

SHRP-P-619

# **Soil Moisture Proficiency Sample Program**

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## **Abstract**

This report describes the development of the Long-Term Pavement Performance (LTPP) soil sample selection process based on the American Association of State Highway Transportation Officials (AASHTO) model. Lab results present the bias in determining moisture content in cohesive soil and base course aggregate samples.

# **SUMMARY OF RESEARCH**

FINAL RESEARCH REPORT  
on the  
SHRP SOIL MOISTURE PROFICIENCY SAMPLE PROGRAM

One element of Quality Assurance (QA) for laboratory testing that was deemed to be of key importance by SHRP, as a result of Expert Task Group (ETG) recommendations, is the American Association of State Highway and Transportation Officials (AASHTO) accreditation program (AAP) for laboratories. All laboratories providing long term pavement performance (LTPP) testing services were required to be accredited by AAP. Most of the laboratory tests on LTPP field samples were addressed by the AAP, which includes on site inspections of equipment and procedures, and participation in applicable proficiency sample series. However, a few critical tests in the SHRP LTPP studies were not fully addressed. After extensive consultation and careful study, it was determined that supplemental programs should be designed to provide assurance of quality test data in a manner similar to that provided by AAP for other tests.

The Soil Moisture Proficiency Sample Program was one of the supplemental programs approved for implementation. The program was designed to provide precision and bias data concerning standard tests for moisture content of subgrade soils and base course aggregates.

The soil moisture program was modeled after the familiar AASHTO Materials Reference Laboratory (AMRL) proficiency sample programs at the National Institute of Standards and Technology (NIST). The moisture samples were prepared and distributed to participants, the raw test data was collected and collated, and a report documenting the program was issued for SHRP by the AMRL.

Two different cohesive soils were supplied for the program by the Maryland Department of Transportation's Materials Laboratory. These soils were from the same sources that were used in the Type II Soil Proficiency Sample Program. Soil classification data is contained in appendix I.

Two different base course aggregates were supplied for the program by the University of Nevada-Reno. The aggregates were from the same sources that were used in the Type I Proficiency Sample Program. It is also noted that these materials were obtained from SHRP reference material sources, Watsonville Granite at Monterey, California and Kaiser at Pleasonton, California. Classification data for the materials used is contained in appendix I.

AMRL thoroughly blended, then split each of the four primary materials into two approximately equal parts, one part to

eventually provide material for dry samples and the other part to eventually provide material for wet samples. Each of these 8 parts was then split again into two approximately equal portions designated as split A and split B. Each of the 16 splits(8 A and 8 B) was then split to yield 64 test samples. 8 of the sets of 64 samples were finally processed for distribution in an air dried condition and the other 8 sets were processed for distribution in a wet condition. Finally, 20 groups of 3 test samples each were randomly selected from each of the 16 sets of 64 test samples and identified for shipment to each participating laboratory. Every participant received a total of 48 test samples (16 groups of 3 test samples each).

All samples were selected and identified in accordance with statistically acceptable random procedures. The entire experiment was designed in consultation with SHRP statisticians to allow a complete components of variance analysis to be conducted as resources allowed.

Instructions to the participants (appendix II, page 7) provided directions concerning test sequencing, identification and procedure to follow (AASHTO T265).

Raw test data was returned to AMRL for collation and incorporation into the AMRL report (appendix II). The report was forwarded to the SHRP Quality Assurance Engineer when all data had been received. It was then transmitted to the SHRP Statistician for analysis and determination of test precision and bias.

The Statistician's report (appendix V) provides a full explanation of the data analysis along with complete information derived therefrom.

Precision statements (appendix VII) were drafted in the standard AASHTO\ASTM format for use by standards writing committees as they deem appropriate.

The appendices to this report contain the complete set of supporting documents for this program as listed in the table of contents.

Seventeen (17) laboratories participated in this experiment. Each participant has made a substantial contribution to the successful completion of SHRP research in the LTPP program.

The participants are listed in Appendix II, page 11.

# APPENDIX I

MATERIALS AND RESEARCH  
Laboratory Worksheet

## COMBINED HYDROMETER, SIEVE ANALYSIS AND TEST DATA SHEET

|                                                                                                                                                                                              |                                                                                                                   |                                 |                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------|
| IDENTIFICATION                                                                                                                                                                               | LOG NO.: <u>H0-7289</u>                                                                                           | CONTRACT: <u>H0-292-202-771</u> | FIELD CLASS: <u>AS &amp; R.F.</u>                                                                    |
|                                                                                                                                                                                              | LOCATION - STA. <u>672+50</u>                                                                                     | <u>150' RT. 18 SURV.</u>        | DEPTH: <u>0.5</u> <u>70</u>                                                                          |
| TEST DATA                                                                                                                                                                                    | EST. MOIST.: <u>A</u>                                                                                             | OPT. MOIST. DATE: <u>6-5-90</u> | CUT <input checked="" type="checkbox"/> FILL <input type="checkbox"/> NC/NF <input type="checkbox"/> |
|                                                                                                                                                                                              | OPERATOR: <u>LTD</u>                                                                                              | DATE: <u>6-20-90</u>            | CHECKED BY: <u>P.8</u> DATE: <u>6/29/90</u>                                                          |
| TEST DATA                                                                                                                                                                                    | CLASSIFICATION : MSMT <u>A4.7*</u> AASHTO <u>A.C(3)</u> EST. C.B.R. VALUE <u>6</u>                                |                                 |                                                                                                      |
|                                                                                                                                                                                              | LIQUID LIMIT <input type="checkbox"/> : <u>32</u> SHRINKAGE LIMIT: <u>18</u> SHRINKAGE } 95% T-180                |                                 |                                                                                                      |
|                                                                                                                                                                                              | PLASTICITY INDEX: <u>11</u> SHRINKAGE RATIO: <u>1.72</u> <input type="checkbox"/> FACTOR } 98% T-99               |                                 |                                                                                                      |
|                                                                                                                                                                                              | MOISTURE DENSITY } <input checked="" type="checkbox"/> T-180 <u>C</u> MAX. DEN. = _____ pcf OPT. MOIST. = _____ % |                                 |                                                                                                      |
|                                                                                                                                                                                              | RELATIONS } <input type="checkbox"/> T-99 MAX. DEN. = _____ pcf OPT. MOIST. = _____ %                             |                                 |                                                                                                      |
|                                                                                                                                                                                              | GRADATION (PERCENT PASSING by WEIGHT)                                                                             |                                 |                                                                                                      |
|                                                                                                                                                                                              | 2 1/2" _____ 1/2" <u>99</u> #40 <u>71</u> *COARSE SAND: (2.0-0.42mm) <u>18</u> } <u>46</u>                        |                                 |                                                                                                      |
|                                                                                                                                                                                              | 2" _____ 3/8" _____ #60 <u>63</u> *FINE SAND: (0.42-0.075mm) <u>28</u> } <u>23</u>                                |                                 |                                                                                                      |
|                                                                                                                                                                                              | 1 1/2" _____ #4 <u>94</u> #100 <u>55</u> SILT: (0.075-0.005mm) _____ } <u>31</u>                                  |                                 |                                                                                                      |
|                                                                                                                                                                                              | 1" <u>100</u> #10 <u>87</u> #200 <u>47</u> *CLAY: (0.005-0.001mm) _____ } <u>31</u>                               |                                 |                                                                                                      |
| 3/4" <u>99</u> #30 _____ #270 _____ COLLOIDS: (0.001mm Minus) _____ }                                                                                                                        |                                                                                                                   |                                 |                                                                                                      |
| MOISTURE AT _____ ( ) = _____ % ( ) ; MOISTURE AT _____ ( ) = _____ % ( )                                                                                                                    |                                                                                                                   |                                 |                                                                                                      |
| <input type="checkbox"/> ORGANIC TEST: _____ %, <input type="checkbox"/> P.H. _____, <input type="checkbox"/> OTHER TESTS <u>SLCR = 2.67</u>                                                 |                                                                                                                   |                                 |                                                                                                      |
| <input type="checkbox"/> COLOR _____ <input type="checkbox"/> C.B.R. _____ %, ( ) <input type="checkbox"/> VOL. CHANGE _____ %                                                               |                                                                                                                   |                                 |                                                                                                      |
| REMARKS: <u>*TR. RF</u> <u>SOIL STABILIZATION</u> <u>ATTN. B. KOCHEN</u>                                                                                                                     |                                                                                                                   |                                 |                                                                                                      |
| <input checked="" type="checkbox"/> 24 Hr. Bath <input type="checkbox"/> MSMT <input type="checkbox"/> #40 Wash <input type="checkbox"/> #200 Wash <input type="checkbox"/> No Bath Required |                                                                                                                   |                                 |                                                                                                      |

## MECHANICAL ANALYSIS DATA

|                                             |                                                                            |                                                         |                                                                |
|---------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------|
| HYGRO                                       | (W <sub>o</sub> ) <u>23.12</u>                                             | TEST SAMPLE                                             |                                                                |
|                                             | (W <sub>s</sub> ) - <u>22.86</u>                                           | W <sub>o</sub> x 100 ÷ (% HYGRO + 100) = W <sub>s</sub> |                                                                |
|                                             | (W <sub>w</sub> ) <u>26</u> x 100 ÷ W <sub>s</sub> = <u>1.1</u> % HYGRO    | W <sub>o</sub> = <u>55.19</u>                           | W <sub>s</sub> = <u>54.59</u>                                  |
| BATH                                        | SEDIMENTATION                                                              | TEMP °F                                                 | H + C = R                                                      |
|                                             | START MIN.                                                                 |                                                         |                                                                |
| CALCULATIONS                                | FINE SIEVE ANALYSIS                                                        |                                                         | EST. MAX. GRAIN SIZE mm                                        |
|                                             | WHERE: P <sub>p</sub> = $\frac{W_p}{W_s} \times 100$ P <sub>p</sub> 10=100 |                                                         | *COARSE SAND P <sub>p</sub> 10 - P <sub>p</sub> 40 = <u>18</u> |
|                                             | SIEVE                                                                      | W <sub>s</sub> = <u>54.59</u>                           | *FINE SAND P <sub>p</sub> 40 - P <sub>p</sub> 200 = <u>28</u>  |
|                                             | #30                                                                        | $\frac{W_i}{W_p} =$ _____                               |                                                                |
|                                             | #40                                                                        | $\frac{W_i}{W_p} =$ <u>9.81</u>                         |                                                                |
|                                             | #60                                                                        | $\frac{W_i}{W_p} =$ <u>5.55</u>                         |                                                                |
|                                             | #100                                                                       | $\frac{W_i}{W_p} =$ <u>4.81</u>                         |                                                                |
|                                             | #200                                                                       | $\frac{W_i}{W_p} =$ <u>5.09</u>                         |                                                                |
|                                             | #270                                                                       | $\frac{W_i}{W_p} =$ _____                               |                                                                |
|                                             | NOMENCLATURE                                                               |                                                         |                                                                |
| WHERE:                                      |                                                                            |                                                         |                                                                |
| W <sub>o</sub> = Air Dry (gm)               |                                                                            |                                                         |                                                                |
| W <sub>s</sub> = Oven Dry (gm)              |                                                                            |                                                         |                                                                |
| W <sub>w</sub> = Water Wt. (gm)             |                                                                            |                                                         |                                                                |
| H = Hydrometer Reading                      |                                                                            |                                                         |                                                                |
| C = Temp. Correction Factor                 |                                                                            |                                                         |                                                                |
| R = Corrected Hydrom. Reading               |                                                                            |                                                         |                                                                |
| P <sub>R</sub> = % Samp. Retained on Sieve  |                                                                            |                                                         |                                                                |
| P <sub>p</sub> = % Sample Passing Sieve     |                                                                            |                                                         |                                                                |
| W <sub>i</sub> = Wt. Retained on Sieve (gm) |                                                                            |                                                         |                                                                |
| S = % Total Sample Passing #10 Sieve        |                                                                            |                                                         |                                                                |
| W <sub>p</sub> = Wt. Passing Sieve (gm)     |                                                                            |                                                         |                                                                |

F

| LOG. NO. <u>HO-7207</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                     | 24 HOUR HYDROMETER ANALYSIS                                            |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|------|------|--------------|-----------|--------------------------------------------|------|-------|-------|--------|--|--|------|--|------|--|------|--|--------|--------|------|--------|------|
| FORMULA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | $P = \frac{R_a}{W_s} \times 100$                                                                                                                                                                                                                                                                                                                    |                                                                        | $d = d_i \times K_L \times K_G \times K_v$                                                                                                                                                                                                                                                                                 |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>WHERE:</b><br>P = % Soil in Suspension<br>R = Corrected Hydrometer Reading<br>a = Constant - Depending on Specific Gravity<br>W <sub>s</sub> = Oven Dry Weight of Test Sample<br>H = Hydrometer Reading, Uncorrected<br>C = Correction Factor for Temperature<br>S = % Total Sample Passing #10 Sieve<br>S <sub>i</sub> = % Total Sample Passing |                                                                        | <b>WHERE:</b><br>d = Corrected Grain Diameter<br>d <sub>i</sub> = Max. Grain Dia. Under Assumed Conditions<br>K <sub>L</sub> = Correction for Elevation of Hydrometer (H)<br>K <sub>G</sub> = Correction for Variation of Specific Gravity<br>K <sub>v</sub> = Correction for Variation of Viscosity of Suspending Medium. |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | a = <u>0.996</u> W <sub>s</sub> = <u>54.59</u> % Total Sample Passing #10 (S) = <u>87</u> Sp. Gr. = <u>2.67</u>                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
| CALCULATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TEMP<br>°F                                                                                                                                                                                                                                                                                                                                          | $(H + C = R) \times \frac{100a}{W_s} = P \times \frac{S_i}{100} = S_i$ |                                                                                                                                                                                                                                                                                                                            |      |       |      |      | OBS.<br>TIME | T<br>MIN. | $d_i \times K_L \times K_G \times K_v = d$ |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              | 30 sec.   | .081                                       |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              | 1         | .057                                       |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 76                                                                                                                                                                                                                                                                                                                                                  | 31.5                                                                   | -5.2                                                                                                                                                                                                                                                                                                                       | 26.3 | 1823  | 47.9 | 42   |              | 2         | .040                                       | .831 | .0380 | .032  |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 75                                                                                                                                                                                                                                                                                                                                                  | 30.0                                                                   | -5.2                                                                                                                                                                                                                                                                                                                       | 24.8 |       | 45.2 | 37   |              | 5         | .026                                       | .840 | .0247 | .021  |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 75                                                                                                                                                                                                                                                                                                                                                  | 27.5                                                                   | -5.4                                                                                                                                                                                                                                                                                                                       | 22.1 |       | 40.3 | 35   |              | 15        | .015                                       | .855 | .0144 | .012  |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 75                                                                                                                                                                                                                                                                                                                                                  | 26.0                                                                   | -5.4                                                                                                                                                                                                                                                                                                                       | 20.6 |       | 37.6 | 33   |              | 30        | .010                                       | .864 | .0096 | .0083 |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 75                                                                                                                                                                                                                                                                                                                                                  | 24.0                                                                   | -5.4                                                                                                                                                                                                                                                                                                                       | 18.6 |       | 33.9 | 29   |              | 60        | .0074                                      | .876 | .0071 | .0062 |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 74                                                                                                                                                                                                                                                                                                                                                  | 21.0                                                                   | -5.6                                                                                                                                                                                                                                                                                                                       | 15.4 |       | 28.1 | 24   |              | 250       | .0036                                      | .894 | .0035 | .0031 |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 74                                                                                                                                                                                                                                                                                                                                                  | 18.0                                                                   | -5.6                                                                                                                                                                                                                                                                                                                       | 12.4 | 1.823 | 22.6 | 20   |              | 1440      | .0015                                      | .910 | .0014 | .0013 |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
| <b>MECHANICAL ANALYSIS (AASHTO DESIGNATIONS M.146 AND T.88)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3" style="text-align: center;">GRAVEL</td> <td colspan="2" style="text-align: center;">SAND</td> <td colspan="2" rowspan="2" style="text-align: center;">SILT</td> <td colspan="2" rowspan="2" style="text-align: center;">CLAY</td> </tr> <tr> <td style="text-align: center;">COARSE</td> <td style="text-align: center;">MEDIUM</td> <td style="text-align: center;">FINE</td> <td style="text-align: center;">COARSE</td> <td style="text-align: center;">FINE</td> </tr> </table> |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       | GRAVEL |  |  | SAND |  | SILT |  | CLAY |  | COARSE | MEDIUM | FINE | COARSE | FINE |
| GRAVEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                     |                                                                        | SAND                                                                                                                                                                                                                                                                                                                       |      | SILT  |      | CLAY |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
| COARSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MEDIUM                                                                                                                                                                                                                                                                                                                                              | FINE                                                                   | COARSE                                                                                                                                                                                                                                                                                                                     | FINE |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |
| % SOIL MORTAR = READING FROM CURVE $\div \frac{S_i}{100}$ REMARKS: $0.005 = 27.4 \div .87 \approx 31$                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                     |                                                                        |                                                                                                                                                                                                                                                                                                                            |      |       |      |      |              |           |                                            |      |       |       |        |  |  |      |  |      |  |      |  |        |        |      |        |      |

# MATERIALS AND RESEARCH Laboratory Worksheet

## COMBINED HYDROMETER, SIEVE ANALYSIS AND TEST DATA SHEET

|                       |                      |                           |                              |                                                              |
|-----------------------|----------------------|---------------------------|------------------------------|--------------------------------------------------------------|
| <b>IDENTIFICATION</b> | LOG NO.:             | CONTRACT: <u>MTS # 47</u> |                              | FIELD CLASS:                                                 |
|                       | LOCATION - STA.      | DEPTH:                    |                              |                                                              |
|                       | EST. MOIST.:         | OPT. MOIST. DATE:         | CUT <input type="checkbox"/> | FILL <input type="checkbox"/> NC/NF <input type="checkbox"/> |
|                       | OPERATOR: <u>LTD</u> | DATE: <u>3-14-90</u>      | CHECKED BY: <u>EJ</u>        | DATE: <u>3-21-90</u>                                         |

|                  |                                                              |                              |                                            |
|------------------|--------------------------------------------------------------|------------------------------|--------------------------------------------|
| <b>TEST DATA</b> | CLASSIFICATION : MSMT <u>A-5</u>                             | AASHTO <u>A-5(8)</u>         | EST. C.B.R. VALUE <u>1</u>                 |
|                  | LIQUID LIMIT <input type="checkbox"/> : <u>56</u>            | SHRINKAGE LIMIT: <u>32</u>   | SHRINKAGE } 95% T-180                      |
|                  | PLASTICITY INDEX: <u>11</u>                                  | SHRINKAGE RATIO: <u>1.38</u> | <input type="checkbox"/> FACTOR } 98% T-99 |
|                  | MOISTURE DENSITY } <input checked="" type="checkbox"/> T-180 | MAX. DEN. = <u>81.5</u>      | pcf OPT. MOIST. = <u>31.8</u> %            |
|                  | RELATIONS } <input type="checkbox"/> T-99                    | MAX. DEN. = _____            | pcf OPT. MOIST. = _____ %                  |
|                  | GRADATION (PERCENT PASSING by WEIGHT)                        |                              |                                            |

|                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |      |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------|-----------|-----------|----|------|-----|-----------|--------|----|------|-----------|----|-----|------|-----------|------|-----|------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--|----------------------------|----------------------|----------------------------|-------------|-----------------------|-----------|------------------------|-----------|---------------------------|--|
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>2 1/2"</td> <td>1/2"</td> <td>#40</td> <td><u>91</u></td> </tr> <tr> <td>2"</td> <td>3/8"</td> <td>#60</td> <td><u>83</u></td> </tr> <tr> <td>1 1/2"</td> <td>#4</td> <td>#100</td> <td><u>75</u></td> </tr> <tr> <td>1"</td> <td>#10</td> <td>#200</td> <td><u>62</u></td> </tr> <tr> <td>3/4"</td> <td>#30</td> <td>#270</td> <td></td> </tr> </table> | 2 1/2"               | 1/2" | #40       | <u>91</u> | 2" | 3/8" | #60 | <u>83</u> | 1 1/2" | #4 | #100 | <u>75</u> | 1" | #10 | #200 | <u>62</u> | 3/4" | #30 | #270 |  | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="2">PERCENT OF SOIL MORTAR</td> </tr> <tr> <td>*COARSE SAND: (2.0-0.42mm)</td> <td><u>9</u> } <u>38</u></td> </tr> <tr> <td>*FINE SAND: (0.42-0.075mm)</td> <td><u>29</u> }</td> </tr> <tr> <td>SILT: (0.075-0.005mm)</td> <td><u>45</u></td> </tr> <tr> <td>*CLAY: (0.005-0.001mm)</td> <td><u>17</u></td> </tr> <tr> <td>COLLOIDS: (0.001mm Minus)</td> <td></td> </tr> </table> | PERCENT OF SOIL MORTAR |  | *COARSE SAND: (2.0-0.42mm) | <u>9</u> } <u>38</u> | *FINE SAND: (0.42-0.075mm) | <u>29</u> } | SILT: (0.075-0.005mm) | <u>45</u> | *CLAY: (0.005-0.001mm) | <u>17</u> | COLLOIDS: (0.001mm Minus) |  |
| 2 1/2"                                                                                                                                                                                                                                                                                                                                                                                                                              | 1/2"                 | #40  | <u>91</u> |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| 2"                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3/8"                 | #60  | <u>83</u> |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| 1 1/2"                                                                                                                                                                                                                                                                                                                                                                                                                              | #4                   | #100 | <u>75</u> |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| 1"                                                                                                                                                                                                                                                                                                                                                                                                                                  | #10                  | #200 | <u>62</u> |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| 3/4"                                                                                                                                                                                                                                                                                                                                                                                                                                | #30                  | #270 |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| PERCENT OF SOIL MORTAR                                                                                                                                                                                                                                                                                                                                                                                                              |                      |      |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| *COARSE SAND: (2.0-0.42mm)                                                                                                                                                                                                                                                                                                                                                                                                          | <u>9</u> } <u>38</u> |      |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| *FINE SAND: (0.42-0.075mm)                                                                                                                                                                                                                                                                                                                                                                                                          | <u>29</u> }          |      |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| SILT: (0.075-0.005mm)                                                                                                                                                                                                                                                                                                                                                                                                               | <u>45</u>            |      |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| *CLAY: (0.005-0.001mm)                                                                                                                                                                                                                                                                                                                                                                                                              | <u>17</u>            |      |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |
| COLLOIDS: (0.001mm Minus)                                                                                                                                                                                                                                                                                                                                                                                                           |                      |      |           |           |    |      |     |           |        |    |      |           |    |     |      |           |      |     |      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |  |                            |                      |                            |             |                       |           |                        |           |                           |  |

MOISTURE AT \_\_\_\_\_ ( ) = \_\_\_\_\_ % ( ) ; MOISTURE AT \_\_\_\_\_ ( ) = \_\_\_\_\_ % ( )

☐ ORGANIC TEST: \_\_\_\_\_ %, ☐ P.H. \_\_\_\_\_, ☐ OTHER TESTS SP GR. 2.73

☐ COLOR \_\_\_\_\_ ☐ C.B.R. \_\_\_\_\_ %, ( ) ☐ VOL. CHANGE \_\_\_\_\_ %

REMARKS: \_\_\_\_\_

☒ 24 Hr. Bath ☐ MSMT ☐ #40 Wash ☐ #200 Wash ☐ No Bath Required

## MECHANICAL ANALYSIS DATA

|              |                                                                         |                    |                                                             |  |
|--------------|-------------------------------------------------------------------------|--------------------|-------------------------------------------------------------|--|
| <b>HYGRO</b> | (W <sub>o</sub> ) <u>26.39</u>                                          | <b>TEST SAMPLE</b> | W <sub>o</sub> x 100 ÷ (% HYGRO + 100) = W <sub>s</sub>     |  |
|              | (W <sub>o</sub> ) - <u>25.65</u>                                        |                    | W <sub>o</sub> = <u>55.41</u> W <sub>s</sub> = <u>53.85</u> |  |
|              | (W <sub>o</sub> ) <u>74</u> x 100 ÷ W <sub>s</sub> = <u>2.9</u> % HYGRO |                    |                                                             |  |

|             |               |      |         |   |   |   |                                     |                         |                                                               |
|-------------|---------------|------|---------|---|---|---|-------------------------------------|-------------------------|---------------------------------------------------------------|
| <b>BATH</b> | SEDIMENTATION |      | TEMP °F | H | C | R | (R/W <sub>s</sub> ) x 100<br>% CLAY | EST. MAX. GRAIN SIZE mm | *COARSE SAND<br>P <sub>10</sub> - P <sub>40</sub> = <u>9</u>  |
|             | START         | MIN. |         |   |   |   |                                     |                         | * FINE SAND<br>P <sub>40</sub> - P <sub>200</sub> = <u>29</u> |

|                     |                                                                            |                   |                   |                  |                      |                    |                     |
|---------------------|----------------------------------------------------------------------------|-------------------|-------------------|------------------|----------------------|--------------------|---------------------|
| <b>CALCULATIONS</b> | FINE SIEVE ANALYSIS                                                        |                   |                   |                  |                      |                    | <b>NOMENCLATURE</b> |
|                     | WHERE: P <sub>p</sub> = $\frac{W_p}{W_s} \times 100$ P <sub>p</sub> 10=100 |                   |                   |                  |                      |                    |                     |
|                     | SIEVE                                                                      | W <sub>s</sub>    | P <sub>p</sub>    | % <sub>100</sub> | % TOTAL SAMPLE PASS. | MAX. GRAIN SIZE mm |                     |
|                     | #30                                                                        | $\frac{W_1}{W_p}$ |                   |                  |                      | 0.60               |                     |
|                     | #40                                                                        | $\frac{W_1}{W_p}$ | <u>91.16 ± 91</u> | <u>1.0</u>       | <u>91</u>            | 0.425              |                     |
|                     | #60                                                                        | $\frac{W_1}{W_p}$ | <u>83.16 ± 83</u> | <u>1.0</u>       | <u>83</u>            | 0.250              |                     |
|                     | #100                                                                       | $\frac{W_1}{W_p}$ | <u>74.80 ± 75</u> | <u>1.0</u>       | <u>75</u>            | 0.150              |                     |
|                     | #200                                                                       | $\frac{W_1}{W_p}$ | <u>61.97 ± 62</u> | <u>1.0</u>       | <u>62</u>            | 0.075              |                     |
| #270                | $\frac{W_1}{W_p}$                                                          |                   |                   |                  | 0.053                |                    |                     |

WHERE:

W<sub>o</sub> = Air Dry (gm)  
W<sub>s</sub> = Oven Dry (gm)  
W<sub>w</sub> = Water Wt. (gm)  
H = Hydrometer Reading  
C = Temp. Correction Factor  
R = Corrected Hydrom. Reading  
P<sub>p</sub> = % Samp. Retained on Sieve  
P<sub>p</sub> = % Sample Passing Sieve  
W<sub>i</sub> = Wt. Retained on Sieve (gm)  
S = % Total Sample Passing #10 Sieve  
W<sub>p</sub> = Wt. Passing Sieve (gm)

LOG. NO. MTS 47

## 24 HOUR HYDROMETER ANALYSIS

$$P = \frac{R_a}{W_s} \times 100$$

$$d = d_i \times K_L \times K_G \times K_v$$

WHERE :

