigator tip. Continue to apply the stabbing and twisting action while flushing the fines upward.
- K. Raise the irrigator slowly without shutting off the flow. Regulate the flow just before the irrigator is entirely withdrawn and adjust the final level to 15 ± 0.1 in., reading the bottom of the meniscus. Record as **Time Sedimentation Period Started** on the worksheet.
- L. Allow the cylinder and contents to stand undisturbed on a vibration free location for a $20 \text{ min} \pm 15$ sec sedimentation period. The time will begin with removal of the irrigator tube.
- M. After the 20-min sedimentation period has elapsed and a clear line of demarcation has formed between the test specimen and the clear liquid, read and record the level of the top of the clay suspension as Clay Reading, **B**, on the worksheet.
- N. If no clear line of demarcation has formed at the end of the specified 20-minute sedimentation period, allow the sample to stand undisturbed for a maximum of 30 minutes until a clay reading can be obtained. Immediately read and record the level of the top of the clay suspension. If total sedimentation time exceeds 30 minutes, rerun the test using the fourth sample. If two or more samples do not settle, rerun the test using three new individual samples of the same material.
- O. After the clay reading has been obtained, obtain the sand reading by using a weighted foot assembly.
 - 1. When using the weighted foot assembly with the sand indicator on the rod of the assembly place the assembly over the cylinder and gently lower the assembly toward the sand. Do not allow the indicator to hit the mouth of the cylinder while the assembly is being lowered. When the weighted foot comes to rest on the sand, tip the assembly toward the graduations on the cylinder until the indicator touches the side of the cylinder. Subtract 10 in. from the level indicated by the extreme top edge of the indicator and record this value on the worksheet as **A**.
 - 2. If an older model weighted foot assembly with centering screws is used, keep one of the centering screws in contact with the cylinder wall near the graduations so that it can be seen at all times while the assembly is being lowered. When the weighted foot has come to rest on the sand, read the level of the centering screw and record this value on the worksheet as **A**.
- P. If clay or sand readings fall between 0.1 in. graduations, record the level of the next higher 0.1 in. graduation as the reading.
- Q. Repeat Steps V. B – P for test specimens two and three.

VII. Calculations

- A. Calculate the portions of coarse sand to fine sand in the bin percentages from the JMF for the composite.

1. Calculate the total combined sand from the JMF, **T**, to the nearest 0.1% using the following formula:

$$T = F + C$$

Where:

F = fine sand from JMF, %

C = coarse sand from JMF, %

Example:

F = 8.0

C = 24.0

$$T = 8.0 + 24.0$$

$$T = 32.0\%$$

2. Calculate the percentage of fine and coarse sand in the composite.
 - a. Calculate the percentage of fine sand for the composite, **D**, to the nearest percent using the following formula:

$$D = \frac{F}{T} \times 100$$

Where:

F = fine sand from JMF, %

T = total combined sand from JMF, %

100 = constant to convert decimal to percent

Example:

F = 8.0

T = 32.0

$$D = \frac{8.0}{32.0} \times 100$$

$$= 0.250 \times 100$$

$$D = 25\% \text{ fine sand}$$

- b. Calculate the percentage of coarse sand for the composite, **E**, to the nearest percent using the following formula:

$$E = \frac{C}{T} \times 100$$

Where:

C = coarse sand from JMF, %

T = total combined sand from JMF, %

Example:

C = 24.0

T = 32.0

$$E = \frac{24.0}{32.0} \times 100$$

$$= 0.7500 \times 100$$
$$E = 75\% \text{ coarse sand}$$

B. Calculate the weights of fine and coarse sand to be used to blend a representative composite sand material.

1. Calculate the weight of fine sand for composite, **WF**, to the nearest gram using the following formula:

$$WF = \frac{S \times D}{100}$$

Where:

S = weight of blended sand from Step IV. E, g

D = fine sand for composite, %

100 = constant

Example:

S = 1000 g

D = 25%

$$WF = \frac{1000 \times 25}{100}$$
$$= \frac{25000}{100}$$
$$WF = 250g$$

2. Calculate the weight of coarse sand for the composite, **WC**, to the nearest gram using the following formula:

$$WC = \frac{S \times E}{100}$$

Where:

S = weight of blended sand from Step IV. E, g

E = coarse sand for composite, %

100 = constant

Example:

S = 1000 g

E = 75 %

$$WC = \frac{1000 \times 75}{100}$$
$$= \frac{75000}{100}$$
$$WC = 750g$$

C. Calculate the sand equivalent, **SE**, to the next highest whole number using the following formula:

$$SE = \frac{A}{B} \times 100$$

Where:

A = sand reading

B = clay reading

100 = constant

Example:

A = 2.7

B = 6.7

$$\begin{aligned} SE &= \frac{2.7}{6.7} \times 100 \\ &= 04.29 \times 100 \\ SE &= 40.29 = 41 \end{aligned}$$

- D. Calculate the average sand equivalent value (Avg SE), C, to the next highest whole number using the following formula:

$$C = \frac{SE_1 + SE_2 + SE_3}{3}$$

Where:

SE₁ = sand equivalent for test specimen 1

SE₂ = sand equivalent for test specimen 2

SE₃ = sand equivalent for test specimen 3

3 = constant, number of test specimens

Example:

SE₁ = 41

SE₂ = 43

SE₃ = 44

$$\begin{aligned} C &= \frac{41 + 43 + 44}{3} \\ &= \frac{128}{3} \\ C &= 42.7 = 43 \end{aligned}$$

VIII. Report

- A. Report the individual sand equivalent values for each test specimen and the Average Sand Equivalent Value on the Sand Equivalent for Asphaltic Concrete Sands Worksheet and on the Asphaltic Concrete Job Mix Formula.

IX. Normal Test Reporting Time

Normal testing and reporting time is 2 days.

MATT MENU SELECTION - 31

Louisiana Department of Transportation and Development

DOTD 03-22-0730
Rev. 06/02

ASPHALTIC CONCRETE JOB MIX FORMULA - 1992 Specifications

Metric / English E (M or E) Spec Year 1992 < Entry Fields located on MATT Menu
Proj. No. 1111-1111-1111 JMF No: Plant Code H13017 Mix Code 012 Seq. No. 1115
Plant Type 2 1=Batch Screenless 2=Batch Hot Bin ADT/Lane Mixing Time: Dry Wet
3=Drum Mixer 4=Continuous Prod. Rate: kg/Batch (lb/batch) Mg/Hr (Tons/Hr)
F.A.P. Proj. Cont. Proj. Engr.

	CODE	SOURCE	PERCENT	SP.GRAV.	FR. RATE
Asphalt Cement (AC)	<u>1330</u>	<u>AC-30</u>	<u>15.12</u>	<u>1.03</u>	<u>(1-4)</u>
Crushed Aggregate	<u>1351</u>	<u>Cr. Gravel</u>	<u>16.41</u>	<u>#3 2.62-10.0%</u>	<u>3</u>
Crushed Aggregate	<u> </u>	<u> </u>	<u>1.01</u>	<u>#2 2.65-34.6%</u>	<u> </u>
Screenings	<u> </u>	<u> </u>	<u>1.01</u>	<u>#1 2.65-55.4%</u>	<u> </u>
Reclaimed Materials	<u> </u>	<u> </u>	<u>1.01</u>	<u> </u>	<u> </u>
Coarse Sand	<u>3174</u>	<u> </u>	<u>21.21</u>	<u> </u>	<u> </u>
Fine Sand	<u> </u>	<u> </u>	<u>17.16</u>	<u> </u>	<u> </u>
Anti-Strip (AS)	<u> </u>	<u>Unichem B154</u>	<u>10.6</u>	<u>JMF Limits: 0.5 - 0.7</u>	<u> </u>
Lime	<u> </u>	<u> </u>	<u>1.01</u>	<u> </u>	<u> </u>
Other	<u> </u>	<u> </u>	<u>1.01</u>	<u> </u>	<u> </u>
Other	<u> </u>	<u> </u>	<u>1.01</u>	<u> </u>	<u> </u>