P = % Soil in Suspension  
 R = Corrected Hydrometer Reading  
 a = Constant - Depending on Specific Gravity  
 W<sub>s</sub> = Oven Dry Weight of Test Sample  
 H = Hydrometer Reading, Uncorrected  
 C = Correction Factor for Temperature  
 S = % Total Sample Passing #10 Sieve  
 S<sub>i</sub> = % Total Sample Passing

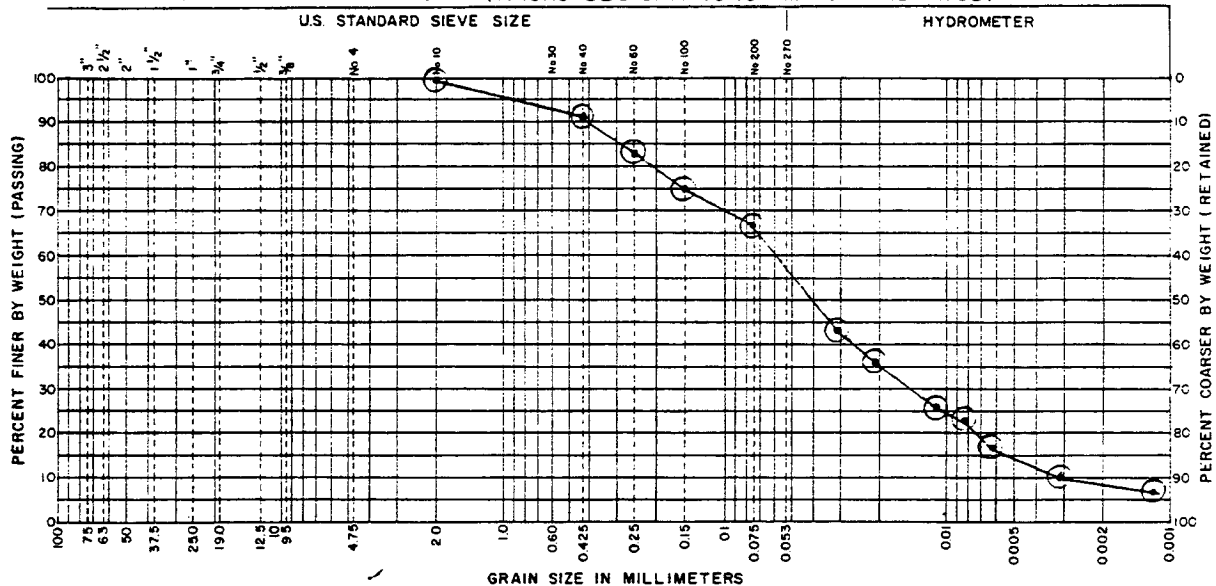
WHERE :

d = Corrected Grain Diameter  
 d<sub>i</sub> = Max. Grain Dia. Under Assumed Conditions  
 K<sub>L</sub> = Correction for Elevation of Hydrometer (H)  
 K<sub>G</sub> = Correction for Variation of Specific Gravity  
 K<sub>v</sub> = Correction for Variation of Viscosity of Suspending Medium.

a = 0.982 W<sub>s</sub> = 53.85 % Total Sample Passing #10 (S) 100 Sp. Gr. 2.73

| TEMP<br>°F | (H + C = R) × $\frac{100a}{W_s}$ = P × $\frac{S_i}{100}$ = S <sub>i</sub> | OBS.<br>TIME | T<br>MIN. | d <sub>i</sub> × K <sub>L</sub> × K <sub>G</sub> × K <sub>v</sub> = d |
|------------|---------------------------------------------------------------------------|--------------|-----------|-----------------------------------------------------------------------|
|            | -                                                                         |              | 30 sec    | .081                                                                  |
|            | -                                                                         |              | 1         | .057                                                                  |
| 79         | 28.0 - 4.5 23.5 1.824 42.9 43                                             |              | 2         | .040 .852 .0364 .031                                                  |
| 79         | 24.0 - 4.5 19.5 35.6 36                                                   |              | 5         | .026 .876 .0237 .021                                                  |
|            | -                                                                         |              |           |                                                                       |
| 79         | 19.0 - 4.5 14.5 26.4 26                                                   |              | 15        | .015 .905 .0137 .012                                                  |
| 79         | 17.0 - 4.5 12.5 22.8 23                                                   |              | 30        | .010 .915 .0091 .0083                                                 |
| 79         | 14.0 - 4.5 9.5 17.3 17                                                    |              | 60        | .0074 .930 .0067 .0062                                                |
| 80         | 10.0 - 4.3 5.7 10.4 10                                                    |              | 250       | .0036 .950 .0033 .0031                                                |
|            | -                                                                         |              |           |                                                                       |
| 77         | 9.0 - 4.3 4.1 1.824 7.4 7                                                 |              | 1440      | .0015 .955 .0014 .0013                                                |

## MECHANICAL ANALYSIS (AASHTO DESIGNATIONS M.146 AND T.88)



| GRAVEL |        |      | SAND   |      | SILT | CLAY |
|--------|--------|------|--------|------|------|------|
| COARSE | MEDIUM | FINE | COARSE | FINE |      |      |

% SOIL MORTAR = READING FROM CURVE ÷  $\frac{S_i}{100}$

REMARKS: 0.005 = 16.8 ÷ 1.02 17

**SHRP PROFICIENCY SAMPLES  
FOR RESILIENT MODULUS TESTING  
OF UNBOUNDED MATERIAL  
(Gradation)**

| Sieve Size | Total % Passing |
|------------|-----------------|
| 1.5"       | 100             |
| 1"         | 82              |
| 3/4"       | 73              |
| 1/2"       | 61              |
| 3/8"       | 52              |
| #4         | 39              |
| #8         | 27              |
| #16        | 21              |
| #30        | 15              |
| #50        | 10              |
| #100       | 8               |
| #200       | 6               |

AASHTO Soil Classification

Unified Soil Classification

A-1-a

GW-GM

PLASTIC INDEX  
np

| Material Identification | Specific Gravity of<br>Material Passing #4 | Specific Gravity of<br>Material Retained on #4 |
|-------------------------|--------------------------------------------|------------------------------------------------|
| Watsonville             | 2.777                                      | 2.865                                          |
| Pleasanton              | 2.713                                      | 2.748                                          |

# APPENDIX II

**SHRP Moisture Content  
Proficiency Sample  
Program**

# **S.H.R.P. Moisture - Content Proficiency Sample Program**

## **CONTENTS**

### **Correspondence Document**

The correspondence document that was mailed to the 17 laboratories participating in the S.H.R.P. Moisture Content Proficiency Sample Program, consists of an Instruction page, a copy of the Standard Test method, and a Data sheet to be used for recording test results.

\* Although only 17 complete samples were distributed by AMRL, (17 laboratories participated in the Proficiency Sample Program) 20 complete samples were prepared, leaving 3 complete samples to serve as replacements in case of loss or damage during shipment. As a result, the following report reflects the in-house data recorded for 20 complete samples. (A complete sample is defined as 16 Sets of 3 sub-samples each, with one Set coming from each of the 16 Sample Types).

## **Section 1 - Master Identification Record**

### **Laboratory Identification Sheet**

This sheet identifies each laboratory participating in the program. Each laboratory was assigned a number which is used to identify and trace the laboratories data.

### **Test Sample Splitting Procedure**

This document illustrates the process used to split the material from the Split A or Split B portion to yield 64 sub-samples. Each of the 4 Primary materials was blended and then split into 2 approximately equal portions. Each of these portions was then split to yield 2 portions, one half being identified as Split A, and the other half being identified as Split B. Each of the splits, (Split A or Split B) was then split to yield 64 sub-samples. Each laboratory was shipped 3 randomly selected sub-samples from the 64 sub-samples. (3 sub-samples constitute one Set for a particular material type).

### **Sample Type Identification Sheet**

This document describes the attributes of each of the 16 different sample types. It also identifies the four primary materials that were used to in preparing the samples. Each laboratory was shipped one set, (3 sub-samples) from each of the 16 Sample Types.

Each Sample Type is described by the following criteria:

- \* Primary material type. (Aggregate 1 or Aggregate 2, Soil 1 or Soil 2)
- \* Which half of the split the sample originated from. (Split A or Split B)
- \* Moisture condition of the material. (Air dry, Plastic Limit or Saturated Surface Dry).

To approximate the plastic limit or saturated surface dry condition, the following moisture contents were added to the air dry samples:

- \* Aggregate 1 -->  $2.00 \pm .04\%$  moisture.
- \* Aggregate 2 -->  $3.00 \pm .04\%$  moisture.
- \* Soil 1 -->  $15.00 \pm .04\%$  moisture.
- \* Soil 2 -->  $25.00 \pm .04\%$  moisture.

#### Laboratory Sub-Sample Identification Sheet

These sheets identify the 3 randomly selected sub-samples that were assigned to each laboratory for a particular sample type. The sub-samples that each laboratory received are identified by sample type number and the letter a, b or c on the data sheets. The sheets also identify the proper set testing sequence for that set of 3 sub-samples. The numbers were assigned using the Lotus random number generator function.

Example: For Sample Type No. 1, Laboratory No. 1 was assigned sub-sample No.'s 12, 42 and 57. These 3 sub-samples are identified as Sample#'s 1a, 1b and 1c respectively. These 3 sub-samples were labeled Set #11, meaning that from the total group of 16 sets received by the laboratory, Sample Type No. 1 would be the eleventh set tested.

#### Laboratory Set Testing Sequence Table

This table shows the Set Testing Sequence for all of the laboratories. There is a column for each sample type and a row for each laboratory.

## Section 2 - Master Data Record

### Master Data Record

These are the data tables used to record the mass and the amount of moisture added to the sub-samples prepared by AMRL. These data sheets may be compared with the Returned Data Sheets shown in Section 3.

## Section 3 - Returned Data Sheets

### Returned Data Sheets

These data sheets were filled out by participating laboratories and returned to AMRL.

### Returned Tare Weights

\* Note that Laboratory No.'s 3, 7, 9, 10, 11, 13 and 19 did not comply with the request to record the tare weights of the bags on the back of the Data Sheet.

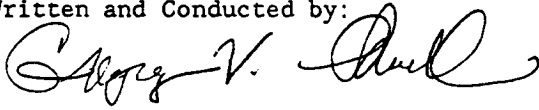
\* When comparing the respective masses of the sub-samples on the Master Data Sheets with the masses of the sub-samples submitted from the laboratories on the Returned Data Sheets, it appears that some of the laboratories may not have used the entire sub-sample when testing for moisture content.

### Errors in processing

Note 1: Laboratory No. 15 received two sets identified as Set #1. The Set containing Sub-Samples 9a, 9b and 9c was inadvertently identified as Set #1 when it should have been Set #3. The situation was explained to the laboratory prior to testing and is considered resolved.

Note 2: Laboratory No. 11, Set 8, Sample 9b had an excessive amount of moisture added to the sample. This error is reflected in the laboratories returned data sheet.

Written and Conducted by:

A handwritten signature in black ink, appearing to read "Gregory V. Uherek". The signature is fluid and cursive, with the first name "Gregory" being more prominent.

Gregory V. Uherek, AMRL Research Associate  
October, 1990

## **Correspondence Document**

Date

Name of laboratory manager  
Laboratory name and address

Subject: SHRP Moisture Content Proficiency Test Samples

Dear (insert name):

SHRP has engaged the AASHTO Materials Reference Laboratory to prepare and distribute proficiency test samples for moisture content determination. In connection with this effort, we are sending two boxes containing 16 sets of material to your laboratory. Each set of material is identified with a Set Number from 1 to 16 and contains three double-bagged test samples identified with a Sample Number. The two boxes you receive should contain forty-eight test samples (16 sets containing 3 samples each).

Please determine the moisture content of each sample in accordance with Section 5 of AASHTO T265-86. A copy of this standard is attached for your convenience. Test each set individually and in numerical order according to the Set Number (i.e. Begin testing with Set Number 1 and end testing with Set Number 16.). Do not open the bags containing a test sample until the test sample is ready to be tested. Opening the sample bags too soon may affect the moisture content of the samples.

Please use the enclosed data sheet to record your test results. (Additional copies of this letter, test method T265 and the data sheet have been included in each box of material being sent to your laboratory.) Set and Sample Numbers have been entered in the appropriate columns on the data sheet and are exclusive to your laboratory. Record all weights to the nearest 0.1 g and calculate and report the moisture content to the nearest 0.01%. After testing record the weight of the bag containing each sample and the applicable Set and Sample Number on the back of the data sheet.

Please test all samples as soon as possible, but no later than thirty days after receipt, and return a completed data sheet: Gregory Uherek, AASHTO Materials Reference Laboratory, Building 226, Room A365, Gaithersburg, Maryland 20899.

If you have any questions, or if the samples received are damaged or incomplete, please contact Greg Uherek at (301) 975-6704.

Sincerely,

Peter A. Spellerberg, Assistant Manager  
AASHTO Materials Reference Laboratory

Enclosures

## Standard Method of Test for

### Laboratory Determination of Moisture Content of Soils

AASHTO DESIGNATION: T 265-86

(ASTM DESIGNATION: D 2216-71 (1980))

#### SCOPE

- 1.1 This method covers the laboratory determination of the moisture content of soil.
- 1.2 The following applies to all specified limits in this standard: For the purposes of determining conformance with these specifications, an observed value or a calculated value shall be rounded off "to the nearest unit" in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of AASHTO R-11, Recommended Practice For Indicating Which Places Of Figures Are To Be Considered Significant in Specified Limiting Values.

#### 1. DEFINITION

- 2.1 *Moisture or Water Content of a Soil*.—The ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the solid particles. Practical application is to determine the weight of water removed by drying the moist soil to a constant weight in a drying oven controlled at  $230 \pm 9^\circ\text{F}$  ( $110 \pm 5^\circ\text{C}$ ) and to use this value as the weight of water in the given soil mass. The weight of soil remaining after oven-drying is used as the weight of the solid particles.

#### APPARATUS

- 3.1 *Drying Oven*, thermostatically-controlled, preferably of the forced-draft type, capable of being heated continuously at a temperature of  $230 \pm 9^\circ\text{F}$  ( $110 \pm 5^\circ\text{C}$ ).
- 3.2 *Balance*.—The balance shall conform to the requirements of AASHTO M 231, for the class of general purpose balance required for the principal sample weight of the sample being prepared.
- 3.3 *Containers*.—Suitable containers made of material resistant to corrosion and not subject to change in weight or disintegration on repeated heating and cooling. Containers shall have close-fitting lids to prevent loss of moisture from samples before initial weighing and to prevent absorption of moisture from the atmosphere following drying and before final weighing. One container is needed for each moisture content determination.

#### TEST SAMPLE

- 4.1 Select a representative quantity of moist soil in the amount indicated in the method of test. If no amount is indicated, the minimum weight of the sample shall be in accordance with the following table:

| Maximum Particle Size   | Minimum Weight of Sample, g |
|-------------------------|-----------------------------|
| No. 40 (0.425 mm) sieve | 10                          |
| No. 4 (4.75 mm) sieve   | 100                         |
| 1/4 in. (12.5 mm)       | 300                         |
| 1 in. (25.0 mm)         | 500                         |
| 2 in. (50 mm)           | 1000                        |

#### 5. PROCEDURE

- 5.1 Weigh a clean, dry container with its lid, and place the moisture content sample in the container. Replace the lid immediately, and weigh the container, including the lid and the moist sample. Remove the lid and place the container with the moist sample in the drying oven maintained at a temperature of  $230 \pm 9^\circ\text{F}$  ( $110 \pm 5^\circ\text{C}$ ) and dry to a constant weight (Notes 1 and 2). Immediately upon removal from the oven, place the lid and allow the sample to cool to room temperature. Weigh the container including the lid and the dried sample (Notes 3 and 4).

NOTE 1.—Checking every moisture content sample to determine that it is dried to a constant weight is impractical. In most cases, drying of a moisture content sample overnight (15 or 16 h) is sufficient. In cases where there is doubt concerning the adequacy of overnight drying, drying should be continued until the weights after two successive periods of drying indicate no change in weight. Samples of sand may often be dried to constant weight in a period of several hours. Since dry soil may absorb moisture from wet samples, dried samples should be removed before placing wet samples in the oven.

NOTE 2.—Oven-drying at  $230 \pm 9^\circ\text{F}$  ( $110 \pm 5^\circ\text{C}$ ) does not result in reliable moisture content values for soil containing gypsum or other minerals having loosely bound water of hydration or for soil containing significant amounts of organic material. Reliable moisture content values for these soils can be obtained by drying in an oven at approximately  $140^\circ\text{F}$  ( $60^\circ\text{C}$ ), or by vacuum desiccation at a pressure of approximately 10 mm Hg and at a temperature not lower than  $73^\circ\text{F}$  ( $23^\circ\text{C}$ ).

NOTE 3.—A container without a lid may be used provided the moist sample is weighed immediately after being taken and providing the dried sample is weighed immediately after being removed from the oven or after cooling in a desiccator.

NOTE 4.—Moisture content samples should be discarded and should not be used in any other tests.

#### 6. CALCULATION

- 6.1 Calculate the moisture content of the soil as follows:

$$w = \frac{[(\text{weight of moisture})/(\text{weight of oven-dry soil})] \times 100 = [(W_1 - W_2)/(W_2 - W_3)] \times 100$$

where:

$w$  = moisture content, %

$W_1$  = weight of container and moist soil, g.

$W_2$  = weight of container and oven-dried soil, g. and

$W_3$  = weight of container, g.

- 6.2 Calculate the percent of moisture content to the nearest 0.1 percent.

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Laboratory Name \_\_\_\_\_

Laboratory No. \_\_\_\_\_

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 5a      | _____                  | _____               | _____                | 9    | 10a     | _____                  | _____               | _____                |
|      | 5b      | _____                  | _____               | _____                |      | 10b     | _____                  | _____               | _____                |
|      | 5c      | _____                  | _____               | _____                |      | 10c     | _____                  | _____               | _____                |
| 2    | 3a      | _____                  | _____               | _____                | 10   | 6a      | _____                  | _____               | _____                |
|      | 3b      | _____                  | _____               | _____                |      | 6b      | _____                  | _____               | _____                |
|      | 3c      | _____                  | _____               | _____                |      | 6c      | _____                  | _____               | _____                |
| 3    | 12a     | _____                  | _____               | _____                | 11   | 1a      | _____                  | _____               | _____                |
|      | 12b     | _____                  | _____               | _____                |      | 1b      | _____                  | _____               | _____                |
|      | 12c     | _____                  | _____               | _____                |      | 1c      | _____                  | _____               | _____                |
| 4    | 13a     | _____                  | _____               | _____                | 12   | 8a      | _____                  | _____               | _____                |
|      | 13b     | _____                  | _____               | _____                |      | 8b      | _____                  | _____               | _____                |
|      | 13c     | _____                  | _____               | _____                |      | 8c      | _____                  | _____               | _____                |
| 5    | 4a      | _____                  | _____               | _____                | 13   | 2a      | _____                  | _____               | _____                |
|      | 4b      | _____                  | _____               | _____                |      | 2a      | _____                  | _____               | _____                |
|      | 4c      | _____                  | _____               | _____                |      | 2c      | _____                  | _____               | _____                |
| 6    | 15a     | _____                  | _____               | _____                | 14   | 16a     | _____                  | _____               | _____                |
|      | 15b     | _____                  | _____               | _____                |      | 16b     | _____                  | _____               | _____                |
|      | 15c     | _____                  | _____               | _____                |      | 16c     | _____                  | _____               | _____                |
| 7    | 14a     | _____                  | _____               | _____                | 15   | 11a     | _____                  | _____               | _____                |
|      | 14b     | _____                  | _____               | _____                |      | 11b     | _____                  | _____               | _____                |
|      | 14c     | _____                  | _____               | _____                |      | 11c     | _____                  | _____               | _____                |
| 8    | 9a      | _____                  | _____               | _____                | 16   | 7a      | _____                  | _____               | _____                |
|      | 9b      | _____                  | _____               | _____                |      | 7b      | _____                  | _____               | _____                |
|      | 9c      | _____                  | _____               | _____                |      | 7c      | _____                  | _____               | _____                |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: \_\_\_\_\_

Checked and Approved, Date: \_\_\_\_\_

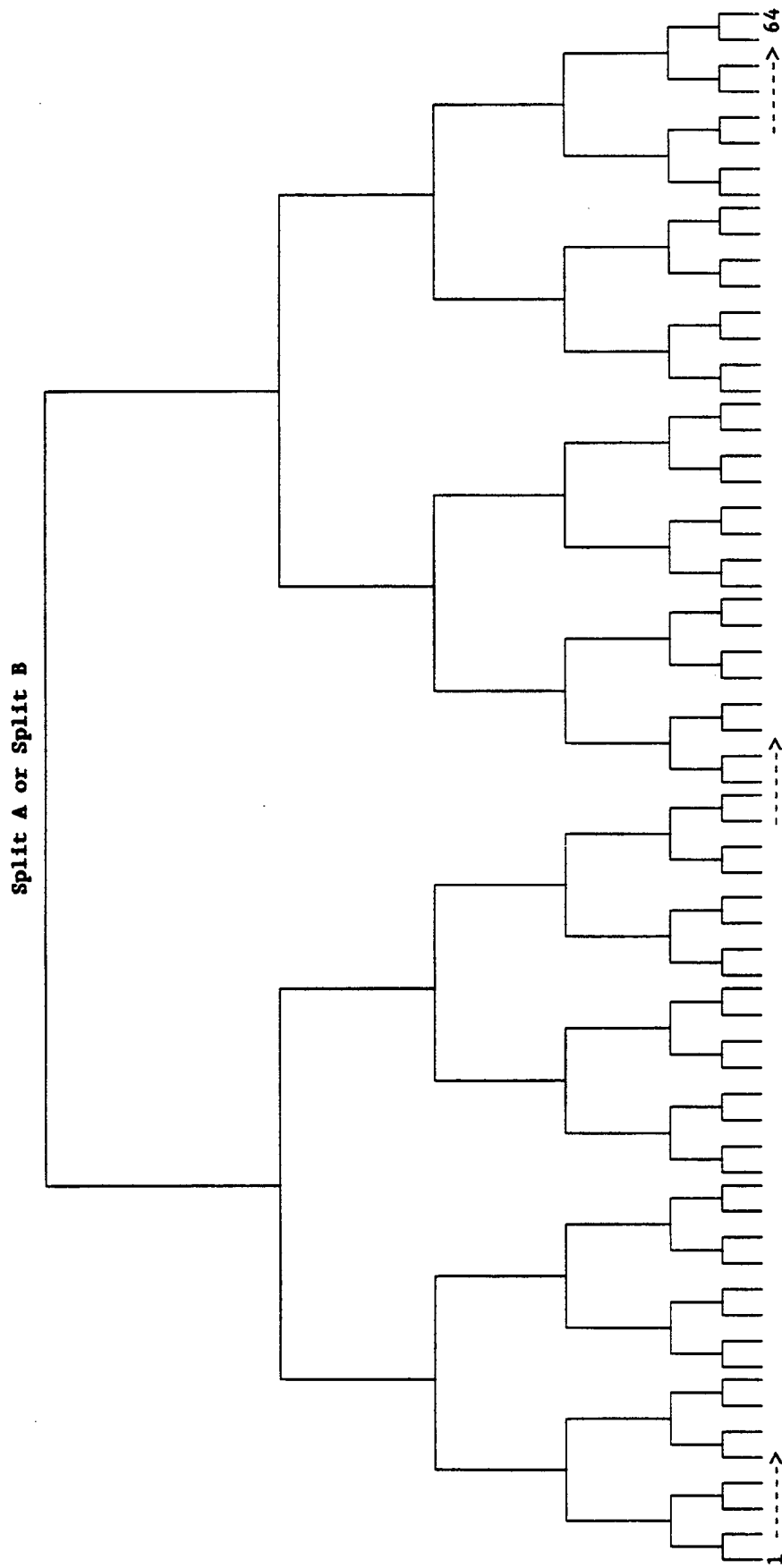
## **Section 1**

# **Master Identification Record**

S.H.R.P. MOISTURE CONTENT PROFICIENCY SAMPLE PROGRAM  
Participating Laboratories

|                                                                                             |
|---------------------------------------------------------------------------------------------|
| Braun Engineering Testing, Inc.<br>Minneapolis, Minnesota 55435                             |
| California Department of Transportation<br>Sacramento, California 95819                     |
| Federal Highway Administration<br>Denver, Colorado 80225                                    |
| Florida Department of Transportation<br>Gainesville, Florida 32602                          |
| Iowa Department of Transportation<br>Ames, Iowa 50010                                       |
| Kansas Department of Transportation<br>Topeka, Kansas 66611                                 |
| Law Engineering<br>Atlanta, Georgia 30324                                                   |
| Maryland State Highway Administration<br>Brooklandville, Maryland 21022                     |
| Minnesota Department of Transportation<br>Maplewood, Minnesota 55109                        |
| Nevada Department of Transportation<br>Carson City, Nevada 89712                            |
| Oregon State Highway Division<br>Salem, Oregon 97310                                        |
| PSI<br>Pittsburgh, Pennsylvania 15220                                                       |
| Southwestern Laboratories<br>Houston, Texas 77249                                           |
| Texas State Department of Highways and<br>Public Transportation<br>Austin, Texas 78731-6033 |
| University of Nevada-Reno<br>Reno, Nevada 89557-0030                                        |
| West Virginia Department of Transportation<br>Charleston, West Virginia 25311               |
| Western Technologies Inc.<br>Phoenix, Arizona 85036                                         |

**S.H.R.P. Moisture Content Proficiency Sample Program  
Test Sample Splitting Procedure**



THE BOTTOM ROW OF THE DIAGRAM REPRESENTS THE 64 SUB-SAMPLES AS SPLIT FROM THE ORIGINAL TEST SAMPLE.  
EACH PARTICIPATING LABORATORY WILL RECEIVE 3 RANDOMLY SELECTED SUB-SAMPLES.