Contractor's Results	Average	1	2	3	4	Department Validation	Average	JMF Limits
Spec. Gravity	<u>2.33</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Theo. Gravity	<u>2.43</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
% Theo. Gravity	<u>95.9</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>95-97</u>	<u> </u>
% Voids	<u>4.0</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>3-5</u>	<u> </u>
% VMA	<u>15.8</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
% VFA	<u>71.5</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>72-80</u>	<u> </u>
Stability, kN(lb)	<u>1540</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>1400</u>	<u> </u>
Flow, 0.1mm (1/100 in)	<u>110</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>5-15</u>	<u> </u>

RECOMMENDED FORMULA	mm/μm	In.	LOOSE MIX RESULTS	1	2	Avg.	JMF Limits	DEPARTMENT RESULTS
63	2 1/2	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Adjustment Factor <u>1.100</u>
50	2	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Tensile Str., Control, kPa (PSI) <u> </u>
37.5	1 1/2	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Tensile Str., Ratio (TSR), % <u> </u>
31.5	1 1/4	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	Ross Count, % (T 195) <u> </u>
25.0	1	<u>11010</u>	<u> </u>	<u> </u>	<u> </u>	<u>100</u>	<u> </u>	% Ret. Asph. Coating (TR 317) <u> </u>
19.0	3/4	<u>1918</u>	<u> </u>	<u> </u>	<u> </u>	<u>92-100</u>	<u> </u>	Effective AC, % <u>1.01</u>
12.5	1/2	<u>1815</u>	<u> </u>	<u> </u>	<u> </u>	<u>79-91</u>	<u> </u>	Absorbed AC, % <u>1.01</u>
9.5	3/8	<u>1617</u>	<u> </u>	<u> </u>	<u> </u>	<u>61-73</u>	<u> </u>	% Natural Sands <u>3.2</u>
4.75	No. 4	<u>1514</u>	<u> </u>	<u> </u>	<u> </u>	<u>48-60</u>	<u> </u>	Sand Equivalent <u>42</u>
2.00	No. 10	<u>1410</u>	<u> </u>	<u> </u>	<u> </u>	<u>34-46</u>	<u> </u>	Moisture Content of Mix, % <u>1.01</u>
425	No. 40	<u>1212</u>	<u> </u>	<u> </u>	<u> </u>	<u>17-27</u>	<u> </u>	Opt. Mixing Temp. C (F) <u>3123</u>
180	No. 80	<u>1114</u>	<u> </u>	<u> </u>	<u> </u>	<u>10-18</u>	<u> </u>	Opt. Compaction Temp. C (F) <u>3130</u>
75	No. 200	<u>1510</u>	<u> </u>	<u> </u>	<u> </u>	<u>3-7</u>	<u> </u>	Absorb Recov., Pa. S(Poises) <u> </u>
%AC Extract.	<u>1512</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>4.8-5.5</u>	<u> </u>	
% Crushed	<u>1815</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>70% Min.</u>	<u> </u>	
Mix Temp. C (F)	<u>3110</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>205-335F</u>	<u> </u>	
%AC (Met/Sc)	<u>1512</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>5.1-5.3</u>	<u> </u>	
%AS (Meter)	<u>1.01</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	

Submitted for the Contractor by: 1011814 Contractor's Technician Date: 1011-1210-1012
Proposal Approved (Yes No) Lab: Date:
Approved (Yes No) Lab. Engr. Date:
Revised Specs.: 11992 Date First Used:

Remarks
Use

APPROVED FOR PROJECT BY:

Figure 1

MATT MENU SELECTION - 31

Louisiana Department of Transportation and Development

03/02

ASPHALTIC CONCRETE JOB MIX FORMULA - 2000 Specifications

Metric / English E (M or E) Spec Year 2000

< Entry Fields located on MATT Menu

Proj. No. 111-11-1111 Plant Code H916 Mix Code 29 Mix Use 07

Seq No. 100 Plant Type 3 1 = Batch Screenless 2 = Batch Hot Bin 3 = Drum Mixer 4 = Continuous G_{sb} 2.645 P_s 94.9 P_{ba}

ADT/Lane Nom. Aggr. Size AC Corr. Factor Permeability

F.A.P No. Project Contr. Project Engr

	Code	Source	Percent	Spec. Grav.	Fr. Rate (1-4)
Asphalt Cement (AC)	<u>658 PG 70-22M</u>	<u>41AU EAGON</u>	<u>5.1</u>	<u>1.03</u>	
Crushed Aggregate	<u>631 - 3/4" CR. GRAVEL</u>	<u>AB31 CLOVERHILL PIT</u>	<u>33.6</u>	<u>2.640</u>	<u>3</u>
Crushed Aggregate	<u>631 - 1/2" CR. GRAVEL</u>	<u>AB31 CLOVERHILL PIT</u>	<u>15.1</u>	<u>2.614</u>	<u>3</u>
Screenings			<u>0</u>		
Reclaimed Materials			<u>0</u>		
Coarse Sand	<u>630 COARSE SAND</u>	<u>AB31 CLOVERHILL PIT</u>	<u>24.0</u>	<u>2.681</u>	
Fine Sand		<u>AB93 WASHINGTON PIT</u>	<u>8.0</u>	<u>2.650</u>	
Anti-Strip (AS)	<u>ADHERE LA 2</u>	<u>5730 ARK-MA 2</u>	<u>0.6</u>	JMF Limits: <u>0.5-0.7</u>	
Lime			<u>0</u>		
Other	<u>631 - 3/4" CR. GRAVEL</u>	<u>AB31 CLOVERHILL PIT</u>	<u>14.2</u>	<u>2.628</u>	
Other			<u>0</u>		

	Contractors Avg.	1	2	3	4	Validation Avg.	JMF Limits
Spec. Grav. (Bulk)	<u>2.1389</u>					<u>0</u>	
Theo. Gr (Max G _{mm})	<u>2.1463</u>					<u>0</u>	
% Theo. Gravity	<u>97.0</u>					<u>0</u>	<u>96-98</u>
% Voids (Air)	<u>3.0</u>					<u>0</u>	<u>2-4</u>
% VMA	<u>14.3</u>					<u>0</u>	<u>14.0 MIN</u>
% VFA	<u>79</u>					<u>0</u>	
Stability, lb	<u>1900</u>					<u>0</u>	<u>1200 MIN</u>
Flow, 1/100 in.	<u>14</u>					<u>0</u>	<u>8-18</u>

RECOMMENDED FORMULA		LOOSE MIX RESULTS		DEPARTMENT RESULTS	
U.S. Sieve		1	2	Avg.	JMF Limits
2 in. (50 mm)					
1 1/2 in. (37.5 mm)					
1 in. (25.0 mm)					
3/4 in. (19.0 mm)	<u>100</u>			<u>100</u>	
1/2 in. (12.5 mm)	<u>96</u>			<u>90-100</u>	
3/8 in. (9.5 mm)	<u>86</u>			<u>80-89</u>	
No. 4 (4.75 mm)	<u>59</u>			<u>53-65</u>	
No. 8 (2.36 mm)	<u>36</u>			<u>31-41</u>	
No. 16 (1.18 mm)	<u>26</u>			<u>23-29</u>	
No. 30 (600 µm)	<u>17</u>			<u>14-20</u>	
No. 50 (300 µm)	<u>9</u>			<u>6-12</u>	
No. 100 (150 µm)	<u>6</u>			<u>4-8</u>	
No. 200 (75 µm)	<u>4.5</u>			<u>2.5-6.5</u>	
% AC Extract	<u>5.1</u>			<u>4.7-5.5</u>	
% Crushed	<u>85</u>			<u>80 MIN</u>	
Mix Temp °F (°C)	<u>325</u>			<u>300-350</u>	
% AC (Met/Sc)	<u>5.1</u>			<u>5.0-5.2</u>	
% AS (Meter)	<u>0.6</u>			<u>0.5-0.7</u>	
Adjustment Factor					<u>1.00</u>
Tensile Strength, Control, psi					
Tensile Strength Ratio (TSR), %					
Ross Count, % (AASHTO T 195)					
Effective AC, %					
Absorbed AC, %					
% Natural Sands					<u>30</u>
Sand Equivalent					<u>43</u>
Moisture Content of Mix, %					
Optimum Mixing Temp. (F)					<u>330</u>
Optimum Compaction Temp. (F)					<u>300</u>
Abson Recovery (Poles)					