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Sample Type Identification Sheet**

**SAMPLE TYPE NO.**

**SAMPLE DESCRIPTION**

- |         |                                          |
|---------|------------------------------------------|
| 1.....  | Aggregate 1, Split A, SSD Condition      |
| 2.....  | Aggregate 1, Split B, SSD Condition      |
| 3.....  | Aggregate 2, Split A, SSD Condition      |
| 4.....  | Aggregate 2, Split B, SSD Condition      |
| 5.....  | Aggregate 1, Split A, Air Dry Condition  |
| 6.....  | Aggregate 1, Split B, Air Dry Condition  |
| 7.....  | Aggregate 2, Split A, Air Dry Condition  |
| 8.....  | Aggregate 2, Split B, Air Dry Condition  |
| 9.....  | Soil 1, Split A, Plastic Limit Condition |
| 10..... | Soil 1, Split B, Plastic Limit Condition |
| 11..... | Soil 2, Split A, Plastic Limit Condition |
| 12..... | Soil 2, Split B, Plastic Limit Condition |
| 13..... | Soil 1, Split A, Air Dry Condition       |
| 14..... | Soil 1, Split B, Air Dry Condition       |
| 15..... | Soil 2, Split A, Air Dry Condition       |
| 16..... | Soil 2, Split B, Air Dry Condition       |

**PRIMARY**

**MATERIALS USED**

**Aggregate 1** - Watsonville, Supplied by University of Reno, Nevada  
**Aggregate 2** - Pleasonton, Supplied by University of Reno, Nevada

**Soil 1** - \*\*, Supplied by the Department of Highways, Maryland  
**Soil 2** - \*\*, Supplied by the Department of Highways, Maryland

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 1**

Aggregate No. 1, Split A, Saturated - Surface - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 12           | 42           | 57           | 11           |
| 2              | 64           | 10           | 59           | 10           |
| 3              | 8            | 36           | 38           | 1            |
| 4              | 6            | 39           | 7            | 14           |
| 5              | 46           | 3            | 21           | 2            |
| 6              | 35           | 1            | 13           | 12           |
| 7              | 37           | 25           | 9            | 12           |
| 8              | 17           | 61           | 20           | 7            |
| 9              | 31           | 27           | 16           | 7            |
| 10             | 14           | 15           | 41           | 6            |
| 11             | 29           | 2            | 52           | 1            |
| 12             | 47           | 56           | 18           | 1            |
| 13             | 44           | 48           | 54           | 13           |
| 14             | 49           | 50           | 45           | 10           |
| 15             | 43           | 26           | 19           | 12           |
| 16             | 32           | 51           | 4            | 10           |
| 17             | 30           | 24           | 28           | 15           |
| 18             | 34           | 53           | 58           | 15           |
| 19             | 11           | 55           | 5            | 8            |
| 20             | 62           | 33           | 60           | 8            |

REMAINDERS : 23, 22, 40, 63

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 2**

Aggregate No. 1, Split B, Saturated - Surface - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 40           | 46           | 15           | 13           |
| 2              | 52           | 18           | 13           | 8            |
| 3              | 34           | 22           | 26           | 8            |
| 4              | 36           | 20           | 43           | 8            |
| 5              | 57           | 33           | 23           | 10           |
| 6              | 51           | 19           | 2            | 4            |
| 7              | 6            | 49           | 4            | 1            |
| 8              | 50           | 48           | 27           | 11           |
| 9              | 7            | 37           | 16           | 12           |
| 10             | 25           | 29           | 41           | 15           |
| 11             | 47           | 45           | 60           | 11           |
| 12             | 14           | 5            | 38           | 9            |
| 13             | 21           | 9            | 61           | 2            |
| 14             | 3            | 39           | 64           | 16           |
| 15             | 24           | 31           | 12           | 1            |
| 16             | 58           | 11           | 42           | 15           |
| 17             | 1            | 32           | 30           | 3            |
| 18             | 56           | 53           | 63           | 11           |
| 19             | 54           | 35           | 44           | 4            |
| 20             | 55           | 59           | 28           | 14           |

REMAINDERS : 8, 17, 62, 10

**S.H.R.P. Moisture Content Proficiency Sample Program  
Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 3**

Aggregate No. 2, Split A, Saturated - Surface - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 36           | 37           | 52           | 2            |
| 2              | 18           | 13           | 19           | 2            |
| 3              | 26           | 40           | 31           | 6            |
| 4              | 11           | 47           | 33           | 2            |
| 5              | 39           | 29           | 20           | 9            |
| 6              | 45           | 12           | 28           | 5            |
| 7              | 41           | 7            | 50           | 11           |
| 8              | 5            | 63           | 23           | 13           |
| 9              | 64           | 54           | 24           | 13           |
| 10             | 2            | 48           | 22           | 8            |
| 11             | 3            | 9            | 30           | 6            |
| 12             | 14           | 25           | 60           | 13           |
| 13             | 59           | 6            | 10           | 7            |
| 14             | 8            | 4            | 32           | 11           |
| 15             | 44           | 62           | 34           | 5            |
| 16             | 46           | 55           | 15           | 6            |
| 17             | 1            | 58           | 61           | 12           |
| 18             | 43           | 51           | 17           | 9            |
| 19             | 42           | 57           | 35           | 15           |
| 20             | 38           | 53           | 16           | 9            |

REMAINDERS : 56, 49, 21, 27

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 4**

Aggregate No. 2, Split B, Saturated - Surface - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 17           | 49           | 18           | 5            |
| 2              | 19           | 35           | 28           | 12           |
| 3              | 63           | 4            | 13           | 10           |
| 4              | 23           | 43           | 33           | 12           |
| 5              | 42           | 56           | 14           | 14           |
| 6              | 47           | 50           | 1            | 1            |
| 7              | 58           | 38           | 40           | 7            |
| 8              | 9            | 36           | 7            | 10           |
| 9              | 20           | 16           | 22           | 8            |
| 10             | 53           | 26           | 10           | 12           |
| 11             | 30           | 51           | 12           | 12           |
| 12             | 57           | 45           | 55           | 14           |
| 13             | 44           | 59           | 11           | 3            |
| 14             | 39           | 32           | 61           | 15           |
| 15             | 6            | 41           | 25           | 8            |
| 16             | 2            | 62           | 27           | 14           |
| 17             | 64           | 8            | 24           | 5            |
| 18             | 21           | 46           | 3            | 7            |
| 19             | 60           | 48           | 34           | 13           |
| 20             | 15           | 29           | 37           | 5            |

REMAINDERS : 31, 52, 5, 54

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 5**

Aggregate No. 1, Split A, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 8            | 1            | 3            | 1            |
| 2              | 16           | 49           | 27           | 16           |
| 3              | 9            | 38           | 34           | 7            |
| 4              | 35           | 7            | 57           | 10           |
| 5              | 23           | 60           | 59           | 16           |
| 6              | 14           | 44           | 24           | 16           |
| 7              | 47           | 29           | 39           | 6            |
| 8              | 25           | 32           | 41           | 3            |
| 9              | 30           | 19           | 33           | 9            |
| 10             | 20           | 2            | 58           | 2            |
| 11             | 31           | 54           | 61           | 15           |
| 12             | 45           | 26           | 51           | 8            |
| 13             | 40           | 11           | 37           | 1            |
| 14             | 55           | 21           | 4            | 2            |
| 15             | 43           | 36           | 42           | 10           |
| 16             | 5            | 52           | 13           | 13           |
| 17             | 17           | 22           | 28           | 2            |
| 18             | 48           | 64           | 46           | 6            |
| 19             | 15           | 12           | 63           | 6            |
| 20             | 10           | 18           | 6            | 12           |

REMAINDERS : 56, 53, 62, 50

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 6**

Aggregate No. 1, Split B, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 29           | 26           | 27           | 10           |
| 2              | 58           | 28           | 15           | 13           |
| 3              | 6            | 21           | 20           | 4            |
| 4              | 47           | 17           | 30           | 13           |
| 5              | 44           | 62           | 45           | 3            |
| 6              | 13           | 55           | 3            | 13           |
| 7              | 38           | 23           | 14           | 5            |
| 8              | 16           | 18           | 11           | 16           |
| 9              | 35           | 37           | 12           | 3            |
| 10             | 54           | 41           | 56           | 5            |
| 11             | 50           | 48           | 33           | 2            |
| 12             | 2            | 4            | 8            | 7            |
| 13             | 61           | 59           | 60           | 10           |
| 14             | 24           | 51           | 5            | 9            |
| 15             | 25           | 40           | 32           | 7            |
| 16             | 39           | 22           | 34           | 12           |
| 17             | 36           | 49           | 46           | 4            |
| 18             | 53           | 52           | 43           | 1            |
| 19             | 7            | 9            | 1            | 2            |
| 20             | 64           | 19           | 31           | 15           |

REMAINDERS : 57, 63, 42, 10

**S.H.R.P. Moisture Content Proficiency Sample Program  
Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 7**

Aggregate No. 2, Split A, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 26           | 22           | 12           | 16           |
| 2              | 8            | 60           | 20           | 11           |
| 3              | 59           | 47           | 30           | 3            |
| 4              | 2            | 29           | 33           | 5            |
| 5              | 25           | 19           | 45           | 13           |
| 6              | 32           | 53           | 49           | 3            |
| 7              | 54           | 24           | 38           | 16           |
| 8              | 21           | 48           | 39           | 6            |
| 9              | 17           | 31           | 61           | 2            |
| 10             | 46           | 4            | 62           | 11           |
| 11             | 57           | 37           | 56           | 7            |
| 12             | 41           | 50           | 43           | 11           |
| 13             | 10           | 51           | 34           | 8            |
| 14             | 6            | 40           | 11           | 7            |
| 15             | 52           | 16           | 5            | 6            |
| 16             | 35           | 44           | 42           | 8            |
| 17             | 28           | 27           | 58           | 14           |
| 18             | 36           | 15           | 18           | 12           |
| 19             | 23           | 7            | 64           | 10           |
| 20             | 1            | 55           | 9            | 13           |

REMAINDERS : 13, 63, 14, 3

# S.H.R.P. Moisture Content Proficiency Sample Program

## Laboratory Sub-Sample Identification Sheet

### SAMPLE TYPE NO. 8

Aggregate No. 2, Split B, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 33           | 27           | 36           | 12           |
| 2              | 26           | 52           | 40           | 6            |
| 3              | 3            | 2            | 4            | 15           |
| 4              | 57           | 15           | 38           | 6            |
| 5              | 61           | 59           | 34           | 11           |
| 6              | 12           | 6            | 64           | 2            |
| 7              | 42           | 11           | 56           | 15           |
| 8              | 23           | 37           | 21           | 5            |
| 9              | 53           | 55           | 1            | 11           |
| 10             | 58           | 13           | 8            | 3            |
| 11             | 17           | 62           | 18           | 5            |
| 12             | 25           | 41           | 28           | 10           |
| 13             | 22           | 16           | 10           | 4            |
| 14             | 14           | 5            | 20           | 8            |
| 15             | 49           | 31           | 50           | 16           |
| 16             | 51           | 9            | 24           | 4            |
| 17             | 60           | 48           | 29           | 1            |
| 18             | 35           | 39           | 47           | 16           |
| 19             | 43           | 44           | 19           | 5            |
| 20             | 45           | 32           | 7            | 10           |

REMAINDERS : 54, 30, 63, 46

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 9**

Soil No. 1, Split A, Plastic - Limit Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 51           | 59           | 31           | 8            |
| 2              | 56           | 40           | 26           | 1            |
| 3              | 29           | 7            | 30           | 2            |
| 4              | 46           | 57           | 32           | 3            |
| 5              | 18           | 34           | 45           | 8            |
| 6              | 8            | 11           | 50           | 8            |
| 7              | 47           | 37           | 38           | 2            |
| 8              | 44           | 62           | 63           | 1            |
| 9              | 48           | 2            | 35           | 15           |
| 10             | 41           | 42           | 52           | 7            |
| 11             | 55           | 3            | 5            | 8            |
| 12             | 64           | 49           | 14           | 15           |
| 13             | 61           | 54           | 17           | 14           |
| 14             | 43           | 25           | 53           | 5            |
| 15             | 12           | 20           | 15           | 3            |
| 16             | 4            | 1            | 10           | 1            |
| 17             | 28           | 27           | 39           | 9            |
| 18             | 9            | 58           | 16           | 14           |
| 19             | 33           | 19           | 60           | 12           |
| 20             | 23           | 13           | 24           | 1            |

REMAINDERS : 21, 22, 36, 6

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 10**

Soil No. 1, Split B, Plastic - Limit Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 2            | 21           | 3            | 9            |
| 2              | 17           | 16           | 55           | 14           |
| 3              | 28           | 19           | 62           | 11           |
| 4              | 40           | 47           | 38           | 1            |
| 5              | 10           | 20           | 29           | 6            |
| 6              | 61           | 6            | 43           | 7            |
| 7              | 4            | 52           | 31           | 3            |
| 8              | 9            | 14           | 26           | 8            |
| 9              | 41           | 35           | 44           | 1            |
| 10             | 18           | 33           | 5            | 1            |
| 11             | 13           | 54           | 36           | 9            |
| 12             | 34           | 60           | 59           | 16           |
| 13             | 42           | 53           | 50           | 16           |
| 14             | 58           | 24           | 25           | 12           |
| 15             | 11           | 56           | 23           | 11           |
| 16             | 30           | 32           | 8            | 7            |
| 17             | 22           | 12           | 7            | 10           |
| 18             | 27           | 39           | 37           | 13           |
| 19             | 57           | 51           | 63           | 3            |
| 20             | 48           | 46           | 1            | 3            |

REMAINDERS : 45, 64, 49, 15

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 11**

Soil No. 2, Split A, Plastic - Limit Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 60           | 11           | 6            | 15           |
| 2              | 64           | 37           | 55           | 15           |
| 3              | 59           | 12           | 14           | 12           |
| 4              | 26           | 18           | 25           | 16           |
| 5              | 33           | 40           | 3            | 4            |
| 6              | 8            | 58           | 17           | 6            |
| 7              | 44           | 48           | 2            | 8            |
| 8              | 20           | 1            | 45           | 4            |
| 9              | 31           | 38           | 41           | 4            |
| 10             | 28           | 5            | 49           | 9            |
| 11             | 47           | 4            | 52           | 16           |
| 12             | 23           | 61           | 15           | 3            |
| 13             | 30           | 24           | 57           | 5            |
| 14             | 7            | 39           | 34           | 1            |
| 15             | 29           | 54           | 42           | 4            |
| 16             | 21           | 62           | 43           | 3            |
| 17             | 27           | 46           | 53           | 6            |
| 18             | 9            | 13           | 63           | 4            |
| 19             | 35           | 32           | 10           | 9            |
| 20             | 19           | 51           | 50           | 16           |

REMAINDERS : 56, 22, 36, 16

**S.H.R.P. Moisture Content Proficiency Sample Program  
Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 12**

Soil No. 2, Split B, Plastic - Limit Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 40           | 24           | 33           | 3            |
| 2              | 39           | 12           | 55           | 4            |
| 3              | 61           | 49           | 1            | 16           |
| 4              | 25           | 16           | 62           | 9            |
| 5              | 60           | 3            | 31           | 7            |
| 6              | 22           | 45           | 53           | 15           |
| 7              | 29           | 9            | 41           | 14           |
| 8              | 8            | 18           | 54           | 12           |
| 9              | 10           | 36           | 21           | 5            |
| 10             | 52           | 28           | 4            | 16           |
| 11             | 5            | 7            | 51           | 13           |
| 12             | 19           | 15           | 6            | 6            |
| 13             | 46           | 63           | 14           | 15           |
| 14             | 50           | 57           | 30           | 14           |
| 15             | 48           | 34           | 59           | 15           |
| 16             | 58           | 27           | 13           | 2            |
| 17             | 17           | 56           | 20           | 13           |
| 18             | 23           | 32           | 35           | 3            |
| 19             | 42           | 11           | 44           | 11           |
| 20             | 64           | 38           | 43           | 2            |

REMAINDERS : 26, 2, 47, 37

**S.H.R.P. Moisture Content Proficiency Sample Program  
Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 13**

Soil No. 1, Split A, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 4            | 50           | 52           | 4            |
| 2              | 35           | 27           | 34           | 5            |
| 3              | 56           | 3            | 40           | 5            |
| 4              | 21           | 32           | 10           | 4            |
| 5              | 15           | 60           | 59           | 5            |
| 6              | 39           | 47           | 12           | 11           |
| 7              | 28           | 58           | 13           | 9            |
| 8              | 8            | 31           | 53           | 2            |
| 9              | 25           | 16           | 37           | 6            |
| 10             | 55           | 20           | 44           | 4            |
| 11             | 23           | 1            | 22           | 4            |
| 12             | 6            | 45           | 19           | 4            |
| 13             | 2            | 49           | 7            | 11           |
| 14             | 61           | 36           | 26           | 3            |
| 15             | 48           | 64           | 62           | 14           |
| 16             | 11           | 9            | 17           | 9            |
| 17             | 33           | 46           | 42           | 11           |
| 18             | 41           | 51           | 24           | 2            |
| 19             | 54           | 5            | 29           | 7            |
| 20             | 63           | 14           | 43           | 6            |

REMAINDERS : 30, 38, 36, 6

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 14**

Soil No. 1, Split B, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 63           | 49           | 27           | 7            |
| 2              | 24           | 23           | 60           | 9            |
| 3              | 35           | 10           | 51           | 13           |
| 4              | 6            | 29           | 48           | 11           |
| 5              | 58           | 43           | 18           | 12           |
| 6              | 9            | 22           | 38           | 10           |
| 7              | 37           | 50           | 61           | 13           |
| 8              | 12           | 26           | 30           | 15           |
| 9              | 3            | 53           | 62           | 10           |
| 10             | 8            | 57           | 39           | 10           |
| 11             | 13           | 40           | 52           | 14           |
| 12             | 5            | 36           | 59           | 12           |
| 13             | 20           | 14           | 45           | 12           |
| 14             | 28           | 44           | 7            | 6            |
| 15             | 56           | 31           | 42           | 9            |
| 16             | 2            | 32           | 41           | 11           |
| 17             | 15           | 34           | 21           | 8            |
| 18             | 4            | 25           | 46           | 8            |
| 19             | 19           | 54           | 47           | 1            |
| 20             | 16           | 1            | 64           | 4            |

REMAINDERS : 55, 17, 33, 11

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 15**

Soil No. 2, Split A, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 51           | 6            | 17           | 6            |
| 2              | 47           | 24           | 28           | 7            |
| 3              | 60           | 26           | 15           | 14           |
| 4              | 37           | 55           | 3            | 7            |
| 5              | 18           | 54           | 29           | 15           |
| 6              | 12           | 33           | 41           | 14           |
| 7              | 22           | 53           | 32           | 4            |
| 8              | 20           | 21           | 39           | 9            |
| 9              | 5            | 8            | 35           | 14           |
| 10             | 31           | 45           | 58           | 13           |
| 11             | 10           | 46           | 4            | 10           |
| 12             | 43           | 44           | 23           | 5            |
| 13             | 11           | 48           | 19           | 9            |
| 14             | 57           | 52           | 16           | 4            |
| 15             | 13           | 56           | 14           | 2            |
| 16             | 64           | 50           | 9            | 16           |
| 17             | 61           | 7            | 1            | 16           |
| 18             | 63           | 27           | 42           | 5            |
| 19             | 36           | 59           | 30           | 16           |
| 20             | 49           | 62           | 34           | 7            |

REMAINDERS : 40, 38, 2, 25

**S.H.R.P. Moisture Content Proficiency Sample Program**  
**Laboratory Sub-Sample Identification Sheet**

**SAMPLE TYPE NO. 16**

Soil No. 2, Split B, Air - Dry Condition

| LABORATORY NO. | SUB-SAMPLE A | SUB-SAMPLE B | SUB-SAMPLE C | TESTING SEQ. |
|----------------|--------------|--------------|--------------|--------------|
| 1              | 62           | 57           | 8            | 14           |
| 2              | 40           | 20           | 35           | 3            |
| 3              | 22           | 32           | 29           | 9            |
| 4              | 63           | 5            | 53           | 15           |
| 5              | 7            | 51           | 17           | 1            |
| 6              | 59           | 4            | 13           | 9            |
| 7              | 28           | 21           | 16           | 10           |
| 8              | 3            | 48           | 36           | 14           |
| 9              | 12           | 18           | 47           | 16           |
| 10             | 34           | 49           | 56           | 14           |
| 11             | 43           | 10           | 6            | 3            |
| 12             | 41           | 58           | 26           | 2            |
| 13             | 24           | 15           | 19           | 6            |
| 14             | 23           | 25           | 27           | 13           |
| 15             | 42           | 11           | 60           | 13           |
| 16             | 61           | 31           | 1            | 5            |
| 17             | 55           | 38           | 45           | 7            |
| 18             | 14           | 54           | 52           | 10           |
| 19             | 9            | 30           | 2            | 14           |
| 20             | 39           | 44           | 37           | 11           |

REMAINDERS : 50, 64, 33, 46

**S.H.R.P. Moisture - Content Proficiency Sample Program**  
**Laboratory Set Testing Sequence Table**

| <----- SAMPLE TYPE NUMBER -----> |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| LAB#                             | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 1                                | 11 | 13 | 2  | 5  | 1  | 10 | 16 | 12 | 8  | 9  | 15 | 3  | 4  | 7  | 6  | 14 |
| 2                                | 10 | 8  | 2  | 12 | 16 | 13 | 11 | 6  | 1  | 14 | 15 | 4  | 5  | 9  | 7  | 3  |
| 3                                | 1  | 8  | 6  | 10 | 7  | 4  | 3  | 15 | 2  | 11 | 12 | 16 | 5  | 13 | 14 | 9  |
| 4                                | 14 | 8  | 2  | 12 | 10 | 13 | 5  | 6  | 3  | 1  | 16 | 9  | 4  | 11 | 7  | 15 |
| 5                                | 2  | 10 | 9  | 14 | 16 | 3  | 13 | 11 | 8  | 6  | 4  | 7  | 5  | 12 | 15 | 1  |
| 6                                | 12 | 4  | 5  | 1  | 16 | 13 | 3  | 2  | 8  | 7  | 6  | 15 | 11 | 10 | 14 | 9  |
| 7                                | 12 | 1  | 11 | 7  | 6  | 5  | 16 | 15 | 2  | 3  | 8  | 14 | 9  | 13 | 4  | 10 |
| 8                                | 7  | 11 | 13 | 10 | 3  | 16 | 6  | 5  | 1  | 8  | 4  | 12 | 2  | 15 | 9  | 14 |
| 9                                | 7  | 12 | 13 | 8  | 9  | 3  | 2  | 11 | 15 | 1  | 4  | 5  | 6  | 10 | 14 | 16 |
| 10                               | 6  | 15 | 8  | 12 | 2  | 5  | 11 | 3  | 7  | 1  | 9  | 16 | 4  | 10 | 13 | 14 |
| 11                               | 1  | 11 | 6  | 12 | 15 | 2  | 7  | 5  | 8  | 9  | 16 | 13 | 4  | 14 | 10 | 3  |
| 12                               | 1  | 9  | 13 | 14 | 8  | 7  | 11 | 10 | 15 | 16 | 3  | 6  | 4  | 12 | 5  | 2  |
| 13                               | 13 | 2  | 7  | 3  | 1  | 10 | 8  | 4  | 14 | 16 | 5  | 15 | 11 | 12 | 9  | 6  |
| 14                               | 10 | 16 | 11 | 15 | 2  | 9  | 7  | 8  | 5  | 12 | 1  | 14 | 3  | 6  | 4  | 13 |
| 15                               | 12 | 1  | 5  | 8  | 10 | 7  | 6  | 16 | 3  | 11 | 4  | 15 | 14 | 9  | 2  | 13 |
| 16                               | 10 | 15 | 6  | 14 | 13 | 12 | 8  | 4  | 1  | 7  | 3  | 2  | 9  | 11 | 16 | 5  |
| 17                               | 15 | 3  | 12 | 5  | 2  | 4  | 14 | 1  | 9  | 10 | 6  | 13 | 11 | 8  | 16 | 7  |
| 18                               | 15 | 11 | 9  | 7  | 6  | 1  | 12 | 16 | 14 | 13 | 4  | 3  | 2  | 8  | 5  | 10 |
| 19                               | 8  | 4  | 15 | 13 | 6  | 2  | 10 | 5  | 12 | 3  | 9  | 11 | 7  | 1  | 16 | 14 |
| 20                               | 8  | 14 | 9  | 5  | 12 | 15 | 13 | 10 | 1  | 3  | 16 | 2  | 6  | 4  | 7  | 11 |

## **Section 2**

### **Master Data Record**

# S.H.R.P. Master Data Sheet

Lab Name:

Laboratory No. 1

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 5a      | 873.9                    |                       | air dry                  | 9    | 10a     | 373.5                    | 429.5                 | 14.99                    |
|      | 5b      | 839.2                    |                       | air dry                  |      | 10b     | 337.0                    | 387.6                 | 15.01                    |
|      | 5c      | 800.0                    |                       | air dry                  |      | 10c     | 363.3                    | 417.8                 | 15.00                    |
| 2    | 3a      | 659.4                    | 679.1                 | 2.99                     | 10   | 6a      | 749.5                    |                       | air dry                  |
|      | 3b      | 782.6                    | 806.1                 | 3.00                     |      | 6b      | 633.6                    |                       | air dry                  |
|      | 3c      | 952.3                    | 980.9                 | 3.00                     |      | 6c      | 473.5                    |                       | air dry                  |
| 3    | 12a     | 412.5                    | 515.6                 | 24.99                    | 11   | 1a      | 833.8                    | 850.5                 | 2.00                     |
|      | 12b     | 388.8                    | 486.0                 | 25.00                    |      | 1b      | 658.7                    | 671.8                 | 1.99                     |
|      | 12c     | 537.7                    | 672.2                 | 25.01                    |      | 1c      | 1037.0                   | 1057.7                | 2.00                     |
| 4    | 13a     | 453.7                    |                       | air dry                  | 12   | 8a      | 598.3                    |                       | air dry                  |
|      | 13b     | 364.3                    |                       | air dry                  |      | 8b      | 889.7                    |                       | air dry                  |
|      | 13c     | 336.0                    |                       | air dry                  |      | 8c      | 643.4                    |                       | air dry                  |
| 5    | 4a      | 699.1                    | 720.1                 | 3.00                     | 13   | 2a      | 540.3                    | 551.2                 | 2.02                     |
|      | 4b      | 700.1                    | 721.1                 | 3.00                     |      | 2b      | 673.3                    | 686.8                 | 2.01                     |
|      | 4c      | 713.1                    | 734.5                 | 3.00                     |      | 2c      | 939.9                    | 958.7                 | 2.00                     |
| 6    | 15a     | 547.3                    |                       | air dry                  | 14   | 16a     | 449.0                    |                       | air dry                  |
|      | 15b     | 478.0                    |                       | air dry                  |      | 16b     | 417.4                    |                       | air dry                  |
|      | 15c     | 363.2                    |                       | air dry                  |      | 16c     | 334.8                    |                       | air dry                  |
| 7    | 14a     | 303.2                    |                       | air dry                  | 15   | 11a     | 351.2                    | 439.1                 | 25.03                    |
|      | 14b     | 340.6                    |                       | air dry                  |      | 11b     | 488.0                    | 610.0                 | 25.00                    |
|      | 14c     | 381.5                    |                       | air dry                  |      | 11c     | 471.7                    | 589.6                 | 25.00                    |
| 8    | 9a      | 347.3                    | 399.4                 | 15.00                    | 16   | 7a      | 1024.7                   |                       | air dry                  |
|      | 9b      | 347.1                    | 399.2                 | 15.01                    |      | 7b      | 825.2                    |                       | air dry                  |
|      | 9c      | 311.7                    | 358.5                 | 15.01                    |      | 7c      | 847.2                    |                       | air dry                  |

Lab Name:

Laboratory No. 2

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 9a      | 302.1                    | 347.4                 | 15.00                    | 9    | 14a     | 305.0                    |                       | air dry                  |
|      | 9b      | 276.9                    | 318.4                 | 14.99                    |      | 14b     | 373.4                    |                       | air dry                  |
|      | 9c      | 337.2                    | 387.8                 | 15.01                    |      | 14c     | 272.6                    |                       | air dry                  |
| 2    | 3a      | 917.6                    | 945.1                 | 3.00                     | 10   | 1a      | 917.5                    | 935.8                 | 1.99                     |
|      | 3b      | 931.2                    | 959.2                 | 3.01                     |      | 1b      | 701.4                    | 715.4                 | 2.00                     |
|      | 3c      | 917.4                    | 944.9                 | 3.00                     |      | 1c      | 881.6                    | 899.2                 | 2.00                     |
| 3    | 16a     | 467.5                    |                       | air dry                  | 11   | 7a      | 891.3                    |                       | air dry                  |
|      | 16b     | 524.0                    |                       | air dry                  |      | 7b      | 770.6                    |                       | air dry                  |
|      | 16c     | 419.7                    |                       | air dry                  |      | 7c      | 690.0                    |                       | air dry                  |
| 4    | 12a     | 383.4                    | 479.3                 | 25.01                    | 12   | 4a      | 739.1                    | 761.3                 | 3.00                     |
|      | 12b     | 413.2                    | 516.5                 | 25.00                    |      | 4b      | 698.0                    | 718.9                 | 2.99                     |
|      | 12c     | 333.7                    | 417.1                 | 24.99                    |      | 4c      | 897.1                    | 924.0                 | 3.00                     |
| 5    | 13a     | 329.4                    |                       | air dry                  | 13   | 6a      | 849.3                    |                       | air dry                  |
|      | 13b     | 341.8                    |                       | air dry                  |      | 6b      | 699.1                    |                       | air dry                  |
|      | 13c     | 275.0                    |                       | air dry                  |      | 6c      | 1058.5                   |                       | air dry                  |
| 6    | 8a      | 1156.1                   |                       | air dry                  | 14   | 10a     | 352.8                    | 405.7                 | 14.99                    |
|      | 8b      | 878.6                    |                       | air dry                  |      | 10b     | 404.9                    | 465.6                 | 14.99                    |
|      | 8c      | 698.6                    |                       | air dry                  |      | 10c     | 267.0                    | 307.1                 | 15.02                    |
| 7    | 15a     | 394.2                    |                       | air dry                  | 15   | 11a     | 379.9                    | 474.8                 | 24.98                    |
|      | 15b     | 407.2                    |                       | air dry                  |      | 11b     | 428.7                    | 535.9                 | 25.01                    |
|      | 15c     | 360.7                    |                       | air dry                  |      | 11c     | 364.3                    | 455.4                 | 25.01                    |
| 8    | 2a      | 552.2                    | 563.2                 | 1.99                     | 16   | 5a      | 1016.9                   |                       | air dry                  |
|      | 2b      | 770.7                    | 786.1                 | 2.00                     |      | 5b      | 824.9                    |                       | air dry                  |
|      | 2c      | 651.9                    | 664.9                 | 1.99                     |      | 5c      | 860.5                    |                       | air dry                  |

Lab Name:

Laboratory No. 3

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 1a      | 838.2                    | 855.0                 | 2.00                     | 9    | 16a     | 525.9                    |                       | air dry                  |
|      | 1b      | 921.7                    | 940.2                 | 2.01                     |      | 16b     | 556.3                    |                       | air dry                  |
|      | 1c      | 797.3                    | 813.2                 | 1.99                     |      | 16c     | 500.3                    |                       | air dry                  |
| 2    | 9a      | 346.2                    | 398.1                 | 14.99                    | 10   | 4a      | 787.7                    | 811.3                 | 3.00                     |
|      | 9b      | 289.5                    | 333.0                 | 15.03                    |      | 4b      | 768.0                    | 791.0                 | 2.99                     |
|      | 9c      | 315.3                    | 362.6                 | 15.00                    |      | 4c      | 958.2                    | 987.0                 | 3.01                     |
| 3    | 7a      | 681.3                    |                       | air dry                  | 11   | 10a     | 340.4                    | 391.4                 | 14.98                    |
|      | 7b      | 723.5                    |                       | air dry                  |      | 10b     | 373.7                    | 429.8                 | 15.01                    |
|      | 7c      | 891.1                    |                       | air dry                  |      | 10c     | 262.2                    | 301.5                 | 15.00                    |
| 4    | 6a      | 872.7                    |                       | air dry                  | 12   | 11a     | 386.0                    | 482.5                 | 25.00                    |
|      | 6b      | 804.8                    |                       | air dry                  |      | 11b     | 499.6                    | 624.5                 | 25.00                    |
|      | 6c      | 784.9                    |                       | air dry                  |      | 11c     | 423.6                    | 529.5                 | 25.00                    |
| 5    | 13a     | 337.0                    |                       | air dry                  | 13   | 14a     | 335.6                    |                       | air dry                  |
|      | 13b     | 288.0                    |                       | air dry                  |      | 14b     | 303.5                    |                       | air dry                  |
|      | 13c     | 334.9                    |                       | air dry                  |      | 14c     | 224.8                    |                       | air dry                  |
| 6    | 3a      | 1036.3                   | 1067.4                | 3.00                     | 14   | 15a     | 475.7                    |                       | air dry                  |
|      | 3b      | 822.8                    | 847.5                 | 3.00                     |      | 15b     | 360.6                    |                       | air dry                  |
|      | 3c      | 1087.6                   | 1120.2                | 3.00                     |      | 15c     | 583.6                    |                       | air dry                  |
| 7    | 5a      | 791.4                    |                       | air dry                  | 15   | 8a      | 698.3                    |                       | air dry                  |
|      | 5b      | 642.4                    |                       | air dry                  |      | 8b      | 867.0                    |                       | air dry                  |
|      | 5c      | 861.0                    |                       | air dry                  |      | 8c      | 782.7                    |                       | air dry                  |
| 8    | 2a      | 851.0                    | 868.0                 | 2.00                     | 16   | 12a     | 406.8                    | 508.5                 | 25.00                    |
|      | 2b      | 880.4                    | 898.0                 | 2.00                     |      | 12b     | 447.7                    | 559.6                 | 24.99                    |
|      | 2c      | 820.7                    | 837.1                 | 2.00                     |      | 12c     | 426.0                    | 532.5                 | 25.00                    |

Lab Name:

Laboratory No. 4

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 10a     | 340.1                    | 391.0                 | 14.97                    | 9    | 12a     | 483.7                    | 604.6                 | 24.99                    |
|      | 10b     | 297.7                    | 342.4                 | 15.02                    |      | 12b     | 420.9                    | 526.1                 | 24.99                    |
|      | 10c     | 334.1                    | 384.1                 | 14.97                    |      | 12c     | 445.5                    | 556.9                 | 25.01                    |
| 2    | 3a      | 867.2                    | 893.2                 | 3.00                     | 10   | 5a      | 786.2                    |                       | air dry                  |
|      | 3b      | 769.0                    | 792.1                 | 3.00                     |      | 5b      | 761.5                    |                       | air dry                  |
|      | 3c      | 822.8                    | 847.6                 | 3.01                     |      | 5c      | 770.9                    |                       | air dry                  |
| 3    | 9a      | 327.0                    | 376.0                 | 14.98                    | 11   | 14a     | 326.2                    |                       | air dry                  |
|      | 9b      | 321.1                    | 369.3                 | 15.01                    |      | 14b     | 391.3                    |                       | air dry                  |
|      | 9c      | 322.8                    | 371.2                 | 14.99                    |      | 14c     | 389.6                    |                       | air dry                  |
| 4    | 13a     | 398.7                    |                       | air dry                  | 12   | 4a      | 701.2                    | 722.2                 | 2.99                     |
|      | 13b     | 352.6                    |                       | air dry                  |      | 4b      | 806.8                    | 831.0                 | 3.00                     |
|      | 13c     | 371.0                    |                       | air dry                  |      | 4c      | 613.7                    | 632.1                 | 3.00                     |
| 5    | 7a      | 878.5                    |                       | air dry                  | 13   | 6a      | 950.7                    |                       | air dry                  |
|      | 7b      | 848.5                    |                       | air dry                  |      | 6b      | 691.8                    |                       | air dry                  |
|      | 7c      | 796.0                    |                       | air dry                  |      | 6c      | 669.4                    |                       | air dry                  |
| 6    | 8a      | 903.8                    |                       | air dry                  | 14   | 1a      | 980.4                    | 1000.0                | 2.00                     |
|      | 8b      | 797.9                    |                       | air dry                  |      | 1b      | 858.6                    | 875.8                 | 2.00                     |
|      | 8c      | 771.2                    |                       | air dry                  |      | 1c      | 1048.1                   | 1069.1                | 2.00                     |
| 7    | 15a     | 296.0                    |                       | air dry                  | 15   | 16a     | 469.0                    |                       | air dry                  |
|      | 15b     | 608.2                    |                       | air dry                  |      | 16b     | 353.0                    |                       | air dry                  |
|      | 15c     | 404.4                    |                       | air dry                  |      | 16c     | 436.2                    |                       | air dry                  |
| 8    | 2a      | 563.3                    | 574.6                 | 2.01                     | 16   | 11a     | 399.7                    | 499.6                 | 24.99                    |
|      | 2b      | 933.7                    | 952.4                 | 2.00                     |      | 11b     | 423.2                    | 529.0                 | 25.00                    |
|      | 2c      | 779.1                    | 794.7                 | 2.00                     |      | 11c     | 387.8                    | 484.8                 | 25.01                    |

Lab Name:

Laboratory No. 5

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 16a     | 319.4                    |                       | air dry                  | 9    | 3a      | 832.5                    | 857.5                 | 3.00                     |
|      | 16b     | 461.6                    |                       | air dry                  |      | 3b      | 1066.0                   | 1098.0                | 3.00                     |
|      | 16c     | 512.7                    |                       | air dry                  |      | 3c      | 932.3                    | 960.3                 | 3.00                     |
| 2    | 1a      | 734.0                    | 748.7                 | 2.00                     | 10   | 2a      | 824.1                    | 840.5                 | 1.99                     |
|      | 1b      | 788.8                    | 804.5                 | 1.99                     |      | 2b      | 949.5                    | 968.6                 | 2.01                     |
|      | 1c      | 1031.9                   | 1052.5                | 2.00                     |      | 2c      | 896.7                    | 914.6                 | 2.00                     |
| 3    | 6a      | 950.4                    |                       | air dry                  | 11   | 8a      | 983.7                    |                       | air dry                  |
|      | 6b      | 727.0                    |                       | air dry                  |      | 8b      | 734.2                    |                       | air dry                  |
|      | 6c      | 1057.5                   |                       | air dry                  |      | 8c      | 846.7                    |                       | air dry                  |
| 4    | 11a     | 512.9                    | 641.1                 | 25.00                    | 12   | 14a     | 267.1                    |                       | air dry                  |
|      | 11b     | 436.0                    | 545.0                 | 25.00                    |      | 14b     | 361.4                    |                       | air dry                  |
|      | 11c     | 480.9                    | 601.1                 | 24.99                    |      | 14c     | 348.9                    |                       | air dry                  |
| 5    | 13a     | 377.3                    |                       | air dry                  | 13   | 7a      | 969.9                    |                       | air dry                  |
|      | 13b     | 357.0                    |                       | air dry                  |      | 7b      | 835.3                    |                       | air dry                  |
|      | 13c     | 358.1                    |                       | air dry                  |      | 7c      | 737.0                    |                       | air dry                  |
| 6    | 10a     | 331.3                    | 381.0                 | 15.00                    | 14   | 4a      | 788.2                    | 811.8                 | 2.99                     |
|      | 10b     | 371.1                    | 426.7                 | 14.98                    |      | 4b      | 848.4                    | 873.9                 | 3.01                     |
|      | 10c     | 327.7                    | 376.8                 | 14.98                    |      | 4c      | 816.0                    | 840.5                 | 3.00                     |
| 7    | 12a     | 383.3                    | 479.1                 | 24.99                    | 15   | 15a     | 400.7                    |                       | air dry                  |
|      | 12b     | 431.3                    | 539.1                 | 24.99                    |      | 15b     | 613.2                    |                       | air dry                  |
|      | 12c     | 401.8                    | 502.3                 | 25.01                    |      | 15c     | 341.6                    |                       | air dry                  |
| 8    | 9a      | 333.7                    | 383.8                 | 15.01                    | 16   | 5a      | 889.4                    |                       | air dry                  |
|      | 9b      | 293.8                    | 337.9                 | 15.01                    |      | 5b      | 869.0                    |                       | air dry                  |
|      | 9c      | 319.0                    | 366.9                 | 15.02                    |      | 5c      | 775.1                    |                       | air dry                  |

Lab Name:

Laboratory No. 6

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 4a      | 1097.5                   | 1130.4                | 3.00                     | 9    | 16a     | 416.6                    |                       | air dry                  |
|      | 4b      | 824.5                    | 849.2                 | 3.00                     |      | 16b     | 345.5                    |                       | air dry                  |
|      | 4c      | 745.0                    | 767.4                 | 3.01                     |      | 16c     | 371.0                    |                       | air dry                  |
| 2    | 8a      | 810.3                    |                       | air dry                  | 10   | 14a     | 320.3                    |                       | air dry                  |
|      | 8b      | 761.0                    |                       | air dry                  |      | 14b     | 365.3                    |                       | air dry                  |
|      | 8c      | 897.4                    |                       | air dry                  |      | 14c     | 387.1                    |                       | air dry                  |
| 3    | 7a      | 727.4                    |                       | air dry                  | 11   | 13a     | 375.8                    |                       | air dry                  |
|      | 7b      | 718.1                    |                       | air dry                  |      | 13b     | 322.2                    |                       | air dry                  |
|      | 7c      | 767.9                    |                       | air dry                  |      | 13c     | 420.8                    |                       | air dry                  |
| 4    | 2a      | 703.2                    | 717.3                 | 2.01                     | 12   | 1a      | 793.8                    | 809.7                 | 2.00                     |
|      | 2b      | 983.5                    | 1003.3                | 2.01                     |      | 1b      | 630.5                    | 643.1                 | 2.00                     |
|      | 2c      | 594.1                    | 606.0                 | 2.00                     |      | 1c      | 759.7                    | 775.0                 | 2.01                     |
| 5    | 3a      | 922.8                    | 950.5                 | 3.00                     | 13   | 6a      | 914.0                    |                       | air dry                  |
|      | 3b      | 887.9                    | 914.5                 | 3.00                     |      | 6b      | 832.4                    |                       | air dry                  |
|      | 3c      | 1035.0                   | 1066.2                | 3.01                     |      | 6c      | 762.0                    |                       | air dry                  |
| 6    | 11a     | 474.4                    | 593.1                 | 25.02                    | 14   | 15a     | 461.6                    |                       | air dry                  |
|      | 11b     | 412.5                    | 515.6                 | 24.99                    |      | 15b     | 301.0                    |                       | air dry                  |
|      | 11c     | 474.6                    | 593.3                 | 25.01                    |      | 15c     | 404.6                    |                       | air dry                  |
| 7    | 10a     | 250.0                    | 287.5                 | 15.00                    | 15   | 12a     | 485.8                    | 607.3                 | 25.01                    |
|      | 10b     | 338.3                    | 389.0                 | 14.99                    |      | 12b     | 374.3                    | 467.9                 | 25.01                    |
|      | 10c     | 359.7                    | 413.6                 | 14.98                    |      | 12c     | 456.7                    | 570.9                 | 25.01                    |
| 8    | 9a      | 291.8                    | 335.6                 | 15.01                    | 16   | 5a      | 886.0                    |                       | air dry                  |
|      | 9b      | 297.0                    | 341.6                 | 15.02                    |      | 5b      | 685.5                    |                       | air dry                  |
|      | 9c      | 350.0                    | 402.5                 | 15.00                    |      | 5c      | 895.6                    |                       | air dry                  |

Lab Name:

Laboratory No. 7

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 2a      | 880.9                    | 898.5                 | 2.00                     | 9    | 13a     | 302.3                    |                       | air dry                  |
|      | 2b      | 736.2                    | 750.9                 | 2.00                     |      | 13b     | 355.6                    |                       | air dry                  |
|      | 2c      | 680.3                    | 693.9                 | 2.00                     |      | 13c     | 355.0                    |                       | air dry                  |
| 2    | 9a      | 310.2                    | 356.7                 | 14.99                    | 10   | 16a     | 473.4                    |                       | air dry                  |
|      | 9b      | 337.4                    | 388.0                 | 15.00                    |      | 16b     | 523.2                    |                       | air dry                  |
|      | 9c      | 312.4                    | 359.3                 | 15.01                    |      | 16c     | 412.4                    |                       | air dry                  |
| 3    | 10a     | 349.4                    | 401.7                 | 14.97                    | 11   | 3a      | 780.0                    | 803.4                 | 3.00                     |
|      | 10b     | 260.8                    | 299.9                 | 14.99                    |      | 3b      | 655.7                    | 675.4                 | 3.00                     |
|      | 10c     | 321.1                    | 369.3                 | 15.01                    |      | 3c      | 951.8                    | 980.4                 | 3.00                     |
| 4    | 15a     | 392.8                    |                       | air dry                  | 12   | 1a      | 787.4                    | 803.1                 | 1.99                     |
|      | 15b     | 584.0                    |                       | air dry                  |      | 1b      | 826.0                    | 842.5                 | 2.00                     |
|      | 15c     | 419.8                    |                       | air dry                  |      | 1c      | 745.6                    | 760.5                 | 2.00                     |
| 5    | 6a      | 1102.6                   |                       | air dry                  | 13   | 14a     | 370.3                    |                       | air dry                  |
|      | 6b      | 729.7                    |                       | air dry                  |      | 14b     | 325.9                    |                       | air dry                  |
|      | 6c      | 841.9                    |                       | air dry                  |      | 14c     | 293.7                    |                       | air dry                  |
| 6    | 5a      | 972.6                    |                       | air dry                  | 14   | 12a     | 498.0                    | 622.5                 | 25.00                    |
|      | 5b      | 794.7                    |                       | air dry                  |      | 12b     | 527.1                    | 658.9                 | 25.00                    |
|      | 5c      | 965.0                    |                       | air dry                  |      | 12c     | 422.2                    | 527.8                 | 25.01                    |
| 7    | 4a      | 1027.7                   | 1058.5                | 3.00                     | 15   | 8a      | 691.0                    |                       | air dry                  |
|      | 4b      | 935.7                    | 963.9                 | 3.01                     |      | 8b      | 754.0                    |                       | air dry                  |
|      | 4c      | 911.7                    | 939.1                 | 3.01                     |      | 8c      | 867.2                    |                       | air dry                  |
| 8    | 11a     | 464.8                    | 581.0                 | 25.00                    | 16   | 7a      | 643.7                    |                       | air dry                  |
|      | 11b     | 449.1                    | 561.5                 | 25.03                    |      | 7b      | 726.8                    |                       | air dry                  |
|      | 11c     | 467.4                    | 584.3                 | 25.01                    |      | 7c      | 963.1                    |                       | air dry                  |

Lab Name:

Laboratory No. 8

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 9a      | 320.9                    | 369.0                 | 14.99                    | 9    | 15a     | 373.1                    |                       | air dry                  |
|      | 9b      | 379.8                    | 436.8                 | 15.01                    |      | 15b     | 353.6                    |                       | air dry                  |
|      | 9c      | 380.7                    | 437.8                 | 15.00                    |      | 15c     | 310.4                    |                       | air dry                  |
| 2    | 13a     | 278.0                    |                       | air dry                  | 10   | 4a      | 776.2                    | 799.5                 | 3.00                     |
|      | 13b     | 348.4                    |                       | air dry                  |      | 4b      | 620.0                    | 638.6                 | 3.00                     |
|      | 13c     | 336.6                    |                       | air dry                  |      | 4c      | 936.3                    | 964.4                 | 3.00                     |
| 3    | 5a      | 639.2                    |                       | air dry                  | 11   | 2a      | 579.1                    | 590.7                 | 2.00                     |
|      | 5b      | 753.9                    |                       | air dry                  |      | 2b      | 779.8                    | 795.5                 | 2.01                     |
|      | 5c      | 804.8                    |                       | air dry                  |      | 2c      | 911.4                    | 929.5                 | 1.99                     |
| 4    | 11a     | 411.6                    | 514.5                 | 25.00                    | 12   | 12a     | 394.2                    | 492.8                 | 25.01                    |
|      | 11b     | 472.4                    | 590.6                 | 25.02                    |      | 12b     | 544.3                    | 680.4                 | 25.00                    |
|      | 11c     | 394.3                    | 492.9                 | 25.01                    |      | 12c     | 398.1                    | 497.6                 | 24.99                    |
| 5    | 8a      | 962.3                    |                       | air dry                  | 13   | 3a      | 732.9                    | 754.9                 | 3.00                     |
|      | 8b      | 901.7                    |                       | air dry                  |      | 3b      | 977.0                    | 1006.3                | 3.00                     |
|      | 8c      | 675.9                    |                       | air dry                  |      | 3c      | 1068.8                   | 1100.7                | 2.98                     |
| 6    | 7a      | 802.6                    |                       | air dry                  | 14   | 16a     | 337.7                    |                       | air dry                  |
|      | 7b      | 695.8                    |                       | air dry                  |      | 16b     | 532.4                    |                       | air dry                  |
|      | 7c      | 789.7                    |                       | air dry                  |      | 16c     | 439.1                    |                       | air dry                  |
| 7    | 1a      | 1076.3                   | 1097.8                | 2.00                     | 15   | 14a     | 309.3                    |                       | air dry                  |
|      | 1b      | 977.9                    | 997.5                 | 2.00                     |      | 14b     | 354.5                    |                       | air dry                  |
|      | 1c      | 904.7                    | 922.9                 | 2.01                     |      | 14c     | 388.2                    |                       | air dry                  |
| 8    | 10a     | 348.4                    | 400.6                 | 14.98                    | 16   | 6a      | 1001.1                   |                       | air dry                  |
|      | 10b     | 352.2                    | 405.0                 | 15.00                    |      | 6b      | 683.0                    |                       | air dry                  |
|      | 10c     | 342.4                    | 393.8                 | 15.01                    |      | 6c      | 806.6                    |                       | air dry                  |

Lab Name:

Laboratory No. 9

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 10a     | 348.7                    | 401.0                 | 15.00                    | 9    | 5a      | 697.0                    |                       | air dry                  |
|      | 10b     | 285.5                    | 328.3                 | 14.99                    |      | 5b      | 1000.0                   |                       | air dry                  |
|      | 10c     | 380.3                    | 437.4                 | 15.01                    |      | 5c      | 834.2                    |                       | air dry                  |
| 2    | 7a      | 770.8                    |                       | air dry                  | 10   | 14a     | 365.8                    |                       | air dry                  |
|      | 7b      | 688.1                    |                       | air dry                  |      | 14b     | 308.9                    |                       | air dry                  |
|      | 7c      | 685.8                    |                       | air dry                  |      | 14c     | 288.2                    |                       | air dry                  |
| 3    | 6a      | 1177.3                   |                       | air dry                  | 11   | 8a      | 813.0                    |                       | air dry                  |
|      | 6b      | 943.8                    |                       | air dry                  |      | 8b      | 875.0                    |                       | air dry                  |
|      | 6c      | 782.9                    |                       | air dry                  |      | 8c      | 816.7                    |                       | air dry                  |
| 4    | 11a     | 395.5                    | 494.4                 | 25.01                    | 12   | 2a      | 792.5                    | 808.4                 | 2.01                     |
|      | 11b     | 387.2                    | 484.0                 | 25.00                    |      | 2b      | 647.4                    | 660.5                 | 2.02                     |
|      | 11c     | 379.9                    | 474.9                 | 25.01                    |      | 2c      | 519.4                    | 529.8                 | 2.00                     |
| 5    | 12a     | 478.0                    | 597.5                 | 25.00                    | 13   | 3a      | 1089.1                   | 1121.9                | 3.01                     |
|      | 12b     | 430.3                    | 537.9                 | 25.01                    |      | 3b      | 855.2                    | 880.9                 | 3.00                     |
|      | 12c     | 397.0                    | 496.3                 | 25.01                    |      | 3c      | 948.8                    | 977.3                 | 3.00                     |
| 6    | 13a     | 294.3                    |                       | air dry                  | 14   | 15a     | 410.2                    |                       | air dry                  |
|      | 13b     | 382.0                    |                       | air dry                  |      | 15b     | 483.9                    |                       | air dry                  |
|      | 13c     | 339.1                    |                       | air dry                  |      | 15c     | 283.2                    |                       | air dry                  |
| 7    | 1a      | 916.7                    | 935.1                 | 2.01                     | 15   | 9a      | 307.6                    | 353.7                 | 14.99                    |
|      | 1b      | 983.2                    | 1002.9                | 2.00                     |      | 9b      | 256.6                    | 295.1                 | 15.00                    |
|      | 1c      | 888.4                    | 906.2                 | 2.00                     |      | 9c      | 320.7                    | 368.8                 | 15.00                    |
| 8    | 4a      | 675.0                    | 695.3                 | 3.01                     | 16   | 16a     | 381.3                    |                       | air dry                  |
|      | 4b      | 892.1                    | 918.9                 | 3.00                     |      | 16b     | 515.3                    |                       | air dry                  |
|      | 4c      | 714.4                    | 735.8                 | 3.00                     |      | 16c     | 458.9                    |                       | air dry                  |

Lab Name:

Laboratory No. 10

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 10a     | 362.0                    | 416.3                 | 15.00                    | 9    | 11a     | 352.8                    | 441.0                 | 25.00                    |
|      | 10b     | 332.7                    | 382.7                 | 15.03                    |      | 11b     | 462.4                    | 578.0                 | 25.00                    |
|      | 10c     | 321.6                    | 369.8                 | 14.99                    |      | 11c     | 556.5                    | 695.6                 | 25.00                    |
| 2    | 5a      | 1058.8                   |                       | air dry                  | 10   | 14a     | 278.1                    |                       | air dry                  |
|      | 5b      | 904.1                    |                       | air dry                  |      | 14b     | 296.0                    |                       | air dry                  |
|      | 5c      | 860.2                    |                       | air dry                  |      | 14c     | 355.2                    |                       | air dry                  |
| 3    | 8a      | 952.8                    |                       | air dry                  | 11   | 7a      | 751.0                    |                       | air dry                  |
|      | 8b      | 815.3                    |                       | air dry                  |      | 7b      | 769.3                    |                       | air dry                  |
|      | 8c      | 660.4                    |                       | air dry                  |      | 7c      | 731.4                    |                       | air dry                  |
| 4    | 13a     | 356.7                    |                       | air dry                  | 12   | 4a      | 1068.7                   | 1100.8                | 3.00                     |
|      | 13b     | 321.1                    |                       | air dry                  |      | 4b      | 928.7                    | 956.6                 | 3.00                     |
|      | 13c     | 320.6                    |                       | air dry                  |      | 4c      | 786.4                    | 810.1                 | 3.01                     |
| 5    | 6a      | 996.9                    |                       | air dry                  | 13   | 15a     | 374.8                    |                       | air dry                  |
|      | 6b      | 868.3                    |                       | air dry                  |      | 15b     | 372.7                    |                       | air dry                  |
|      | 6c      | 814.3                    |                       | air dry                  |      | 15c     | 448.9                    |                       | air dry                  |
| 6    | 1a      | 910.5                    | 928.9                 | 2.02                     | 14   | 16a     | 414.8                    |                       | air dry                  |
|      | 1b      | 776.4                    | 791.9                 | 2.00                     |      | 16b     | 467.2                    |                       | air dry                  |
|      | 1c      | 898.4                    | 916.4                 | 2.00                     |      | 16c     | 482.7                    |                       | air dry                  |
| 7    | 9a      | 315.9                    | 363.3                 | 15.00                    | 15   | 2a      | 864.1                    | 881.4                 | 2.00                     |
|      | 9b      | 331.1                    | 380.8                 | 15.01                    |      | 2b      | 983.2                    | 1002.9                | 2.00                     |
|      | 9c      | 322.7                    | 371.1                 | 15.00                    |      | 2c      | 740.7                    | 755.6                 | 2.01                     |
| 8    | 3a      | 619.0                    | 637.6                 | 3.00                     | 16   | 12a     | 396.4                    | 495.5                 | 25.00                    |
|      | 3b      | 868.6                    | 894.7                 | 3.00                     |      | 12b     | 477.0                    | 596.3                 | 25.01                    |
|      | 3c      | 844.7                    | 870.0                 | 3.00                     |      | 12c     | 475.2                    | 594.0                 | 25.00                    |

Lab Name:

Laboratory No. 11

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 1a      | 899.5                    | 917.5                 | 2.00                     | 9    | 10a     | 326.8                    | 375.8                 | 14.99                    |
|      | 1b      | 800.6                    | 816.6                 | 2.00                     |      | 10b     | 260.3                    | 299.3                 | 14.98                    |
|      | 1c      | 1040.1                   | 1060.9                | 2.00                     |      | 10c     | 271.2                    | 311.9                 | 15.01                    |
| 2    | 6a      | 1011.6                   |                       | air dry                  | 10   | 15a     | 401.3                    |                       | air dry                  |
|      | 6b      | 1130.5                   |                       | air dry                  |      | 15b     | 358.8                    |                       | air dry                  |
|      | 6c      | 983.9                    |                       | air dry                  |      | 15c     | 407.1                    |                       | air dry                  |
| 3    | 16a     | 479.4                    |                       | air dry                  | 11   | 2a      | 653.4                    | 666.5                 | 2.00                     |
|      | 16b     | 360.7                    |                       | air dry                  |      | 2b      | 623.4                    | 635.9                 | 2.01                     |
|      | 16c     | 318.5                    |                       | air dry                  |      | 2c      | 938.1                    | 956.9                 | 2.00                     |
| 4    | 13a     | 389.5                    |                       | air dry                  | 12   | 4a      | 994.2                    | 1024.0                | 3.00                     |
|      | 13b     | 273.1                    |                       | air dry                  |      | 4b      | 716.7                    | 738.2                 | 3.00                     |
|      | 13c     | 350.7                    |                       | air dry                  |      | 4c      | 901.7                    | 928.8                 | 3.01                     |
| 5    | 8a      | 960.2                    |                       | air dry                  | 13   | 12a     | 401.8                    | 502.3                 | 25.01                    |
|      | 8b      | 812.8                    |                       | air dry                  |      | 12b     | 363.2                    | 454.0                 | 25.00                    |
|      | 8c      | 710.0                    |                       | air dry                  |      | 12c     | 375.3                    | 469.1                 | 25.00                    |
| 6    | 3a      | 701.2                    | 722.2                 | 2.99                     | 14   | 14a     | 315.9                    |                       | air dry                  |
|      | 3b      | 889.3                    | 916.0                 | 3.00                     |      | 14b     | 385.3                    |                       | air dry                  |
|      | 3c      | 1037.8                   | 1068.9                | 3.00                     |      | 14c     | 243.5                    |                       | air dry                  |
| 7    | 7a      | 806.1                    |                       | air dry                  | 15   | 5a      | 700.4                    |                       | air dry                  |
|      | 7b      | 988.5                    |                       | air dry                  |      | 5b      | 842.5                    |                       | air dry                  |
|      | 7c      | 637.3                    |                       | air dry                  |      | 5c      | 847.8                    |                       | air dry                  |
| 8    | 9a      | 319.5                    | 367.4                 | 14.99                    | 16   | 11a     | 400.7                    | 500.9                 | 25.01                    |
|      | 9b      | 279.1                    | 334.8                 | *19.96                   |      | 11b     | 458.1                    | 572.6                 | 24.99                    |
|      | 9c      | 291.4                    | 335.1                 | 15.00                    |      | 11c     | 410.4                    | 513.0                 | 25.00                    |

Lab Name:

Laboratory No. 12

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 1a      | 671.5                    | 685.0                 | 2.01                     | 9    | 2a      | 590.6                    | 602.4                 | 2.00                     |
|      | 1b      | 875.3                    | 892.9                 | 2.01                     |      | 2b      | 893.6                    | 911.5                 | 2.00                     |
|      | 1c      | 1163.4                   | 1186.7                | 2.00                     |      | 2c      | 533.3                    | 543.9                 | 1.99                     |
| 2    | 16a     | 471.1                    |                       | air dry                  | 10   | 8a      | 1006.9                   |                       | air dry                  |
|      | 16b     | 436.8                    |                       | air dry                  |      | 8b      | 708.8                    |                       | air dry                  |
|      | 16c     | 490.8                    |                       | air dry                  |      | 8c      | 1026.6                   |                       | air dry                  |
| 3    | 11a     | 436.7                    | 545.9                 | 25.01                    | 11   | 7a      | 871.3                    |                       | air dry                  |
|      | 11b     | 370.2                    | 462.8                 | 25.01                    |      | 7b      | 851.8                    |                       | air dry                  |
|      | 11c     | 454.3                    | 567.9                 | 25.01                    |      | 7c      | 809.9                    |                       | air dry                  |
| 4    | 13a     | 274.2                    |                       | air dry                  | 12   | 14a     | 324.9                    |                       | air dry                  |
|      | 13b     | 276.8                    |                       | air dry                  |      | 14b     | 302.5                    |                       | air dry                  |
|      | 13c     | 380.9                    |                       | air dry                  |      | 14c     | 254.8                    |                       | air dry                  |
| 5    | 15a     | 401.8                    |                       | air dry                  | 13   | 3a      | 1054.0                   | 1085.6                | 3.00                     |
|      | 15b     | 427.0                    |                       | air dry                  |      | 3b      | 1151.6                   | 1186.1                | 3.00                     |
|      | 15c     | 382.8                    |                       | air dry                  |      | 3c      | 1035.8                   | 1066.9                | 3.00                     |
| 6    | 12a     | 449.3                    | 561.6                 | 24.99                    | 14   | 4a      | 912.6                    | 940.0                 | 3.00                     |
|      | 12b     | 368.4                    | 460.5                 | 25.00                    |      | 4b      | 869.5                    | 895.7                 | 3.01                     |
|      | 12c     | 423.9                    | 529.9                 | 25.01                    |      | 4c      | 888.7                    | 915.4                 | 3.00                     |
| 7    | 6a      | 786.5                    |                       | air dry                  | 15   | 9a      | 333.5                    | 383.5                 | 14.99                    |
|      | 6b      | 698.8                    |                       | air dry                  |      | 9b      | 375.1                    | 431.4                 | 15.01                    |
|      | 6c      | 834.2                    |                       | air dry                  |      | 9c      | 303.4                    | 349.0                 | 15.03                    |
| 8    | 5a      | 946.8                    |                       | air dry                  | 16   | 10a     | 352.8                    | 405.7                 | 14.99                    |
|      | 5b      | 875.4                    |                       | air dry                  |      | 10b     | 251.1                    | 288.8                 | 15.01                    |
|      | 5c      | 649.5                    |                       | air dry                  |      | 10c     | 241.4                    | 277.6                 | 15.00                    |

Lab Name:

Laboratory No. 13

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 5a      | 912.1                    |                       | air dry                  | 9    | 15a     | 442.8                    |                       | air dry                  |
|      | 5b      | 838.6                    |                       | air dry                  |      | 15b     | 391.0                    |                       | air dry                  |
|      | 5c      | 921.7                    |                       | air dry                  |      | 15c     | 371.6                    |                       | air dry                  |
| 2    | 2a      | 913.9                    | 932.2                 | 2.00                     | 10   | 6a      | 759.5                    |                       | air dry                  |
|      | 2b      | 711.7                    | 725.9                 | 2.00                     |      | 6b      | 820.5                    |                       | air dry                  |
|      | 2c      | 1238.6                   | 1263.4                | 2.00                     |      | 6c      | 755.4                    |                       | air dry                  |
| 3    | 4a      | 782.6                    | 806.2                 | 3.02                     | 11   | 13a     | 250.6                    |                       | air dry                  |
|      | 4b      | 870.1                    | 896.2                 | 3.00                     |      | 13b     | 386.5                    |                       | air dry                  |
|      | 4c      | 853.6                    | 879.1                 | 2.99                     |      | 13c     | 280.7                    |                       | air dry                  |
| 4    | 8a      | 644.3                    |                       | air dry                  | 12   | 14a     | 323.9                    |                       | air dry                  |
|      | 8b      | 790.4                    |                       | air dry                  |      | 14b     | 298.9                    |                       | air dry                  |
|      | 8c      | 1203.4                   |                       | air dry                  |      | 14c     | 416.0                    |                       | air dry                  |
| 5    | 11a     | 480.0                    |                       | air dry                  | 13   | 1a      | 807.2                    | 823.4                 | 2.01                     |
|      | 11b     | 399.5                    |                       | air dry                  |      | 1b      | 836.5                    | 853.2                 | 2.00                     |
|      | 11c     | 457.7                    |                       | air dry                  |      | 1c      | 955.0                    | 974.2                 | 2.01                     |
| 6    | 16a     | 545.1                    |                       | air dry                  | 14   | 9a      | 368.2                    | 423.4                 | 14.99                    |
|      | 16b     | 403.1                    |                       | air dry                  |      | 9b      | 365.8                    | 420.7                 | 15.01                    |
|      | 16c     | 543.6                    |                       | air dry                  |      | 9c      | 320.5                    | 368.6                 | 15.01                    |
| 7    | 3a      | 1017.3                   | 1047.9                | 3.01                     | 15   | 12a     | 491.4                    | 614.1                 | 24.97                    |
|      | 3b      | 931.7                    | 959.7                 | 3.01                     |      | 12b     | 354.5                    | 443.1                 | 25.00                    |
|      | 3c      | 707.3                    | 728.5                 | 3.00                     |      | 12c     | 460.1                    | 575.2                 | 25.02                    |
| 8    | 7a      | 847.7                    |                       | air dry                  | 16   | 10a     | 388.6                    | 446.9                 | 15.00                    |
|      | 7b      | 853.1                    |                       | air dry                  |      | 10b     | 252.4                    | 290.3                 | 15.02                    |
|      | 7c      | 895.3                    |                       | air dry                  |      | 10c     | 257.9                    | 296.6                 | 15.01                    |

Lab Name:

Laboratory No. 14

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 11a     | 438.6                    | 548.2                 | 24.99                    | 9    | 6a      | 739.5                    |                       | air dry                  |
|      | 11b     | 397.8                    | 497.3                 | 25.00                    |      | 6b      | 1151.4                   |                       | air dry                  |
|      | 11c     | 438.2                    | 547.9                 | 25.03                    |      | 6c      | 884.6                    |                       | air dry                  |
| 2    | 5a      | 728.8                    |                       | air dry                  | 10   | 1a      | 877.8                    | 895.4                 | 2.01                     |
|      | 5b      | 949.3                    |                       | air dry                  |      | 1b      | 944.4                    | 963.3                 | 2.00                     |
|      | 5c      | 752.3                    |                       | air dry                  |      | 1c      | 789.7                    | 805.5                 | 2.00                     |
| 3    | 13a     | 317.7                    |                       | air dry                  | 11   | 3a      | 731.0                    | 752.9                 | 3.00                     |
|      | 13b     | 278.0                    |                       | air dry                  |      | 3b      | 677.2                    | 697.5                 | 3.00                     |
|      | 13c     | 291.8                    |                       | air dry                  |      | 3c      | 961.4                    | 990.2                 | 3.00                     |
| 4    | 15a     | 449.3                    |                       | air dry                  | 12   | 10a     | 236.8                    | 272.3                 | 14.99                    |
|      | 15b     | 572.3                    |                       | air dry                  |      | 10b     | 382.7                    | 440.1                 | 15.00                    |
|      | 15c     | 582.1                    |                       | air dry                  |      | 10c     | 331.8                    | 381.6                 | 15.00                    |
| 5    | 9a      | 308.9                    | 355.2                 | 14.99                    | 13   | 16a     | 511.9                    |                       | air dry                  |
|      | 9b      | 337.1                    | 387.7                 | 15.01                    |      | 16b     | 454.7                    |                       | air dry                  |
|      | 9c      | 360.2                    | 414.2                 | 14.99                    |      | 16c     | 461.9                    |                       | air dry                  |
| 6    | 14a     | 354.2                    |                       | air dry                  | 14   | 12a     | 401.6                    | 502.1                 | 25.02                    |
|      | 14b     | 373.6                    |                       | air dry                  |      | 12b     | 403.8                    | 504.8                 | 25.01                    |
|      | 14c     | 391.3                    |                       | air dry                  |      | 12c     | 414.6                    | 518.3                 | 25.01                    |
| 7    | 7a      | 914.7                    |                       | air dry                  | 15   | 4a      | 781.9                    | 805.3                 | 2.99                     |
|      | 7b      | 736.1                    |                       | air dry                  |      | 4b      | 1105.1                   | 1138.3                | 3.00                     |
|      | 7c      | 820.6                    |                       | air dry                  |      | 4c      | 859.2                    | 885.0                 | 3.00                     |
| 8    | 8a      | 746.2                    |                       | air dry                  | 16   | 2a      | 611.4                    | 623.6                 | 2.00                     |
|      | 8b      | 740.4                    |                       | air dry                  |      | 2b      | 700.5                    | 714.5                 | 2.00                     |
|      | 8c      | 737.9                    |                       | air dry                  |      | 2c      | 1004.3                   | 1024.5                | 2.01                     |

Lab Name :

Laboratory No. 15

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 2a      | 953.3                    | 972.5                 | 2.01                     | 9    | 14a     | 270.2                    |                       | air dry                  |
|      | 2b      | 1054.1                   | 1075.2                | 2.00                     |      | 14b     | 319.0                    |                       | air dry                  |
|      | 2c      | 799.4                    | 815.4                 | 2.00                     |      | 14c     | 377.9                    |                       | air dry                  |
| 2    | 15a     | 554.1                    |                       | air dry                  | 10   | 5a      | 1003.0                   |                       | air dry                  |
|      | 15b     | 547.8                    |                       | air dry                  |      | 5b      | 727.4                    |                       | air dry                  |
|      | 15c     | 574.2                    |                       | air dry                  |      | 5c      | 758.4                    |                       | air dry                  |
| 3    | 9a      | 283.3                    | 325.8                 | 15.00                    | 11   | 10a     | 344.3                    | 395.9                 | 15.00                    |
|      | 9b      | 321.4                    | 369.6                 | 15.00                    |      | 10b     | 263.4                    | 302.9                 | 15.00                    |
|      | 9c      | 311.7                    | 358.5                 | 15.01                    |      | 10c     | 365.6                    | 420.4                 | 14.99                    |
| 4    | 11a     | 434.5                    | 543.1                 | 24.99                    | 12   | 1a      | 814.8                    | 831.1                 | 2.00                     |
|      | 11b     | 455.0                    | 568.8                 | 25.01                    |      | 1b      | 915.9                    | 934.2                 | 2.00                     |
|      | 11c     | 506.6                    | 633.3                 | 25.01                    |      | 1c      | 992.4                    | 1012.2                | 2.00                     |
| 5    | 3a      | 873.8                    | 900.0                 | 3.00                     | 13   | 16a     | 498.6                    |                       | air dry                  |
|      | 3b      | 955.6                    | 984.3                 | 3.00                     |      | 16b     | 364.2                    |                       | air dry                  |
|      | 3c      | 728.7                    | 750.6                 | 3.01                     |      | 16c     | 424.9                    |                       | air dry                  |
| 6    | 7a      | 692.6                    |                       | air dry                  | 14   | 13a     | 334.6                    |                       | air dry                  |
|      | 7b      | 887.9                    |                       | air dry                  |      | 13b     | 365.1                    |                       | air dry                  |
|      | 7c      | 1027.6                   |                       | air dry                  |      | 13c     | 341.0                    |                       | air dry                  |
| 7    | 6a      | 590.2                    |                       | air dry                  | 15   | 12a     | 427.3                    | 534.1                 | 24.99                    |
|      | 6b      | 924.8                    |                       | air dry                  |      | 12b     | 596.1                    | 745.1                 | 25.00                    |
|      | 6c      | 625.0                    |                       | air dry                  |      | 12c     | 388.4                    | 485.5                 | 25.00                    |
| 8    | 4a      | 819.2                    | 843.8                 | 3.00                     | 16   | 8a      | 828.4                    |                       | air dry                  |
|      | 4b      | 719.7                    | 741.3                 | 3.00                     |      | 8b      | 816.0                    |                       | air dry                  |
|      | 4c      | 943.4                    | 971.7                 | 3.00                     |      | 8c      | 838.5                    |                       | air dry                  |

Lab Name:

Laboratory No. 16

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 9a      | 292.3                    | 336.1                 | 14.98                    | 9    | 13a     | 438.6                    |                       | air dry                  |
|      | 9b      | 279.5                    | 321.5                 | 15.03                    |      | 13b     | 373.8                    |                       | air dry                  |
|      | 9c      | 318.6                    | 366.4                 | 15.00                    |      | 13c     | 328.5                    |                       | air dry                  |
| 2    | 12a     | 470.8                    | 588.6                 | 25.02                    | 10   | 1a      | 774.0                    | 789.6                 | 2.02                     |
|      | 12b     | 417.3                    | 521.6                 | 24.99                    |      | 1b      | 792.5                    | 808.4                 | 2.01                     |
|      | 12c     | 417.5                    | 521.9                 | 25.01                    |      | 1c      | 773.1                    | 788.6                 | 2.00                     |
| 3    | 11a     | 461.8                    | 577.3                 | 25.01                    | 11   | 14a     | 321.0                    |                       | air dry                  |
|      | 11b     | 416.0                    | 520.0                 | 25.00                    |      | 14b     | 311.2                    |                       | air dry                  |
|      | 11c     | 396.5                    | 495.6                 | 24.99                    |      | 14c     | 350.9                    |                       | air dry                  |
| 4    | 8a      | 801.7                    |                       | air dry                  | 12   | 6a      | 950.9                    |                       | air dry                  |
|      | 8b      | 796.4                    |                       | air dry                  |      | 6b      | 899.4                    |                       | air dry                  |
|      | 8c      | 953.1                    |                       | air dry                  |      | 6c      | 1067.9                   |                       | air dry                  |
| 5    | 16a     | 458.2                    |                       | air dry                  | 13   | 5a      | 948.3                    |                       | air dry                  |
|      | 16b     | 562.5                    |                       | air dry                  |      | 5b      | 742.9                    |                       | air dry                  |
|      | 16c     | 338.7                    |                       | air dry                  |      | 5c      | 996.6                    |                       | air dry                  |
| 6    | 3a      | 900.5                    | 927.5                 | 3.00                     | 14   | 4a      | 768.7                    | 791.8                 | 3.01                     |
|      | 3b      | 948.7                    | 977.2                 | 3.00                     |      | 4b      | 902.5                    | 929.6                 | 3.00                     |
|      | 3c      | 852.7                    | 878.3                 | 3.00                     |      | 4c      | 926.0                    | 953.8                 | 3.00                     |
| 7    | 10a     | 325.7                    | 374.6                 | 15.00                    | 15   | 2a      | 967.8                    | 987.3                 | 2.01                     |
|      | 10b     | 368.3                    | 423.5                 | 15.00                    |      | 2b      | 843.4                    | 860.3                 | 2.00                     |
|      | 10c     | 355.9                    | 409.3                 | 15.00                    |      | 2c      | 873.7                    | 891.2                 | 2.00                     |
| 8    | 7a      | 746.9                    |                       | air dry                  | 16   | 15a     | 544.6                    |                       | air dry                  |
|      | 7b      | 802.5                    |                       | air dry                  |      | 15b     | 556.1                    |                       | air dry                  |
|      | 7c      | 847.1                    |                       | air dry                  |      | 15c     | 369.4                    |                       | air dry                  |

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 8a      | 713.6                    |                       | air dry                  | 9    | 9a      | 284.6                    | 327.3                 | 15.00                    |
|      | 8b      | 774.9                    |                       | air dry                  |      | 9b      | 318.6                    | 366.4                 | 15.00                    |
|      | 8c      | 923.5                    |                       | air dry                  |      | 9c      | 319.1                    | 367.0                 | 15.00                    |
| 2    | 5a      | 955.0                    |                       | air dry                  | 10   | 10a     | 393.6                    | 452.6                 | 15.00                    |
|      | 5b      | 936.5                    |                       | air dry                  |      | 10b     | 374.6                    | 430.8                 | 15.00                    |
|      | 5c      | 703.5                    |                       | air dry                  |      | 10c     | 362.2                    | 416.5                 | 15.00                    |
| 3    | 2a      | 565.4                    | 576.7                 | 2.00                     | 11   | 13a     | 251.7                    |                       | air dry                  |
|      | 2b      | 1052.2                   | 1073.3                | 2.01                     |      | 13b     | 304.6                    |                       | air dry                  |
|      | 2c      | 1038.6                   | 1059.4                | 2.00                     |      | 13c     | 287.3                    |                       | air dry                  |
| 4    | 6a      | 1181.8                   |                       | air dry                  | 12   | 3a      | 650.3                    | 669.8                 | 3.00                     |
|      | 6b      | 971.8                    |                       | air dry                  |      | 3b      | 982.2                    | 1011.7                | 3.00                     |
|      | 6c      | 1032.8                   |                       | air dry                  |      | 3c      | 966.7                    | 995.7                 | 3.00                     |
| 5    | 4a      | 920.1                    | 947.7                 | 3.00                     | 13   | 12a     | 519.5                    | 649.5                 | 25.02                    |
|      | 4b      | 809.0                    | 833.3                 | 3.00                     |      | 12b     | 310.6                    | 388.3                 | 25.02                    |
|      | 4c      | 662.8                    | 682.7                 | 3.00                     |      | 12c     | 476.4                    | 595.6                 | 25.02                    |
| 6    | 11a     | 495.0                    | 618.8                 | 25.01                    | 14   | 7a      | 830.2                    |                       | air dry                  |
|      | 11b     | 445.0                    | 556.3                 | 25.01                    |      | 7b      | 913.4                    |                       | air dry                  |
|      | 11c     | 388.5                    | 485.6                 | 24.99                    |      | 7c      | 868.7                    |                       | air dry                  |
| 7    | 16a     | 482.1                    |                       | air dry                  | 15   | 1a      | 1081.3                   | 1102.9                | 2.00                     |
|      | 16b     | 457.7                    |                       | air dry                  |      | 1b      | 839.6                    | 856.4                 | 2.00                     |
|      | 16c     | 485.7                    |                       | air dry                  |      | 1c      | 993.4                    | 1013.3                | 2.00                     |
| 8    | 14a     | 311.3                    |                       | air dry                  | 16   | 15a     | 500.1                    |                       | air dry                  |
|      | 14b     | 335.8                    |                       | air dry                  |      | 15b     | 427.7                    |                       | air dry                  |
|      | 14c     | 405.6                    |                       | air dry                  |      | 15c     | 400.7                    |                       | air dry                  |

Lab Name:

Laboratory No. 18

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 6a      | 952.2                    |                       | air dry                  | 9    | 3a      | 979.5                    | 1008.9                | 3.00                     |
|      | 6b      | 967.9                    |                       | air dry                  |      | 3b      | 1006.4                   | 1036.6                | 3.00                     |
|      | 6c      | 897.5                    |                       | air dry                  |      | 3c      | 703.0                    | 724.1                 | 3.00                     |
| 2    | 13a     | 313.0                    |                       | air dry                  | 10   | 16a     | 349.3                    |                       | air dry                  |
|      | 13b     | 349.0                    |                       | air dry                  |      | 16b     | 461.5                    |                       | air dry                  |
|      | 13c     | 369.0                    |                       | air dry                  |      | 16c     | 483.8                    |                       | air dry                  |
| 3    | 12a     | 397.7                    | 497.1                 | 24.99                    | 11   | 2a      | 779.9                    | 795.6                 | 2.01                     |
|      | 12b     | 462.5                    | 578.1                 | 24.99                    |      | 2b      | 811.3                    | 827.5                 | 2.00                     |
|      | 12c     | 419.7                    | 524.6                 | 24.99                    |      | 2c      | 925.1                    | 943.7                 | 2.01                     |
| 4    | 11a     | 483.2                    | 604.0                 | 25.00                    | 12   | 7a      | 826.1                    |                       | air dry                  |
|      | 11b     | 438.7                    | 548.3                 | 24.98                    |      | 7b      | 955.6                    |                       | air dry                  |
|      | 11c     | 375.0                    | 468.8                 | 25.01                    |      | 7c      | 601.2                    |                       | air dry                  |
| 5    | 15a     | 502.4                    |                       | air dry                  | 13   | 10a     | 310.7                    | 357.3                 | 15.00                    |
|      | 15b     | 371.3                    |                       | air dry                  |      | 10b     | 341.3                    | 392.5                 | 15.00                    |
|      | 15c     | 389.3                    |                       | air dry                  |      | 10c     | 307.1                    | 353.2                 | 15.01                    |
| 6    | 5a      | 821.4                    |                       | air dry                  | 14   | 9a      | 295.4                    | 339.7                 | 15.00                    |
|      | 5b      | 803.6                    |                       | air dry                  |      | 9b      | 327.3                    | 376.4                 | 15.00                    |
|      | 5c      | 898.2                    |                       | air dry                  |      | 9c      | 309.7                    | 356.1                 | 14.98                    |
| 7    | 4a      | 753.5                    | 776.1                 | 3.00                     | 15   | 1a      | 733.4                    | 748.1                 | 2.00                     |
|      | 4b      | 920.3                    | 948.0                 | 3.01                     |      | 1b      | 1013.5                   | 1033.8                | 2.00                     |
|      | 4c      | 832.3                    | 857.3                 | 3.00                     |      | 1c      | 1122.8                   | 1145.3                | 2.00                     |
| 8    | 14a     | 334.2                    |                       | air dry                  | 16   | 8a      | 706.0                    |                       | air dry                  |
|      | 14b     | 342.9                    |                       | air dry                  |      | 8b      | 748.6                    |                       | air dry                  |
|      | 14c     | 419.7                    |                       | air dry                  |      | 8c      | 684.1                    |                       | air dry                  |

Lab Name:

Laboratory No. 19

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 14a     | 332.4                    |                       | air dry                  | 9    | 11a     | 404.8                    | 506.0                 | 25.00                    |
|      | 14b     | 286.3                    |                       | air dry                  |      | 11b     | 345.2                    | 431.5                 | 25.00                    |
|      | 14c     | 370.3                    |                       | air dry                  |      | 11c     | 412.3                    | 515.4                 | 25.01                    |
| 2    | 6a      | 810.2                    |                       | air dry                  | 10   | 7a      | 826.6                    |                       | air dry                  |
|      | 6b      | 947.0                    |                       | air dry                  |      | 7b      | 844.5                    |                       | air dry                  |
|      | 6c      | 637.8                    |                       | air dry                  |      | 7c      | 742.5                    |                       | air dry                  |
| 3    | 10a     | 255.1                    | 293.4                 | 15.01                    | 11   | 12a     | 433.2                    | 541.5                 | 25.00                    |
|      | 10b     | 290.8                    | 334.4                 | 14.99                    |      | 12b     | 417.8                    | 522.3                 | 25.01                    |
|      | 10c     | 246.3                    | 283.2                 | 14.98                    |      | 12c     | 430.5                    | 538.2                 | 25.02                    |
| 4    | 2a      | 863.2                    | 880.5                 | 2.00                     | 12   | 9a      | 338.2                    | 388.9                 | 14.99                    |
|      | 2b      | 653.1                    | 666.2                 | 2.01                     |      | 9b      | 322.8                    | 371.2                 | 14.99                    |
|      | 2c      | 622.8                    | 635.2                 | 1.99                     |      | 9c      | 331.7                    | 381.5                 | 15.01                    |
| 5    | 8a      | 655.5                    |                       | air dry                  | 13   | 4a      | 857.5                    | 883.3                 | 3.01                     |
|      | 8b      | 700.9                    |                       | air dry                  |      | 4b      | 893.7                    | 920.5                 | 3.00                     |
|      | 8c      | 950.0                    |                       | air dry                  |      | 4c      | 724.6                    | 746.3                 | 2.99                     |
| 6    | 5a      | 895.1                    |                       | air dry                  | 14   | 16a     | 389.4                    |                       | air dry                  |
|      | 5b      | 825.1                    |                       | air dry                  |      | 16b     | 461.6                    |                       | air dry                  |
|      | 5c      | 800.6                    |                       | air dry                  |      | 16c     | 350.9                    |                       | air dry                  |
| 7    | 13a     | 310.3                    |                       | air dry                  | 15   | 3a      | 856.5                    | 882.2                 | 3.00                     |
|      | 13b     | 277.6                    |                       | air dry                  |      | 3b      | 838.0                    | 863.1                 | 3.00                     |
|      | 13c     | 328.2                    |                       | air dry                  |      | 3c      | 867.6                    | 893.6                 | 3.00                     |
| 8    | 1a      | 822.0                    | 838.5                 | 2.01                     | 16   | 15a     | 284.6                    |                       | air dry                  |
|      | 1b      | 786.7                    | 802.5                 | 2.01                     |      | 15b     | 420.7                    |                       | air dry                  |
|      | 1c      | 776.7                    | 792.1                 | 1.98                     |      | 15c     | 354.9                    |                       | air dry                  |