Submitted for the Contractor By: 0184 CONTRACTORS TECHNICIAN Date Submitted: 10-20-02

Proposal Approved (Yes / No) Lab: Date Prop. Appr:

Approved By Lab Engr (Yes / No) Date Approved:

Specs: 2000 Date First Used:

Remarks

Use H916-74 W/C-100

APPROVED FOR PROJECT BY:

Figure 1A

MATT MENU SELECTION - 09

DOTD 03-22-0747
Rev. 1/93

Louisiana Department of Transportation and Development
SAND EQUIVALENT FOR ASPHALTIC CONCRETE SANDS
(DOTD TR 120)

Project No. 111-11-1111
Material Code 275
Date Sampled 09-20-02
Quantity _____ Units _____
Plant Code H.9.16
PO No. _____
Ident. 5.E-1

Lab. No. 58-15.1420
Submitted By 0593
Purpose Code 3
Spec. Code 1
Date Tested 10-02-02

PURP. CODES
1. Quality Control
2. Verification
3. Acceptance
4. Check
5. Resample
6. Source Approval
7. Design
8. Indep Assurance
9. Pre Source Test

Remarks 1 _____
Remarks 2 _____

Item No. 501-01 Sampled By: G.R. SMITH Date: 9/20/02

	Test Results	P/F
JOB MIX FORMULA SEQUENCE NO.	<u>1.0.0</u>	<u>XXXX</u>
MIX CODE	<u>29</u>	<u>XXXX</u>
PLANT TYPE (1=BS, 2=BHB, 3=DM, 4=C)	<u>3</u>	<u>XXXX</u>
COARSE SAND SOURCE <u>CLOVERHILL PIT</u>	<u>A.B.3.1</u>	<u>XXXX</u>
FINE SAND SOURCE <u>WHITTINGTON PIT</u>	<u>A.H.9.3</u>	<u>XXXX</u>
COARSE SAND, % OF COMPOSITE	<u>75</u>	<u>XXXX</u>
FINE SAND, % OF COMPOSITE	<u>25</u>	<u>XXXX</u>
SAND EQUIVALENT, AVERAGE	<u>43</u>	<u>P</u>

CYLINDER NO.	TIME SOAKING PERIOD STARTED	TIME SEDIMENTATION PERIOD STARTED	TIME SAMPLE IS READ
1	<u>2:05</u>	<u>2:18</u>	<u>2:38</u>
2	<u>2:08</u>	<u>2:21</u>	<u>2:41</u>
3	<u>2:11</u>	<u>2:24</u>	<u>2:44</u>

CYLINDER NO.	SAND READING (A)	CLAY READING (B)	SAND EQUIVALENT (A + B) x 100	
1	<u>2.7</u>	<u>6.7</u>	<u>0.4029 x 100</u>	<u>41</u>
2	<u>2.9</u>	<u>6.9</u>	<u>0.4202 x 100</u>	<u>43</u>
3	<u>3.6</u>	<u>8.3</u>	<u>0.4337 x 100</u>	<u>44</u>
TOTAL (C)				<u>128</u>
SAND EQUIVALENT, AVERAGE (C + 3)				<u>43</u>

Tested By: D.S. & G.C.

Date: 10/2/02

APPROVED BY: K.D.

Date: 10/2/02

Figure 2