Lab Name:

Laboratory No. 20

| Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) | Set# | Sample# | Beginning weight (0.1 g) | Ending weight (0.1 g) | Moisture Content (0.01%) |
|------|---------|--------------------------|-----------------------|--------------------------|------|---------|--------------------------|-----------------------|--------------------------|
| 1    | 9a      | 347.4                    | 399.5                 | 15.00                    | 9    | 3a      | 808.2                    | 832.5                 | 3.01                     |
|      | 9b      | 327.5                    | 376.6                 | 14.99                    |      | 3b      | 752.4                    | 774.9                 | 2.99                     |
|      | 9c      | 322.3                    | 370.6                 | 14.99                    |      | 3c      | 829.4                    | 854.3                 | 3.00                     |
| 2    | 12a     | 405.3                    | 506.6                 | 24.99                    | 10   | 8a      | 823.9                    |                       | air dry                  |
|      | 12b     | 485.3                    | 606.6                 | 24.99                    |      | 8b      | 988.6                    |                       | air dry                  |
|      | 12c     | 371.4                    | 464.3                 | 25.01                    |      | 8c      | 814.3                    |                       | air dry                  |
| 3    | 10a     | 315.0                    | 362.3                 | 15.00                    | 11   | 16a     | 461.0                    |                       | air dry                  |
|      | 10b     | 299.0                    | 343.8                 | 14.98                    |      | 16b     | 486.2                    |                       | air dry                  |
|      | 10c     | 400.1                    | 460.0                 | 14.97                    |      | 16c     | 421.9                    |                       | air dry                  |
| 4    | 14a     | 317.4                    |                       | air dry                  | 12   | 5a      | 793.5                    |                       | air dry                  |
|      | 14b     | 348.6                    |                       | air dry                  |      | 5b      | 901.2                    |                       | air dry                  |
|      | 14c     | 307.1                    |                       | air dry                  |      | 5c      | 829.6                    |                       | air dry                  |
| 5    | 4a      | 1045.4                   | 1076.7                | 2.99                     | 13   | 7a      | 707.2                    |                       | air dry                  |
|      | 4b      | 1037.3                   | 1068.4                | 3.00                     |      | 7b      | 890.6                    |                       | air dry                  |
|      | 4c      | 897.7                    | 924.6                 | 3.00                     |      | 7c      | 976.8                    |                       | air dry                  |
| 6    | 13a     | 391.3                    |                       | air dry                  | 14   | 2a      | 712.5                    | 726.8                 | 2.01                     |
|      | 13b     | 332.6                    |                       | air dry                  |      | 2b      | 1015.2                   | 1035.6                | 2.01                     |
|      | 13c     | 338.5                    |                       | air dry                  |      | 2c      | 943.2                    | 962.1                 | 2.00                     |
| 7    | 15a     | 502.7                    |                       | air dry                  | 15   | 6a      | 862.2                    |                       | air dry                  |
|      | 15b     | 499.4                    |                       | air dry                  |      | 6b      | 713.2                    |                       | air dry                  |
|      | 15c     | 311.0                    |                       | air dry                  |      | 6c      | 617.9                    |                       | air dry                  |
| 8    | 1a      | 1164.4                   | 1187.8                | 2.01                     | 16   | 11a     | 441.6                    | 552.0                 | 25.00                    |
|      | 1b      | 811.8                    | 828.0                 | 2.00                     |      | 11b     | 427.2                    | 534.0                 | 25.00                    |
|      | 1c      | 1077.9                   | 1099.5                | 2.00                     |      | 11c     | 446.3                    | 557.9                 | 25.01                    |

### **Section 3**

## **Returned Data Sheets**

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

University of Nevada-Reno  
Reno, Nevada

Laboratory No. 1

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 5a      | 873.2                  | 870.6               | 0.30                 | 9    | 10a     | 428.1                  | 363.8               | 17.67                |
|      | 5b      | 838.3                  | 836.4               | 0.23                 |      | 10b     | 374.5                  | 322.5               | 17.67                |
|      | 5c      | 799.5                  | 797.5               | 0.25                 |      | 10c     | 416.1                  | 353.5               | 17.71                |
| 2    | 3a      | 678.6                  | 656.8               | 3.32                 | 10   | 6a      | 748.8                  | 746.4               | 0.32                 |
|      | 3b      | 805.4                  | 778.4               | 3.47                 |      | 6b      | 632.5                  | 630.7               | 0.29                 |
|      | 3c      | 979.9                  | 948.4               | 3.32                 |      | 6c      | 472.7                  | 471.3               | 0.30                 |
| 3    | 12a     | 544.4                  | 368.8               | 39.48                | 11   | 1a      | 848.9                  | 831.2               | 2.13                 |
|      | 12b     | 484.8                  | 347.8               | 32.39                |      | 1b      | 670.5                  | 656.7               | 2.07                 |
|      | 12c     | 676.6                  | 481.2               | 39.56                |      | 1c      | 1056.0                 | 1033.8              | 2.15                 |
| 4    | 13a     | 252.6                  | 247.0               | 2.27                 | 12   | 8a      | 597.6                  | 595.5               | 0.35                 |
|      | 13b     | 356.4                  | 347.8               | 2.47                 |      | 8b      | 888.8                  | 885.8               | 0.34                 |
|      | 13c     | 335.7                  | 327.9               | 2.38                 |      | 8c      | 642.8                  | 640.4               | 0.37                 |
| 5    | 4a      | 716.5                  | 692.6               | 3.45                 | 13   | 2a      | 550.1                  | 538.7               | 2.12                 |
|      | 4b      | 719.8                  | 695.6               | 3.48                 |      | 2a      | 685.9                  | 671.3               | 2.17                 |
|      | 4c      | 733.1                  | 708.7               | 3.44                 |      | 2c      | 456.8                  | 737.0               | 2.11                 |
| 6    | 15a     | 546.9                  | 489.0               | 11.84                | 14   | 16a     | 448.0                  | 402.6               | 11.28                |
|      | 15b     | 477.1                  | 428.0               | 11.47                |      | 16b     | 416.2                  | 375.7               | 11.37                |
|      | 15c     | 362.8                  | 326.0               | 11.29                |      | 16c     | 333.7                  | 299.9               | 11.27                |
| 7    | 14a     | 302.7                  | 294.8               | 2.68                 | 15   | 11a     | 437.0                  | 312.4               | 39.88                |
|      | 14b     | 340.2                  | 351.5               | 2.62                 |      | 11b     | 608.1                  | 437.0               | 39.15                |
|      | 14c     | 381.0                  | 372.0               | 2.42                 |      | 11c     | 586.8                  | 423.0               | 38.73                |
| 8    | 9a      | 397.6                  | 342.5               | 16.09                | 16   | 7a      | 1024.1                 | 1018.7              | 0.53                 |
|      | 9b      | 397.4                  | 341.3               | 16.44                |      | 7b      | 824.7                  | 820.9               | 0.46                 |
|      | 9c      | 356.7                  | 306.5               | 16.38                |      | 7c      | 846.7                  | 843.5               | 0.38                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: J. MARTIN, 10-1-90

Checked and Approved, Date: Jan 10-2-90

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Federal Highway Administration  
Denver, Colorado

Laboratory No. 2

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 9a      | 345.6                  | 300.1               | 15.16                | 9    | 14a     | 404.6                  | 395.2               | 2.38                 |
|      | 9b      | 317.1                  | 275.1               | 15.27                |      | 14b     | 372.7                  | 364.0               | 2.37                 |
|      | 9c      | 386.0                  | 333.3               | 15.81                |      | 14c     | 272.3                  | 266.1               | 2.33                 |
| 2    | 3a      | 943.5                  | 913.7               | 3.26                 | 10   | 1a      | 934.4                  | 915.2               | 2.10                 |
|      | 3b      | 957.9                  | 927.7               | 3.26                 |      | 1b      | 714.5                  | 699.7               | 2.12                 |
|      | 3c      | 943.0                  | 914.0               | 3.17                 |      | 1c      | 897.9                  | 879.1               | 2.14                 |
| 3    | 16a     | 466.6                  | 420.4               | 10.99                | 11   | 7a      | 890.9                  | 887.6               | 0.37                 |
|      | 16b     | 522.9                  | 469.9               | 11.28                |      | 7b      | 770.1                  | 767.2               | 0.38                 |
|      | 16c     | 419.0                  | 371.1               | 11.11                |      | 7c      | 689.6                  | 686.7               | 0.42                 |
| 4    | 12a     | 477.7                  | 344.5               | 38.66                | 12   | 4a      | 759.4                  | 734.4               | 3.40                 |
|      | 12b     | 514.8                  | 371.3               | 38.65                |      | 4b      | 717.9                  | 694.2               | 3.41                 |
|      | 12c     | 415.3                  | 298.7               | 39.04                |      | 4c      | 922.7                  | 892.6               | 3.27                 |
| 5    | 13a     | 328.7                  | 321.9               | 2.11                 | 13   | 6a      | 848.6                  | 846.6               | 0.24                 |
|      | 13b     | 341.1                  | 334.4               | 2.00                 |      | 6b      | 698.5                  | 696.8               | 0.24                 |
|      | 13c     | 274.1                  | 268.4               | 2.12                 |      | 6c      | 1057.8                 | 1055.8              | 0.19                 |
| 6    | 8a      | 1155.6                 | 1152.0              | 0.31                 | 14   | 10a     | 404.0                  | 344.0               | 17.44                |
|      | 8b      | 877.9                  | 875.1               | 0.32                 |      | 10b     | 463.4                  | 395.2               | 17.26                |
|      | 8c      | 698.0                  | 695.5               | 0.36                 |      | 10c     | 305.2                  | 257.4               | 18.57                |
| 7    | 15a     | 393.4                  | 353.9               | 11.16                | 15   | 11a     | 472.0                  | 336.9               | 40.10                |
|      | 15b     | 406.8                  | 366.2               | 11.09                |      | 11b     | 533.6                  | 383.5               | 39.14                |
|      | 15c     | 360.6                  | 324.0               | 11.30                |      | 11c     | 453.6                  | 324.3               | 39.87                |
| 8    | 2a      | 562.6                  | 550.5               | 2.20                 | 16   | 5a      | 1016.1                 | 1013.5              | 0.26                 |
|      | 2b      | 785.3                  | 768.2               | 2.23                 |      | 5b      | 824.3                  | 821.4               | 0.35                 |
|      | 2c      | 663.9                  | 650.2               | 2.11                 |      | 5c      | 859.7                  | 857.2               | 0.29                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: LARRY SWYDER, 9/22/90

Checked and Approved, Date: D. REEL, 9/23/90

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Laboratory No. 3

Florida Department of Transportation  
Gainesville, Florida

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 1a      | 652.4                  | 639.4               | 2.03                 | 9    | 16a     | 336.2                  | 305.5               | 10.05                |
|      | 1b      | 753.2                  | 738.6               | 1.98                 |      | 16b     | 373.7                  | 340.6               | 9.72                 |
|      | 1c      | 727.1                  | 712.3               | 2.08                 |      | 16c     | 402.1                  | 367.3               | 9.47                 |
| 2    | 9a      | 236.1                  | 202.4               | 16.65                | 10   | 4a      | 810.7                  | 783.8               | 3.43                 |
|      | 9b      | 206.9                  | 177.9               | 16.30                |      | 4b      | 787.4                  | 761.7               | 3.37                 |
|      | 9c      | 216.3                  | 186.2               | 16.17                |      | 4c      | 986.1                  | 954.0               | 3.36                 |
| 3    | 7a      | 680.9                  | 678.9               | 0.29                 | 11   | 10a     | 210.2                  | 180.3               | 16.58                |
|      | 7b      | 722.9                  | 720.6               | 0.32                 |      | 10b     | 217.0                  | 184.1               | 17.87                |
|      | 7c      | 890.5                  | 887.5               | 0.34                 |      | 10c     | 214.3                  | 183.3               | 16.91                |
| 4    | 6a      | 872.2                  | 870.5               | 0.20                 | 12   | 11a     | 221.2                  | 156.4               | 41.43                |
|      | 6b      | 804.4                  | 802.7               | 0.21                 |      | 11b     | 241.6                  | 172.7               | 39.90                |
|      | 6c      | 784.3                  | 782.7               | 0.20                 |      | 11c     | 209.9                  | 150.7               | 39.28                |
| 5    | 13a     | 197.9                  | 193.7               | 2.17                 | 13   | 14a     | 211.6                  | 206.7               | 2.37                 |
|      | 13b     | 201.1                  | 196.9               | 2.13                 |      | 14b     | 225.0                  | 220.0               | 2.27                 |
|      | 13c     | 217.4                  | 212.7               | 2.21                 |      | 14c     | 224.3                  | 219.1               | 2.37                 |
| 6    | 3a      | 1066.5                 | 1032.7              | 3.27                 | 14   | 15a     | 368.5                  | 335.0               | 10.00                |
|      | 3b      | 846.7                  | 819.7               | 3.29                 |      | 15b     | 359.6                  | 326.5               | 10.14                |
|      | 3c      | 1119.3                 | 1084.1              | 3.25                 |      | 15c     | 413.4                  | 376.6               | 9.77                 |
| 7    | 5a      | 791.0                  | 789.4               | 0.20                 | 15   | 8a      | 697.8                  | 695.6               | 0.32                 |
|      | 5b      | 642.0                  | 640.8               | 0.19                 |      | 8b      | 866.7                  | 864.0               | 0.31                 |
|      | 5c      | 860.3                  | 858.7               | 0.19                 |      | 8c      | 782.2                  | 779.6               | 0.33                 |
| 8    | 2a      | 867.3                  | 849.2               | 2.13                 | 16   | 12a     | 234.2                  | 169.0               | 38.58                |
|      | 2b      | 897.4                  | 878.1               | 2.20                 |      | 12b     | 350.6                  | 254.4               | 37.81                |
|      | 2c      | 836.5                  | 818.5               | 2.20                 |      | 12c     | 250.1                  | 180.9               | 38.25                |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: Murrel Hines 9-5-90

Checked and Approved, Date: \_\_\_\_\_

*[Signature]*

# S.H.R.P. Moisture Content Proficiency Sample Program Data Sheet

Maryland Department of Transportation  
Baltimore, Maryland

Laboratory No. 4

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 10a     | 484.3                  | 426.0               | 17.61                | 9    | 12a     | 704.3                  | 537.5               | 38.10                |
|      | 10c     | 436.4                  | 385.2               | 17.65                |      | 12b     | 617.5                  | 472.5               | 38.47                |
|      | 10c     | 428.3                  | 420.9               | 17.63                |      | 12c     | 651.5                  | 495.4               | 39.08                |
| 2    | 3a      | 887.1                  | 858.3               | 3.33                 | 10   | 5a      | 880.8                  | 879.1               | 0.22                 |
|      | 3b      | 886.0                  | 860.4               | 3.34                 |      | 5b      | 856.0                  | 854.3               | 0.22                 |
|      | 3c      | 841.9                  | 814.5               | 3.34                 |      | 5c      | 866.3                  | 864.7               | 0.21                 |
| 3    | 9a      | 471.0                  | 418.0               | 16.43                | 11   | 14a     | 420.9                  | 413.0               | 2.49                 |
|      | 9b      | 464.1                  | 412.1               | 16.41                |      | 14b     | 486.7                  | 477.6               | 2.38                 |
|      | 9c      | 464.9                  | 412.9               | 16.31                |      | 14c     | 485.0                  | 475.9               | 2.39                 |
| 4    | 13a     | 493.0                  | 483.9               | 2.34                 | 12   | 4a      | 825.7                  | 801.8               | 3.43                 |
|      | 13b     | 447.6                  | 441.2               | 1.85                 |      | 4b      | 925.4                  | 897.2               | 3.52                 |
|      | 13c     | 465.5                  | 458.0               | 2.07                 |      | 4c      | 726.1                  | 704.7               | 3.51                 |
| 5    | 7a      | 973.4                  | 969.9               | 0.40                 | 13   | 6a      | 1045.9                 | 1043.7              | 0.23                 |
|      | 7b      | 942.4                  | 939.7               | 0.32                 |      | 6b      | 786.4                  | 784.8               | 0.22                 |
|      | 7c      | 890.7                  | 887.7               | 0.38                 |      | 6c      | 763.9                  | 762.5               | 0.21                 |
| 6    | 8a      | 998.4                  | 995.5               | 0.32                 | 14   | 1a      | 1094.4                 | 1073.2              | 2.17                 |
|      | 8b      | 892.2                  | 889.0               | 0.40                 |      | 1b      | 970.8                  | 952.1               | 2.18                 |
|      | 8c      | 865.8                  | 862.7               | 0.35                 |      | 1c      | 1163.4                 | 1140.6              | 2.18                 |
| 7    | 15a     | 390.5                  | 360.3               | 11.37                | 15   | 16a     | 563.4                  | 517.2               | 10.93                |
|      | 15b     | 202.5                  | 644.6               | 10.73                |      | 16b     | 454.9                  | 419.7               | 11.08                |
|      | 15c     | 498.7                  | 458.5               | 11.06                |      | 16c     | 530.4                  | 487.7               | 10.87                |
| 8    | 2a      | 669.7                  | 657.2               | 2.23                 | 16   | 11a     | 593.9                  | 453.9               | 39.07                |
|      | 2b      | 1048.1                 | 1027.6              | 2.30                 |      | 11b     | 623.6                  | 476.2               | 38.76                |
|      | 2c      | 888.9                  | 871.7               | 2.21                 |      | 11c     | 577.9                  | 442.8               | 38.87                |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: Sec C. Foster 9/2/80

Checked and Approved, Date: Richard W. Thompson 9/4

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Iowa Department of Transportation  
Ames, Iowa

Laboratory No. 5

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 16a     | 319.1                  | 288.9               | 10.45                | 9    | 3a      | 857.0                  | 829.1               | 3.37                 |
|      | 16b     | 461.3                  | 422.8               | 9.11                 |      | 3b      | 1097.0                 | 1062.0              | 3.30                 |
|      | 16c     | 512.4                  | 472.6               | 8.42                 |      | 3c      | 959.3                  | 928.7               | 3.29                 |
| 2    | 1a      | 747.8                  | 731.7               | 2.20                 | 10   | 2a      | 839.9                  | 821.8               | 2.20                 |
|      | 1b      | 804.1                  | 786.8               | 2.20                 |      | 2b      | 967.7                  | 946.7               | 2.22                 |
|      | 1c      | 1051.5                 | 1029.3              | 2.16                 |      | 2c      | 914.0                  | 894.0               | 2.24                 |
| 3    | 6a      | 950.0                  | 947.8               | 0.23                 | 11   | 8a      | 983.3                  | 980.0               | 0.34                 |
|      | 6b      | 726.5                  | 724.7               | 0.25                 |      | 8b      | 733.7                  | 731.3               | 0.33                 |
|      | 6c      | 1056.8                 | 1054.4              | 0.23                 |      | 8c      | 846.2                  | 843.6               | 0.31                 |
| 4    | 11a     | 638.5                  | 487.3               | 31.03                | 12   | 14a     | 267.1                  | 260.8               | 2.42                 |
|      | 11b     | 542.5                  | 399.6               | 35.76                |      | 14b     | 361.1                  | 352.8               | 2.35                 |
|      | 11c     | 598.0                  | 499.5               | 19.72                |      | 14c     | 348.6                  | 340.3               | 2.44                 |
| 5    | 13a     | 377.0                  | 370.4               | 1.78                 | 13   | 7a      | 969.5                  | 966.5               | 0.31                 |
|      | 13b     | 356.3                  | 349.9               | 1.83                 |      | 7b      | 834.9                  | 831.7               | 0.38                 |
|      | 13c     | 357.8                  | 350.2               | 2.17                 |      | 7c      | 736.6                  | 734.0               | 0.35                 |
| 6    | 10a     | 379.8                  | 323.0               | 17.59                | 14   | 4a      | 810.1                  | 784.2               | 3.30                 |
|      | 10b     | 425.4                  | 361.7               | 17.61                |      | 4b      | 873.1                  | 844.2               | 3.42                 |
|      | 10c     | 375.7                  | 320.6               | 17.19                |      | 4c      | 838.1                  | 811.1               | 3.33                 |
| 7    | 12a     | 477.7                  | 348.3               | 37.15                | 15   | 15a     | 400.3                  | 365.5               | 9.52                 |
|      | 12b     | 537.9                  | 408.5               | 31.68                |      | 15b     | 612.7                  | 564.3               | 8.58                 |
|      | 12c     | 500.8                  | 373.7               | 34.01                |      | 15c     | 340.7                  | 309.4               | 10.12                |
| 8    | 9a      | 383.1                  | 330.0               | 16.09                | 16   | 5a      | 889.0                  | 887.1               | 0.21                 |
|      | 9b      | 337.3                  | 291.5               | 15.71                |      | 5b      | 868.7                  | 867.0               | 0.20                 |
|      | 9c      | 366.1                  | 314.9               | 16.26                |      | 5c      | 774.7                  | 773.5               | 0.16                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: Steve Steel 9-10-90

Checked and Approved, Date: W.K. Stearns 9-18-90

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Oregon State Highway Division  
Salem, Oregon

Laboratory No. 6

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 4a      | 1129.0                 | 1091.5              | 3.44                 | 9    | 16a     | 415.7                  | 377.4               | 10.15                |
|      | 4b      | 647.6                  | 820.2               | 3.34                 |      | 16b     | 344.6                  | 311.8               | 10.52                |
|      | 4c      | 765.3                  | 740.5               | 3.35                 |      | 16c     | 370.5                  | 336.4               | 10.14                |
| 2    | 8a      | 809.8                  | 807.1               | 0.34                 | 10   | 14a     | 319.7                  | 312.4               | 2.34                 |
|      | 8b      | 760.4                  | 758.1               | 0.30                 |      | 14b     | 364.7                  | 356.4               | 2.33                 |
|      | 8c      | 896.9                  | 893.9               | 0.34                 |      | 14c     | 386.4                  | 377.4               | 2.39                 |
| 3    | 7a      | 726.9                  | 724.5               | 0.33                 | 11   | 13a     | 321.6                  | 316.2               | 1.71                 |
|      | 7b      | 717.6                  | 715.2               | 0.34                 |      | 13b     | 375.2                  | 367.0               | 2.23                 |
|      | 7c      | 767.0                  | 764.7               | 0.30                 |      | 13c     | 420.4                  | 412.6               | 1.89                 |
| 4    | 2a      | 716.5                  | 701.0               | 2.21                 | 12   | 1a      | 808.8                  | 791.6               | 2.17                 |
|      | 2b      | 1002.4                 | 980.8               | 2.20                 |      | 1b      | 842.3                  | 628.7               | 2.16                 |
|      | 2c      | 605.4                  | 592.5               | 2.18                 |      | 1c      | 774.1                  | 757.6               | 2.18                 |
| 5    | 3a      | 949.4                  | 919.0               | 3.31                 | 13   | 6a      | 913.2                  | 911.1               | 0.23                 |
|      | 3b      | 913.4                  | 883.9               | 3.34                 |      | 6b      | 831.5                  | 829.7               | 0.22                 |
|      | 3c      | 1064.9                 | 1030.5              | 3.34                 |      | 6c      | 761.4                  | 760.0               | 0.18                 |
| 6    | 11a     | 591.3                  | 440.1               | 34.36                | 14   | 15a     | 460.6                  | 418.8               | 9.98                 |
|      | 11b     | 514.1                  | 371.1               | 38.53                |      | 15b     | 300.3                  | 270.7               | 10.94                |
|      | 11c     | 591.4                  | 441.3               | 34.01                |      | 15c     | 403.5                  | 365.6               | 10.37                |
| 7    | 10a     | 286.5                  | 245.5               | 16.70                | 15   | 12a     | 605.5                  | 448.8               | 34.92                |
|      | 10b     | 388.0                  | 330.0               | 17.58                |      | 12b     | 466.3                  | 337.6               | 38.12                |
|      | 10c     | 412.4                  | 351.3               | 17.39                |      | 12c     | 567.9                  | 420.4               | 35.09                |
| 8    | 9a      | 334.6                  | 288.3               | 16.06                | 16   | 5a      | 885.3                  | 883.6               | 0.19                 |
|      | 9b      | 340.8                  | 293.0               | 16.31                |      | 5b      | 684.9                  | 683.6               | 0.19                 |
|      | 9c      | 401.5                  | 345.9               | 16.07                |      | 5c      | 895.0                  | 893.3               | 0.19                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: Ralph Borchert 9-11-90

Checked and Approved, Date: Bill Lien 9-12-90

# S.H.R.P. Moisture Content Proficiency Sample Program Data Sheet

California Department of Transportation  
Sacramento, California

Laboratory No. 7

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 2a      | 878.4                  | 879.5               | 2.15                 | 9    | 13a     | 226.0                  | 221.7               | 1.94                 |
|      | 2b      | 750.9                  | 754.5               | 2.23                 |      | 13b     | 272.4                  | 266.1               | 2.37                 |
|      | 2c      | 693.4                  | 679.3               | 2.08                 |      | 13c     | 267.4                  | 261.7               | 2.18                 |
| 2    | 9a      | 160.8                  | 138.0               | 16.52                | 10   | 16a     | 246.6                  | 221.7               | 11.23                |
|      | 9b      | 186.0                  | 161.0               | 15.53                |      | 16b     | 263.0                  | 256.5               | 11.21                |
|      | 9c      | 160.6                  | 138.4               | 16.04                |      | 16c     | 221.8                  | 199.4               | 11.23                |
| 3    | 10a     | 185.2                  | 157.1               | 17.89                | 11   | 3a      | 802.2                  | 775.8               | 3.40                 |
|      | 10b     | 155.3                  | 132.2               | 17.47                |      | 3b      | 673.8                  | 652.0               | 3.24                 |
|      | 10c     | 171.9                  | 146.9               | 17.02                |      | 3c      | 978.7                  | 947.1               | 3.34                 |
| 4    | 15a     | 201.3                  | 181.1               | 11.15                | 12   | 1a      | 801.8                  | 784.5               | 2.21                 |
|      | 15b     | 286.7                  | 259.0               | 10.67                |      | 1b      | 847.4                  | 823.0               | 2.24                 |
|      | 15c     | 206.3                  | 185.5               | 11.21                |      | 1c      | 759.3                  | 742.8               | 2.22                 |
| 5    | 6a      | 1102.9                 | 1100.4              | 0.23                 | 13   | 14a     | 269.9                  | 263.6               | 2.39                 |
|      | 6b      | 750.0                  | 728.5               | 0.23                 |      | 14b     | 255.0                  | 248.9               | 2.45                 |
|      | 6c      | 842.3                  | 839.7               | 0.29                 |      | 14c     | 226.4                  | 221.0               | 2.44                 |
| 6    | 5a      | 972.9                  | 970.7               | 0.23                 | 14   | 12a     | 392.2                  | 281.4               | 39.37                |
|      | 5b      | 795.3                  | 793.6               | 0.21                 |      | 12b     | 444.5                  | 320.3               | 38.78                |
|      | 5c      | 765.1                  | 963.9               | 0.23                 |      | 12c     | 425.8                  | 305.5               | 39.38                |
| 7    | 4a      | 1057.6                 | 1022.4              | 3.44                 | 15   | 8a      | 690.0                  | 687.3               | 0.39                 |
|      | 4b      | 962.3                  | 930.2               | 3.45                 |      | 8b      | 753.3                  | 750.7               | 0.35                 |
|      | 4c      | 937.4                  | 905.9               | 3.48                 |      | 8c      | 872.7                  | 870.1               | 0.41                 |
| 8    | 11a     | 352.7                  | 253.3               | 39.24                | 16   | 7a      | 643.0                  | 640.3               | 0.42                 |
|      | 11b     | 374.4                  | 267.6               | 37.91                |      | 7b      | 726.2                  | 722.9               | 0.46                 |
|      | 11c     | 386.3                  | 278.2               | 38.86                |      | 7c      | 962.2                  | 958.7               | 0.37                 |

\* Bags were open or had been punctured.

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

For insitu - xhm - Del EST 11/20/90

checked - App - 1, Date 1/21/90

# S.H.R.P. Moisture Content Proficiency Sample Program Data Sheet

uthwestern Laboratories  
uston, Texas

Laboratory NO. 8

| Set# | Sample# | Beginning Weight(0.1g) | Ending Weight(0.1g) | Moisture Loss(0.01%) | Set# | Sample# | Beginning Weight(0.1g) | Ending Weight(0.1g) | Moisture Loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 9 a     | 367.5                  | 317.9               | 15.60                | 9    | 15 a    | 372.6                  | 337.1               | 10.53                |
|      | 9 b     | 435.2                  | 375.2               | 15.99                |      | 15 b    | 353.2                  | 319.4               | 10.58                |
|      | 9 c     | 436.6                  | 376.2               | 16.06                |      | 15 c    | 309.7                  | 279.2               | 10.92                |
| 2    | 13 a    | 277.6                  | 272.3               | 1.95                 | 10   | 4 a     | 797.3                  | 771.6               | 3.33                 |
|      | 13 b    | 347.7                  | 341.9               | 1.70                 |      | 4 b     | 637.5                  | 616.7               | 3.37                 |
|      | 13 c    | 335.7                  | 328.6               | 2.16                 |      | 4 c     | 961.5                  | 930.6               | 3.32                 |
| 3    | 5 a     | 638.8                  | 637.5               | 0.20                 | 11   | 2 a     | 590.2                  | 577.3               | 2.23                 |
|      | 5 b     | 753.4                  | 751.9               | 0.20                 |      | 2 b     | 794.8                  | 777.7               | 2.20                 |
|      | 5 c     | 804.3                  | 802.6               | 0.21                 |      | 2 c     | 928.9                  | 908.9               | 2.20                 |
| 4    | 11 a    | 512.7                  | 369.6               | 38.72                | 12   | 12 a    | 491.0                  | 352.9               | 39.13                |
|      | 11 b    | 588.1                  | 425.1               | 38.34                |      | 12 b    | 677.8                  | 487.6               | 39.01                |
|      | 11 c    | 490.9                  | 353.2               | 38.99                |      | 12 c    | 496.6                  | 356.1               | 39.46                |
| 5    | 8 a     | 961.8                  | 959.0               | 0.29                 | 13   | 3 a     | 754.0                  | 730.3               | 3.25                 |
|      | 8 b     | 901.1                  | 898.5               | 0.29                 |      | 3 b     | 1005.0                 | 972.7               | 3.32                 |
|      | 8 c     | 675.5                  | 673.3               | 0.33                 |      | 3 c     | 1099.3                 | 1064.8              | 3.24                 |
| 6    | 7 a     | 802.4                  | 799.9               | 0.31                 | 14   | 16 a    | 337.1                  | 303.2               | 11.18                |
|      | 7 b     | 695.3                  | 692.9               | 0.35                 |      | 16 b    | 532.2                  | 479.4               | 11.01                |
|      | 7 c     | 789.4                  | 786.6               | 0.36                 |      | 16 c    | 438.9                  | 395.0               | 11.11                |
| 7    | 1 a     | 1096.6                 | 1073.5              | 2.15                 | 15   | 14 a    | 309.5                  | 302.7               | 2.25                 |
|      | 1 b     | 996.5                  | 974.8               | 2.23                 |      | 14 b    | 354.1                  | 346.1               | 2.31                 |
|      | 1 c     | 922.0                  | 902.2               | 2.19                 |      | 14 c    | 380.1                  | 371.3               | 2.37                 |
| 8    | 10 a    | 399.4                  | 340.1               | 17.44                | 16   | 6 a     | 1000.3                 | 998.0               | 0.23                 |
|      | 10 b    | 403.8                  | 345.0               | 17.04                |      | 6 b     | 682.3                  | 680.8               | 0.22                 |
|      | 10 c    | 393.7                  | 334.1               | 17.84                |      | 6 c     | 806.0                  | 804.3               | 0.21                 |

Each set of three sample is to be tested individually and in numerical order according to the set number  
Please be certain to fill in the correct blanks on the data sheet

Responsible Technician, Date:

*Fatai Akiniabi* 10/1/90  
Fatai Akiniabi, CET

Checked and Approved, Date:

*Maghsoud Tahmouressi* 10/1/90  
Maghsoud Tahmouressi, P.E.

# S.H.R.P. Moisture Content Proficiency Sample Program Data Sheet

Braun Engineering Testing, Inc.  
Minneapolis, Minnesota

Laboratory No. 9

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 10a     | 400.5                  | 340.6               | 17.59                | 9    | 5a      | 696.6                  | 694.6               | 0.29                 |
|      | 10b     | 328.7                  | 279.1               | 17.77                |      | 5b      | 999.4                  | 996.5               | 0.29                 |
|      | 10c     | 438.4                  | 373.8               | 17.28                |      | 5c      | 833.5                  | 830.9               | 0.31                 |
| 2    | 7a      | 770.3                  | 766.8               | 0.46                 | 10   | 14a     | 365.5                  | 356.2               | 2.61                 |
|      | 7b      | 687.5                  | 684.5               | 0.44                 |      | 14b     | 308.7                  | 300.9               | 2.59                 |
|      | 7c      | 685.3                  | 682.3               | 0.44                 |      | 14c     | 288.2                  | 280.6               | 2.71                 |
| 3    | 6a      | 1176.5                 | 1173.7              | 0.24                 | 11   | 8a      | 812.5                  | 809.2               | 0.41                 |
|      | 6b      | 943.0                  | 940.5               | 0.26                 |      | 8b      | 874.0                  | 870.4               | 0.41                 |
|      | 6c      | 782.1                  | 779.9               | 0.28                 |      | 8c      | 816.2                  | 812.5               | 0.46                 |
| 4    | 11a     | 490.9                  | 356.1               | 39.82                | 12   | 2a      | 807.6                  | 790.4               | 2.18                 |
|      | 11b     | 481.4                  | 344.8               | 39.62                |      | 2b      | 659.8                  | 645.3               | 2.25                 |
|      | 11c     | 472.0                  | 338.4               | 39.48                |      | 2c      | 529.2                  | 517.3               | 2.30                 |
| 5    | 12a     | 595.7                  | 429.1               | 38.82                | 13   | 3a      | 1120.6                 | 1084.1              | 3.37                 |
|      | 12b     | 536.5                  | 384.4               | 39.67                |      | 3b      | 879.2                  | 854.4               | 3.26                 |
|      | 12c     | 494.5                  | 354.4               | 39.53                |      | 3c      | 976.0                  | 944.6               | 3.32                 |
| 6    | 13a     | 293.6                  | 285.7               | 8.76                 | 14   | 15a     | 409.1                  | 367.4               | 11.35                |
|      | 13b     | 381.7                  | 372.0               | 2.61                 |      | 15b     | 482.6                  | 434.0               | 11.20                |
|      | 13c     | 338.3                  | 329.5               | 2.67                 |      | 15c     | 282.2                  | 252.8               | 11.63                |
| 7    | 1a      | 905.1                  | 885.2               | 2.25                 | 15   | 9a      | 352.5                  | 303.2               | 16.26                |
|      | 1b      | 1001.6                 | 980.0               | 2.20                 |      | 9b      | 294.6                  | 253.1               | 16.40                |
|      | 1c      | 433.1                  | 412.6               | 2.25                 |      | 9c      | 368.0                  | 317.8               | 15.80                |
| 8    | 4a      | 694.1                  | 670.2               | 3.57                 | 16   | 16a     | 380.8                  | 342.6               | 11.15                |
|      | 4b      | 916.4                  | 885.9               | 3.44                 |      | 16b     | 514.7                  | 463.4               | 11.07                |
|      | 4c      | 734.7                  | 709.4               | 3.57                 |      | 16c     | 458.3                  | 410.3               | 11.78                |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: Charles D. Murphy 9-12-90

Checked and Approved, Date: William Boyd 9-12-90

# S.H.R.P. Moisture Content Proficiency Sample Program

Data Sheet

Nevada Department of Transportation  
Carson City, Nevada

Laboratory No. 10

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 10a     | 227.0                  | 200.5               | 17.35                | 9    | 11a     | 213.3                  | 168.6               | 36.90                |
|      | 10b     | 211.4                  | 186.6               | 17.78                |      | 11b     | 257.3                  | 202.5               | 35.65                |
|      | 10c     | 221.5                  | 195.4               | 17.71                |      | 11c     | 232.7                  | 182.8               | 37.21                |
| 2    | 5a      | 1337.4                 | 1335.8              | 0.15                 | 10   | 14a     | 175.7                  | 172.9               | 2.18                 |
|      | 5b      | 1190.6                 | 1189.1              | 0.17                 |      | 14b     | 176.1                  | 173.3               | 2.19                 |
|      | 5c      | 1150.3                 | 1148.8              | 0.17                 |      | 14c     | 207.3                  | 203.8               | 2.27                 |
| 3    | 8a      | 1227.3                 | 1224.7              | 0.27                 | 11   | 7a      | 1044.6                 | 1042.6              | 0.27                 |
|      | 8b      | 1110.2                 | 1107.4              | 0.34                 |      | 7b      | 1078.3                 | 1076.3              | 0.26                 |
|      | 8c      | 946.1                  | 944.3               | 0.27                 |      | 7c      | 1011.9                 | 1010.0              | 0.26                 |
| 4    | *13a    | 227.7                  | 224.0               | 2.09                 | 12   | 4a      | 1392.1                 | 1356.8              | 3.32                 |
|      | 13b     | 201.1                  | 198.1               | 2.00                 |      | 4b      | 1247.6                 | 1216.0              | 3.43                 |
|      | 13c     | 191.9                  | 189.3               | 1.82                 |      | 4c      | 1084.6                 | 1058.0              | 3.41                 |
| 5    | 6a      | 1281.5                 | 1280.0              | 0.15                 | 13   | 15a     | 303.8                  | 285.0               | 7.90                 |
|      | 6b      | 1157.8                 | 1156.2              | 0.18                 |      | 15b     | 338.7                  | 318.4               | 7.55                 |
|      | 6c      | 1169.9                 | 1168.5              | 0.16                 |      | 15c     | 321.4                  | 301.31              | 7.94                 |
| 6    | 1a      | 1066.9                 | 1050.3              | 2.14                 | 14   | 16a     | 330.6                  | 310.7               | 7.62                 |
|      | *1b     | 1237.9                 | 1218.4              | 2.15                 |      | 16b     | 340.5                  | 320.2               | 7.45                 |
|      | 1c      | 1223.7                 | 1204.3              | 2.16                 |      | 16c     | 304.9                  | 285.8               | 8.10                 |
| 7    | 9a      | 203.1                  | 181.9               | 16.10                | 15   | 2a      | 1168.6                 | 1150.1              | 2.15                 |
|      | 9b      | 249.1                  | 222.0               | 15.58                |      | 2b      | 1290.1                 | 1269.1              | 2.14                 |
|      | 9c      | 203.4                  | 182.3               | 15.54                |      | 2c      | 1019.1                 | 1003.0              | 2.18                 |
| 8    | 3a      | 924.4                  | 904.5               | 3.23                 | 16   | 12a     | 257.0                  | 206.0               | 32.49                |
|      | 3b      | 1158.4                 | 1129.5              | 3.34                 |      | 12b     | 276.2                  | 220.9               | 32.21                |
|      | 3c      | 1160.9                 | 1133.5              | 3.26                 |      | 12c     | 262.3                  | 206.0               | 35.68                |

\*Samples had partially opened bags.

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: Pete Baker 9-6-90

Checked and Approved, Date: Ted Beeston, 9-6-90

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Kansas Department of Transportation  
Topeka, Kansas

Laboratory No. 11

| Set # | Sample # | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set # | Sample # | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|-------|----------|------------------------|---------------------|----------------------|-------|----------|------------------------|---------------------|----------------------|
| 1     | 1a       | 535.7                  | 525.5               | 1.94                 | 9     | 10a      | 195.5                  | 166.9               | 17.14                |
|       | 1b       | 520.7                  | 510.4               | 2.02                 |       | 10b      | 193.8                  | 165.3               | 17.24                |
|       | 1c       | 579.9                  | 568.0               | 2.10                 |       | 10c      | 203.1                  | 173.4               | 17.24                |
| 2     | 6a       | 624.6                  | 623.6               | .16                  | 10    | 15a      | 400.7                  | 361.4               | 10.87                |
|       | 6b       | 679.3                  | 677.4               | .28                  |       | 15b      | 358.4                  | 322.9               | 10.99                |
|       | 6c       | 700.4                  | 698.5               | .27                  |       | 15c      | 406.7                  | 366.4               | 11.00                |
| 3     | 16a      | 206.2                  | 186.0               | 10.86                | 11    | 2a       | 577.4                  | 566.1               | 2.00                 |
|       | 16b      | 327.1                  | 294.4               | 11.11                |       | 2b       | 600.0                  | 587.2               | 2.18                 |
|       | 16c      | 318.4                  | 286.4               | 11.17                |       | 2c       | 711.7                  | 697.3               | 2.07                 |
| 4     | 13a      | 183.2                  | 179.0               | 2.35                 | 12    | 4a       | 684.7                  | 663.2               | 3.24                 |
|       | 13b      | 192.0                  | 187.9               | 2.18                 |       | 4b       | 649.8                  | 629.3               | 3.26                 |
|       | 13c      | 188.8                  | 184.6               | 2.28                 |       | 4c       | 708.9                  | 686.6               | 3.25                 |
| 5     | 8a       | 717.0                  | 714.8               | .31                  | 13    | 12a      | 163.2                  | 118.3               | 37.95                |
|       | 8b       | 671.2                  | 669.3               | .28                  |       | 12b      | 172.5                  | 124.5               | 38.55                |
|       | 8c       | 633.2                  | 631.3               | .30                  |       | 12c      | 160.1                  | 113.9               | 40.56                |
| 6     | 3a       | 591.7                  | 573.2               | 3.23                 | 14    | 14a      | 195.9                  | 191.3               | 2.40                 |
|       | 3b       | 684.4                  | 663.7               | 3.12                 |       | 14b      | 196.2                  | 191.7               | 2.35                 |
|       | 3c       | 701.1                  | 679.8               | 3.13                 |       | 14c      | 194.4                  | 189.7               | 2.48                 |
| 7     | 7a       | 741.2                  | 739.1               | .28                  | 15    | 5a       | 613.9                  | 613.1               | .13                  |
|       | 7b       | 749.7                  | 746.8               | .19                  |       | 5b       | 700.9                  | 699.3               | .23                  |
|       | 7c       | 627.0                  | 625.5               | .24                  |       | 5c       | 690.2                  | 689.5               | .10                  |
| 8     | 9a       | 171.2                  | 147.8               | 15.83                | 16    | 11a      | 186.1                  | 131.5               | 40.00                |
|       | 9b       | 173.6                  | 142.7               | 21.65                |       | 11b      | 168.9                  | 120.5               | 40.17                |
|       | 9c       | 186.2                  | 158.9               | 17.18                |       | 11c      | 180.4                  | 129.3               | 39.52                |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: 4/11/94 Checked and Approved, Date: Shelly A. Henry 7-11-94

# S.H.R.P. Moisture Content Proficiency Sample Program Data Sheet

PSI  
Pittsburgh, Pennsylvania

Laboratory No. 12

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 1a      | 682.8                  | 668.6               | 2.12                 | 9    | 2a      | 601.6                  | 588.6               | 2.21                 |
|      | 1b      | 820.2                  | 871.6               | 2.13                 |      | 2b      | 910.2                  | 891.2               | 2.13                 |
|      | 1c      | 1185.2                 | 1160.9              | 2.09                 |      | 2c      | 543.4                  | 531.5               | 2.24                 |
| 2    | 16a     | 470.4                  | 430.2               | 9.34                 | 10   | 8a      | 1006.0                 | 1001.5              | 0.45                 |
|      | 16b     | 436.5                  | 395.6               | 10.34                |      | 8b      | 708.3                  | 705.1               | 0.45                 |
|      | 16c     | 490.4                  | 452.3               | 8.42                 |      | 8c      | 1026.0                 | 1020.7              | 0.52                 |
| 3    | 11a     | 540.3                  | 405.4               | 33.28                | 11   | 7a      | 870.8                  | 867.0               | 0.44                 |
|      | 11b     | 460.1                  | 336.5               | 36.73                |      | 7b      | 851.4                  | 847.6               | 0.45                 |
|      | 11c     | 564.7                  | 416.6               | 35.55                |      | 7c      | 809.4                  | 806.8               | 0.32                 |
| 4    | 13a     | 273.7                  | 267.9               | 2.16                 | 12   | 14a     | 324.3                  | 316.7               | 2.40                 |
|      | 13b     | 276.6                  | 272.1               | 1.65                 |      | 14b     | 301.8                  | 294.5               | 2.48                 |
|      | 13c     | 380.6                  | 373.3               | 1.96                 |      | 14c     | 254.4                  | 248.5               | 2.37                 |
| 5    | 15a     | 401.3                  | 365.8               | 9.70                 | 13   | 3a      | 1083.3                 | 1048.7              | 3.30                 |
|      | 15b     | 426.5                  | 388.5               | 9.78                 |      | 3b      | 1184.1                 | 1146.5              | 3.28                 |
|      | 15c     | 386.1                  | 346.9               | 10.26                |      | 3c      | 1065.1                 | 1031.1              | 3.30                 |
| 6    | 12a     | 558.7                  | 415.5               | 34.46                | 14   | 4a      | 937.9                  | 907.6               | 3.34                 |
|      | 12b     | 457.7                  | 336.1               | 36.18                |      | 4b      | 894.4                  | 863.2               | 3.61                 |
|      | 12c     | 528.0                  | 390.1               | 35.35                |      | 4c      | 914.1                  | 883.7               | 3.44                 |
| 7    | 6a      | 785.7                  | 784.0               | 0.22                 | 15   | 9a      | 381.6                  | 328.6               | 16.13                |
|      | 6b      | 698.5                  | 697.0               | 0.22                 |      | 9b      | 429.1                  | 369.9               | 16.00                |
|      | 6c      | 834.0                  | 832.1               | 0.23                 |      | 9c      | 347.5                  | 299.6               | 15.99                |
| 8    | 5a      | 946.3                  | 944.5               | 0.19                 | 16   | 10a     | 405.7                  | 345.0               | 17.59                |
|      | 5b      | 874.7                  | 872.9               | 0.21                 |      | 10b     | 287.8                  | 246.6               | 16.71                |
|      | 5c      | 649.2                  | 647.7               | 0.23                 |      | 10c     | 277.1                  | 237.1               | 16.87                |

OVER.....

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician Date: 10/12/12

Printed name Appointed Date: 10/12/12

12

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Minnesota Department of Transportation  
Maplewood, Minnesota

Laboratory No. 13

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g)       | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 5a      | 911.5                  | 910.4                     | .12                  | 9    | 15a     | 442.6                  | 399.3               | 10.67                |
|      | 5b      | 837.9                  | 836.8                     | .13                  |      | 15b     | 372.6                  | 351.2               | 11.22                |
|      | 5c      | 920.8                  | 919.7                     | .12                  |      | 15c     | 371.2                  | 333.2               | 11.40                |
| 2    | 2a      | 931                    | INADVERTENTLY<br>SWITCHED |                      | 10   | 6a      | 758.9                  | 756.5               | .32                  |
|      | 2b      | 725.2                  |                           |                      |      | 6b      | 754.9                  | 752.9               | .27                  |
|      | 2c      | 1261.9                 |                           |                      |      | 6c      | 819.4                  | 817.6               | .22                  |
| 3    | 4a      | 804                    | 777.7                     | 3.38                 | 11   | 13a     | 250.7                  | 245.6               | 2.08                 |
|      | 4b      | 895.3                  | 865.7                     | 3.42                 |      | 13b     | 386.2                  | 377.9               | 2.20                 |
|      | 4c      | 878                    | 848.9                     | 3.43                 |      | 13c     | 280.7                  | 275                 | 2.07                 |
| 4    | 8a      | 643.8                  | 641.8                     | .31                  | 12   | 14a     | 323.6                  | 316.3               | 2.31                 |
|      | 8b      | 787.8                  | 787                       | .31                  |      | 14b     | 278.7                  | 291.7               | 2.40                 |
|      | 8c      | 1203.0                 | 1198.4                    | .38                  |      | 14c     | 415.4                  | 404.2               | 2.77                 |
| 5    | 11a     | 597.9                  | 431                       | 38.72                | 13   | 1a      | 822.5                  | 805.3               | 2.14                 |
|      | 11b     | 497.9                  | 358.4                     | 38.92                |      | 1b      | 853.1                  | 834.2               | 2.15                 |
|      | 11c     | 569.8                  | 409                       | 39.31                |      | 1c      | 973                    | 955                 | 1.88                 |
| 6    | 16a     | 544.3                  | INADVERTENTLY<br>SWITCHED |                      | 14   | 9a      | 422                    | 363.2               | 16.19                |
|      | 16b     | 402.5                  |                           |                      |      | 9b      | 419.5                  | 359.3               | 16.75                |
|      | 16c     | 543.7                  |                           |                      |      | 9c      | 367.7                  | 317                 | 15.99                |
| 7    | 3a      | 1047.9                 | 1012.8                    | 3.47                 | 15   | 12a     | 612                    | 440.3               | 39.00                |
|      | 3b      | 958.1                  | 926.5                     | 3.41                 |      | 12b     | 440.8                  | 316.3               | 39.36                |
|      | 3c      | 727.6                  | 704.8                     | 3.24                 |      | 12c     | 573.1                  | 413.8               | 38.50                |
| 8    | 7a      | 846.9                  | 843.3                     | .43                  | 16   | 10a     | 445.3                  | 379.5               | 17.34                |
|      | 7b      | 852.5                  | 847.8                     | .55                  |      | 10b     | 287.1                  | 245.9               | 17.52                |
|      | 7c      | 874.6                  | 842.1                     | .28                  |      | 10c     | 295.2                  | 247.8               | 18.17                |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: Chadwick, 9/17/99  
Checked and Approved, Date: Nail McDev 17-17-99

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

Texas State Dept. of Hwys. & Public Transportation  
Austin, Texas

Laboratory No. 14

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 11a     | 546.7                  | 392.2               | 39.39                | 9    | 6a      | 739.0                  | 737.3               | 0.23                 |
|      | 11b     | 495.5                  | 355.7               | 39.30                |      | 6b      | 1150.7                 | 1147.9              | 0.24                 |
|      | 11c     | 546.1                  | 393.4               | 38.82                |      | 6c      | 884.3                  | 881.9               | 0.27                 |
| 2    | 5a      | 728.1                  | 725.8               | 0.32                 | 10   | 1a      | 894.3                  | 874.7               | 2.24                 |
|      | 5b      | 948.6                  | 945.9               | 0.29                 |      | 1b      | 962.2                  | 941.4               | 2.21                 |
|      | 5c      | 751.6                  | 749.7               | 0.25                 |      | 1c      | 804.7                  | 787.5               | 2.18                 |
| 3    | 13a     | 317.8                  | 312.3               | 1.76                 | 11   | 3a      | 752.0                  | 726.7               | 3.48                 |
|      | 13b     | 277.6                  | 271.0               | 2.44                 |      | 3b      | 696.4                  | 674.0               | 3.32                 |
|      | 13c     | 292.0                  | 285.4               | 2.31                 |      | 3c      | 989.1                  | 956.8               | 3.38                 |
| 4    | 15a     | 449.1                  | 403.5               | 11.30                | 12   | 10a     | 271.1                  | 232.4               | 16.65                |
|      | 15b     | 572.1                  | 514.7               | 11.15                |      | 10b     | 438.7                  | 373.2               | 17.55                |
|      | 15c     | 581.9                  | 523.3               | 11.20                |      | 10c     | 379.5                  | 323.1               | 17.46                |
| 5    | 9a      | 353.8                  | 305.0               | 16.00                | 13   | 16a     | 511.2                  | 460.3               | 11.06                |
|      | 9b      | 386.8                  | 332.9               | 16.19                |      | 16b     | 454.2                  | 409.0               | 11.05                |
|      | 9c      | 413.0                  | 356.0               | 16.01                |      | 16c     | 461.5                  | 415.8               | 10.99                |
| 6    | 14a     | 353.6                  | 342.4               | 3.27                 | 14   | 12a     | 499.3                  | 357.4               | 39.70                |
|      | 14b     | 373.2                  | 364.3               | 2.44                 |      | 12b     | 502.7                  | 360.9               | 39.29                |
|      | 14c     | 391.0                  | 379.7               | 2.98                 |      | 12c     | 516.4                  | 371.4               | 39.04                |
| 7    | 7a      | 914.0                  | 910.0               | 0.44                 | 15   | 4a      | 803.8                  | 777.0               | 3.45                 |
|      | 7b      | 735.6                  | 732.8               | 0.38                 |      | 4b      | 1136.4                 | 1098.5              | 3.45                 |
|      | 7c      | 819.8                  | 816.7               | 0.38                 |      | 4c      | 876.5                  | 826.5               | 6.05                 |
| 8    | 8a      | 745.8                  | 743.2               | 0.35                 | 16   | 2a      | 622.6                  | 608.9               | 2.25                 |
|      | 8b      | 739.9                  | 736.5               | 0.46                 |      | 2b      | 713.7                  | 698.3               | 2.21                 |
|      | 8c      | 737.6                  | 734.9               | 0.37                 |      | 2c      | 1023.6                 | 1000.7              | 2.29                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: David M. Gosselink 9-20-90

Janet D. Evans 9-20-90

Checked and Approved, Date: Janet D. Evans 9/20/90

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

West Virginia Department of Transportation  
Charleston, West Virginia

Laboratory No. 15

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 2a      | 970.9                  | 949.8               | 2.22                 | 9    | 14a     | 269.2                  | 263.2               | 2.28                 |
|      | 2b      | 1073.1                 | 1049.7              | 2.23                 |      | 14b     | 318.0                  | 310.8               | 2.32                 |
|      | 2c      | 814.1                  | 796.3               | 2.23                 |      | 14c     | 377.4                  | 368.8               | 2.33                 |
| 2    | 15a     | 553.0                  | 502.5               | 10.05                | 10   | 5a      | 1901.3                 | 999.6               | 0.17                 |
|      | 15b     | 546.8                  | 495.9               | 10.26                |      | 5b      | 726.3                  | 724.8               | 0.21                 |
|      | 15c     | 573.7                  | 522.0               | 9.90                 |      | 5c      | 757.4                  | 755.5               | 0.25                 |
| 3    | 9a      | 289.9                  | 288.1               | 16.24                | 11   | 10a     | 394.4                  | 335.8               | 17.45                |
|      | 9b      | 320.6                  | 275.7               | 16.18                |      | 10b     | 301.1                  | 257.1               | 17.11                |
|      | 9c      | 365.5                  | 314.0               | 16.40                |      | 10c     | 418.7                  | 356.3               | 17.51                |
| 4    | 11a     | 539.6                  | 395.0               | 36.61                | 12   | 1a      | 829.6                  | 812.2               | 2.14                 |
|      | 11b     | 564.9                  | 410.1               | 37.75                |      | 1b      | 932.7                  | 912.5               | 2.21                 |
|      | 11c     | 630.0                  | 475.9               | 37.58                |      | 1c      | 1010.3                 | 988.7               | 2.18                 |
| 5    | 3a      | 898.2                  | 868.7               | 3.40                 | 13   | 16a     | 497.9                  | 451.7               | 10.23                |
|      | 3b      | 982.4                  | 950.8               | 3.32                 |      | 16b     | 363.7                  | 328.9               | 10.58                |
|      | 3c      | 749.5                  | 724.7               | 3.42                 |      | 16c     | 424.0                  | 385.7               | 9.93                 |
| 6    | 7a      | 691.5                  | 689.3               | 0.32                 | 14   | 13a     | 334.4                  | 328.8               | 1.70                 |
|      | 7b      | 886.3                  | 882.9               | 0.39                 |      | 13b     | 365.1                  | 359.5               | 1.56                 |
|      | 7c      | 1026.1                 | 1022.3              | 0.37                 |      | 13c     | 340.5                  | 335.0               | 1.64                 |
| 7    | 6a      | 589.2                  | 588.0               | 0.20                 | 15   | 12a     | 531.3                  | 385.0               | 38.00                |
|      | 6b      | 923.4                  | 921.2               | 0.24                 |      | 12b     | 742.4                  | 543.7               | 36.55                |
|      | 6c      | 624.2                  | 622.5               | 0.27                 |      | 12c     | 483.8                  | 350.1               | 38.19                |
| 8    | 4a      | 841.7                  | 813.9               | 3.42                 | 16   | 8a      | 827.2                  | 824.6               | 0.32                 |
|      | 4b      | 739.0                  | 714.5               | 3.43                 |      | 8b      | 814.9                  | 812.0               | 0.36                 |
|      | 4c      | 969.8                  | 937.3               | 3.47                 |      | 8c      | 837.3                  | 835.0               | 0.28                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: M. Sajid

Checked and Approved, Date: R. Capper 9/7/90

# S.H.R.P. Moisture Content Proficiency Sample Program Data Sheet

Law Engineering  
Atlanta, Georgia

Laboratory No. 16

| Set # | Sample # | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set # | Sample # | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|-------|----------|------------------------|---------------------|----------------------|-------|----------|------------------------|---------------------|----------------------|
| 1     | 9a       | 116.0                  | 100.9               | 14.97                | 9     | 13a      | 206.8                  | 202.7               | 2.02                 |
|       | 9b       | 136.5                  | 118.7               | 15.00                |       | 13b      | 197.0                  | 193.1               | 2.02                 |
|       | 9c       | 122.9                  | 106.00              | 15.94                |       | 13c      | 196.7                  | 192.6               | 2.13                 |
| 2     | 12a      | 161.5                  | 115.7               | 39.59                | 10    | 1a       | 537.3                  | 526.3               | 2.09                 |
|       | 12b      | 156.4                  | 112.7               | 38.78                |       | 1b       | 807.3                  | 790.0               | 2.19                 |
|       | 12c      | 162.5                  | 117.5               | 37.83                |       | 1c       | 787.5                  | 770.5               | 2.21                 |
| 3     | 11a      | 158.9                  | 115.6               | 37.46                | 11    | 14a      | 204.9                  | 200.2               | 2.35                 |
|       | 11b      | 163.2                  | 116.1               | 40.57                |       | 14b      | 211.2                  | 206.6               | 2.23                 |
|       | 11c      | 135.5                  | 97.2                | 39.40                |       | 14c      | 201.0                  | 196.5               | 2.29                 |
| 4     | 8a       | 376.4                  | 375.2               | 0.32                 | 12    | 6a       | 950.3                  | 948.1               | 0.23                 |
|       | 8b       | 342.6                  | 341.5               | 0.32                 |       | 6b       | 898.7                  | 896.8               | 0.21                 |
|       | 8c       | 629.0                  | 626.6               | 0.38                 |       | 6c       | 1064.5                 | 1062.1              | 0.23                 |
| 5     | 16a      | 314.0                  | 286.0               | 9.79                 | 13    | 5a       | 947.4                  | 945.0               | 0.25                 |
|       | 16b      | 321.2                  | 292.4               | 9.85                 |       | 5b       | 739.8                  | 737.5               | 0.31                 |
|       | 16c      | 331.3                  | 301.4               | 9.92                 |       | 5c       | 994.0                  | 991.6               | 0.24                 |
| 6     | 3a       | 522.3                  | 504.9               | 3.64                 | 14    | 4a       | 743.9                  | 720.3               | 3.28                 |
|       | 3b       | 805.5                  | 781.5               | 3.07                 |       | 4b       | 815.1                  | 788.3               | 3.40                 |
|       | 3c       | 684.3                  | 668.4               | 3.13                 |       | 4c       | 952.3                  | 920.7               | 3.43                 |
| 7     | 10a      | 158.2                  | 135.5               | 16.75                | 15    | 2a       | 985.7                  | 964.2               | 2.23                 |
|       | 10b      | 229.2                  | 196.1               | 16.88                |       | 2b       | 858.5                  | 840.2               | 2.18                 |
|       | 10c      | 163.3                  | 134.3               | 17.23                |       | 2c       | 889.8                  | 871.0               | 2.16                 |
| 8     | 7a       | 708.9                  | 706.1               | 0.40                 | 16    | 15a      | 319.9                  | 290.9               | 10.01                |
|       | 7b       | 730.1                  | 727.8               | 0.32                 |       | 15b      | 303.6                  | 276.0               | 10.00                |
|       | 7c       | 625.2                  | 622.9               | 0.37                 |       | 15c      | 313.5                  | 286.1               | 9.72                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: H. Johnson 10/3/90

Checked and Approved, Date: William K. K. K. K. 10/3/90

# S.H.R.P. Moisture Content Proficiency Sample Program

Data Sheet

Western Technologies  
Phoenix, Arizona

Laboratory No. 17

| Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) | Set# | Sample# | Beginning weight(0.1g) | Ending weight(0.1g) | Moisture loss(0.01%) |
|------|---------|------------------------|---------------------|----------------------|------|---------|------------------------|---------------------|----------------------|
| 1    | 8a      | 713.2                  | 712.6               | 0.08                 | 9    | 9a      | 324.1                  | 278.8               | 16.25                |
|      | 8b      | 714.3                  | 713.3               | 0.13                 |      | 9b      | 323.7                  | 272.1               | 16.05                |
|      | 8c      | 723.1                  | 721.7               | 0.15                 |      | 9c      | 324.3                  | 274.6               | 15.80                |
| 2    | 5a      | 754.4                  | 753.9               | 0.05                 | 10   | 10a     | 449.6                  | 383.1               | 17.36                |
|      | 5b      | 735.5                  | 734.4               | 0.12                 |      | 10b     | 427.6                  | 365.6               | 16.96                |
|      | 5c      | 702.7                  | 702.3               | 0.10                 |      | 10c     | 413.2                  | 352.0               | 17.37                |
| 3    | 2a      | 576.0                  | 574.7               | 2.00                 | 11   | 13a     | 251.4                  | 250.8               | 0.24                 |
|      | 2b      | 672.4                  | 650.6               | 2.08                 |      | 13b     | 304.6                  | 321.7               | 0.87                 |
|      | 2c      | 1258.9                 | 1237.4              | 2.02                 |      | 13c     | 287.9                  | 285.1               | 0.81                 |
| 4    | 6a      | 1181.3                 | 1181.0              | 0.03                 | 12   | 3a      | 168.7                  | 148.5               | 3.11                 |
|      | 6b      | 771.2                  | 770.8               | 0.04                 |      | 3b      | 1021.1                 | 985.1               | 2.14                 |
|      | 6c      | 1251.7                 | 1232.7              | 0.10                 |      | 3c      | 974.2                  | 973.3               | 2.15                 |
| 5    | 4a      | 946.8                  | 917.3               | 3.22                 | 13   | 12a     | 145.3                  | 481.0               | 34.16                |
|      | 4b      | 831.7                  | 826.7               | 3.10                 |      | 12b     | 386.7                  | 281.8               | 37.22                |
|      | 4c      | 1681.2                 | 1611.0              | 3.06                 |      | 12c     | 571.0                  | 436.8               | 35.30                |
| 6    | 11a     | 610.6                  | 447.2               | 34.54                | 14   | 7a      | 827.4                  | 828.4               | 0.12                 |
|      | 11b     | 549.0                  | 422.6               | 37.04                |      | 7b      | 912.7                  | 911.7               | 0.11                 |
|      | 11c     | 481.8                  | 342.2               | 40.77                |      | 7c      | 868.4                  | 867.2               | 0.14                 |
| 7    | 16a     | 981.7                  | 440.4               | 7.38                 | 15   | 1a      | 101.7                  | 100.0               | 2.01                 |
|      | 16b     | 457.2                  | 421.3               | 8.52                 |      | 1b      | 855.4                  | 857.2               | 1.93                 |
|      | 16c     | 485.4                  | 446.1               | 8.81                 |      | 1c      | 102.1                  | 972.4               | 1.97                 |
| 8    | 14a     | 311.0                  | 305.8               | 1.70                 | 16   | 15a     | 502.3                  | 458.6               | 9.09                 |
|      | 14b     | 335.8                  | 321.7               | 1.85                 |      | 15b     | 427.2                  | 391.5               | 9.20                 |
|      | 14c     | 425.5                  | 377.5               | 2.01                 |      | 15c     | 400.3                  | 367.2               | 9.01                 |

Each set of three samples is to be tested individually and in numerical order according to the set number.  
Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: 7/12/90  
Checked and Approved, Date: M. Kuntz 7-25-90

## **Returned Tare Weights**

LAB No. 1

| <u>SET #</u> | <u>SAMPLE</u> | <u>BAG WT.</u> | <u>SET #</u> | <u>SAMPLE</u> | <u>BAG WT.</u> |
|--------------|---------------|----------------|--------------|---------------|----------------|
| 1            | 5 A           | 7.8            | 13           | 2 A           | 7.3            |
|              | B             | 7.7            |              | B             | 7.6            |
|              | C             | 7.3            |              | C             | 7.4            |
| 2            | 3 A           | 7.1            | 14           | 16 A          | 7.9            |
|              | B             | 7.6            |              | B             | 7.9            |
|              | C             | 7.7            |              | C             | 7.9            |
| 3            | 12 A          | 7.7            | 15           | 11 A          | 8.3            |
|              | B             | 8.1            |              | B             | 8.2            |
|              | C             | 8.5            |              | C             | 7.9            |
| 4            | 13 A          | 7.1            | 16           | 7 A           | 7.2            |
|              | B             | 7.1            |              | B             | 7.6            |
|              | C             | 7.0            |              | C             | 7.3            |
| 5            | 4 A           | 9.7            |              |               |                |
|              | B             | 8.2            |              |               |                |
|              | C             | 9.1            |              |               |                |
| 6            | 15 A          | 7.4            |              |               |                |
|              | B             | 7.9            |              |               |                |
|              | C             | 7.5            |              |               |                |
| 7            | 14 A          | 7.7            |              |               |                |
|              | B             | 7.3            |              |               |                |
|              | C             | 7.4            |              |               |                |
| 8            | 9 A           | 8.3            |              |               |                |
|              | B             | 8.0            |              |               |                |
|              | C             | 7.7            |              |               |                |
| 9            | 10 A          | 7.4            |              |               |                |
|              | B             | 7.6            |              |               |                |
|              | C             | 7.7            |              |               |                |
| 10           | 6 A           | 7.4            |              |               |                |
|              | B             | 7.7            |              |               |                |
|              | C             | 7.7            |              |               |                |
| 11           | 1 A           | 7.6            |              |               |                |
|              | B             | 7.4            |              |               |                |
|              | C             | 7.1            |              |               |                |
| 12           | 8 A           | 7.7            |              |               |                |
|              | B             | 7.6            |              |               |                |
|              | C             | 7.1            |              |               |                |

LAB No. 2

- |     |                               |     |                               |
|-----|-------------------------------|-----|-------------------------------|
| 1.  | 9a-8.5<br>9b-7.6<br>9c-8.1    | 14. | 10a-8.3<br>10b-8.5<br>10c-8.1 |
| 2.  | 3a-7.4<br>3b-7.7<br>3c-7.4    | 15. | 11a-9.1<br>11b-8.9<br>11c-8.2 |
| 3.  | 16a-7.9<br>16b-7.9<br>16c-7.8 | 16. | 5a-7.2<br>5b-7.6<br>5c-7.8    |
| 4.  | 12a-8.4<br>12b-8.0<br>12c-8.1 |     |                               |
| 5.  | 13a-7.3<br>13b-7.5<br>13c-7.6 |     |                               |
| 6.  | 8a-7.9<br>8b-7.9<br>8c-7.8    |     |                               |
| 7.  | 15a-8.0<br>15b-7.6<br>15c-7.5 |     |                               |
| 8.  | 2a-7.1<br>2b-7.2<br>2c-7.8    |     |                               |
| 9.  | 14a-7.4<br>14b-7.4<br>14c-7.5 |     |                               |
| 10. | 1a-7.2<br>1b-7.4<br>1c-7.4    |     |                               |
| 11. | 7a-7.6<br>7b-7.2<br>7c-7.3    |     |                               |
| 12. | 4a-8.5<br>4b-7.8<br>4c-8.0    |     |                               |
| 13. | 6a-7.4<br>6b-7.4<br>6c-7.5    |     |                               |

LAB No.4

SAMPLE #      BAG WEIGHT

|    |   |       |
|----|---|-------|
| 10 | A | 8.08  |
|    | B | 7.60  |
|    | C | 7.57  |
| 3  | A | 7.60  |
|    | B | 7.28  |
|    | C | 7.17  |
| 9  | A | 7.37  |
|    | B | 7.67  |
|    | C | 7.24  |
| 13 | A | 7.07  |
|    | B | 7.03  |
|    | C | 7.40  |
| 7  | A | 7.59  |
|    | B | 7.52  |
|    | C | 7.27  |
| 8  | A | 7.34  |
|    | B | 7.23  |
|    | C | 7.22  |
| 15 | A | 7.38  |
|    | B | 7.78  |
|    | C | 7.71  |
| 2  | A | 7.51  |
|    | B | 7.05  |
|    | C | 7.48  |
| 12 | A | 7.87  |
|    | B | 11.41 |
|    | C | 7.90  |
| 5  | A | 7.36  |
|    | B | 7.61  |
|    | C | 7.36  |
| 14 | A | 7.61  |
|    | B | 7.18  |
|    | C | 7.22  |
| 4  | A | 7.67  |
|    | B | 7.86  |
|    | C | 7.66  |

SAMPLE #      BAG WEIGHT

|    |   |      |
|----|---|------|
| 6  | A | 7.20 |
|    | B | 7.24 |
|    | C | 7.31 |
| 1  | A | 7.15 |
|    | B | 7.43 |
|    | C | 7.10 |
| 16 | A | 7.40 |
|    | B | 7.33 |
|    | C | 7.76 |
| 11 | A | 8.17 |
|    | B | 8.45 |
|    | C | 9.02 |

LAB NO. 5

| Bag Weights       |                   |  |
|-------------------|-------------------|--|
| <u>Sample No.</u> | <u>Bag Weight</u> |  |
| 1A                | 7.2               |  |
| 1B                | 7.6               |  |
| 1C                | 7.3               |  |
| 2A                | 7.2               |  |
| 2B                | 7.7               |  |
| 2C                | 7.6               |  |
| 3A                | 7.6               |  |
| 3B                | 7.2               |  |
| 3C                | 7.8               |  |
| 4A                | 8.6               |  |
| 4B                | 7.8               |  |
| 4C                | 9.4               |  |
| 5A                | 7.5               |  |
| 5B                | 7.3               |  |
| 5C                | 7.7               |  |
| 6A                | 7.5               |  |
| 6B                | 7.7               |  |
| 6C                | 7.4               |  |
| 7A                | 7.6               |  |
| 7B                | 7.3               |  |
| 7C                | 7.4               |  |
| Bag Weights       |                   |  |
| <u>Sample No.</u> | <u>Bag Weight</u> |  |
| 8A                | 7.6               |  |
| 8B                | 7.8               |  |
| 8C                | 7.8               |  |
| 9A                | 7.8               |  |
| 9B                | 7.4               |  |
| 9C                | 8.0               |  |
| 10A               | 7.7               |  |
| 10B               | 7.7               |  |
| 10C               | 7.9               |  |
| 11A               | 9.2               |  |
| 11B               | 9.3               |  |
| 11C               | 10.0              |  |
| 12A               | 8.1               |  |
| 12B               | 8.0               |  |
| 12C               | 8.7               |  |
| 13A               | 7.0               |  |
| 13B               | 7.4               |  |
| 13C               | 7.1               |  |
| 14A               | 7.3               |  |
| 14B               | 7.2               |  |
| 14C               | 7.7               |  |
| <u>Sample No.</u> | <u>Bag Weight</u> |  |
| 15A               | 7.4               |  |
| 15B               | 7.4               |  |
| 15C               | 7.9               |  |
| 16A               | 7.4               |  |
| 16B               | 7.5               |  |
| 16C               | 7.3               |  |

LAB NO. 6

Oregon State Highway Division  
Salem, Oregon

| Set# | Sample# | WEIGHT OF |     | Set# | Sample# | WEIGHT OF |     |
|------|---------|-----------|-----|------|---------|-----------|-----|
|      |         | EMPTY     | BAG |      |         | EMPTY     | BAG |
| 1    | 4a      | 7.84      |     | 9    | 16a     | 7.98      |     |
|      | 4b      | 8.18      |     |      | 16b     | 8.28      |     |
|      | 4c      | 8.57      |     |      | 16c     | 7.87      |     |
| 2    | 8a      | 7.36      |     | 10   | 14a     | 7.71      |     |
|      | 8b      | 7.29      |     |      | 14b     | 7.68      |     |
|      | 8c      | 7.70      |     |      | 14c     | 7.80      |     |
| 3    | 7a      | 7.60      |     | 11   | 13a     | 7.36      |     |
|      | 7b      | 7.61      |     |      | 13b     | 7.65      |     |
|      | 7c      | 7.32      |     |      | 13c     | 7.20      |     |
| 4    | 2a      | 7.56      |     | 12   | 1a      | 7.27      |     |
|      | 2b      | 7.55      |     |      | 1b      | 7.46      |     |
|      | 2c      | 7.24      |     |      | 1c      | 7.63      |     |
| 5    | 3a      | 7.71      |     | 13   | 6a      | 7.86      |     |
|      | 3b      | 7.60      |     |      | 6b      | 7.34      |     |
|      | 3c      | 7.29      |     |      | 6c      | 7.77      |     |
| 6    | 11a     | 8.36      |     | 14   | 15a     | 8.04      |     |
|      | 11b     | 8.00      |     |      | 15b     | 8.30      |     |
|      | 11c     | 8.68      |     |      | 15c     | 8.30      |     |
| 7    | 10a     | 7.80      |     | 15   | 12a     | 8.51      |     |
|      | 10b     | 7.71      |     |      | 12b     | 8.46      |     |
|      | 10c     | 7.47      |     |      | 12c     | 9.85      |     |
| 8    | 9a      | 7.89      |     | 16   | 5a      | 7.82      |     |
|      | 9b      | 7.75      |     |      | 5b      | 7.64      |     |
|      | 9c      | 7.88      |     |      | 5c      | 8.14      |     |

# S.H.R.P. Moisture Content Proficiency Sample Program Data Sheet

Southwestern Laboratories  
Houston, Texas

Laboratory NO. **B**

| Set# Sample# | Weight of<br>Empty Bag(0.1g) | Set# Sample# | Weight of<br>Empty Bag(0.1g) |
|--------------|------------------------------|--------------|------------------------------|
| 1 9 a        | 8.3                          | 9 15 a       | 7.5                          |
| 9 b          | 8.0                          | 15 b         | 7.5                          |
| 9 c          | 7.9                          | 15 c         | 7.7                          |
| 2 13 a       | 7.0                          | 10 4 a       | 8.8                          |
| 13 b         | 7.4                          | 4 b          | 7.7                          |
| 13 c         | 7.5                          | 4 c          | 8.8                          |
| 3 5 a        | 7.7                          | 11 2 a       | 7.3                          |
| 5 b          | 7.6                          | 2 b          | 7.5                          |
| 5 c          | 7.7                          | 2 c          | 6.9                          |
| 4 11 a       | 8.8                          | 12 12 a      | 8.1                          |
| 11 b         | 9.2                          | 12 b         | 9.1                          |
| 11 c         | 8.7                          | 12 c         | 7.6                          |
| 5 8 a        | 7.4                          | 13 3 a       | 7.3                          |
| 8 b          | 7.3                          | 3 b          | 7.7                          |
| 8 c          | 7.4                          | 3 c          | 7.8                          |
| 6 7 a        | 7.2                          | 14 16 a      | 7.7                          |
| 7 b          | 7.3                          | 16 b         | 7.3                          |
| 7 c          | 7.4                          | 16 c         | 7.3                          |
| 7 1 a        | 7.3                          | 15 14 a      | 7.2                          |
| 1 b          | 7.3                          | 14 b         | 7.6                          |
| 1 c          | 7.6                          | 14 c         | 7.4                          |
| 8 10 a       | 7.8                          | 16 6 a       | 7.3                          |
| 10 b         | 7.8                          | 6 b          | 7.8                          |
| 10 c         | 7.4                          | 6 c          | 7.8                          |

LAB NO. 12

| Set # | Sample # | Bag Weight(0.1g) | Set # | Sample # | Bag Weight(0.1g) |
|-------|----------|------------------|-------|----------|------------------|
| 1     | 1a       | 7.2              | 9     | 2a       | 7.6              |
|       | 1b       | 7.4              |       | 2b       | 7.5              |
|       | 1c       | 7.3              |       | 2c       | 7.5              |
| 2     | 16a      | 7.8              | 10    | 8a       | 7.4              |
|       | 16b      | 7.4              |       | 8b       | 7.4              |
|       | 16c      | 7.4              |       | 8c       | 7.8              |
| 3     | 11a      | 8.9              | 11    | 7a       | 7.3              |
|       | 11b      | 9.0              |       | 7b       | 7.3              |
|       | 11c      | 9.5              |       | 7c       | 7.4              |
| 4     | 13a      | 7.5              | 12    | 14a      | 7.6              |
|       | 13b      | 7.5              |       | 14b      | 7.8              |
|       | 13c      | 7.5              |       | 14c      | 7.4              |
| 5     | 15a      | 7.8              | 13    | 3a       | 7.7              |
|       | 15b      | 7.8              |       | 3b       | 7.5              |
|       | 15c      | 7.8              |       | 3c       | 7.4              |
| 6     | 12a      | 8.4              | 14    | 4a       | 7.7              |
|       | 12b      | 9.1              |       | 4b       | 7.4              |
|       | 12c      | 7.9              |       | 4c       | 7.7              |
| 7     | 6a       | 7.6              | 15    | 9a       | 8.5              |
|       | 6b       | 7.6              |       | 9b       | 8.6              |
|       | 6c       | 7.9              |       | 9c       | 8.2              |
| 8     | 5a       | 7.2              | 16    | 10a      | 7.7              |
|       | 5b       | 7.3              |       | 10b      | 7.7              |
|       | 5c       | 7.4              |       | 10c      | 7.8              |

LAB NO. 14

| Bag Weight |                               | Bag Weight |                               |
|------------|-------------------------------|------------|-------------------------------|
| #1         | 11A 8.3<br>11B 8.5<br>11C 8.1 | #9         | 6A 7.7<br>6B 7.4<br>6C 7.6    |
| #2         | 5A 7.4<br>5B 7.3<br>5C 7.3    | #10        | 1A 7.3<br>1B 7.3<br>1C 7.6    |
| #3         | 13A 7.3<br>13B 7.4<br>13C 7.1 | #11        | 3A 7.6<br>3B 8.0<br>3C 7.7    |
| #4         | 15A 7.6<br>15B 7.5<br>15C 7.6 | #12        | 10A 7.9<br>10B 7.9<br>10C 7.9 |
| #5         | 9A 8.3<br>9B 7.8<br>9C 8.5    | #13        | 16A 7.5<br>16B 7.5<br>16C 7.3 |
| #6         | 14A 7.6<br>14B 7.5<br>14C 7.0 | #14        | 12A 9.3<br>12B 8.6<br>12C 8.2 |
| #7         | 7A 7.3<br>7B 7.2<br>7C 7.1    | #15        | 4A 7.9<br>4B 8.0<br>4C 14.0   |
| #8         | 8A 7.7<br>8B 7.7<br>8C 7.6    | #16        | 2A 7.9<br>2B 2.2<br>2C 2.3    |

| Set# | Sample# | Bag weight(0.1g) |
|------|---------|------------------|
| 9    | 14a     | 7.5              |
|      | 14b     | 7.7              |
|      | 14c     | 7.1              |
| 10   | 5a      | 7.3              |
|      | 5b      | 7.3              |
|      | 5c      | 7.7              |
| 11   | 10a     | 8.3              |
|      | 10b     | 8.1              |
|      | 10c     | 8.2              |
| 12   | 1a      | 7.0              |
|      | 1b      | 7.1              |
|      | 1c      | 7.2              |
| 13   | 16a     | 7.2              |
|      | 16b     | 7.2              |
|      | 16c     | 7.5              |
| 14   | 13a     | 7.2              |
|      | 13b     | 7.0              |
|      | 13c     | 7.3              |
| 15   | 12a     | 8.8              |
|      | 12b     | 8.6              |
|      | 12c     | 8.3              |
| 16   | 8a      | 7.3              |
|      | 8b      | 7.6              |
|      | 8c      | 7.2              |

| Set# | Sample# | Bag weight(0.1g) |
|------|---------|------------------|
| 1    | 2a      | 7.5              |
|      | 2b      | 7.7              |
|      | 2c      | 7.0              |
| 2    | 15a     | 7.7              |
|      | 15b     | 7.7              |
|      | 15c     | 7.4              |
| 3    | 9a      | 8.2              |
|      | 9b      | 8.4              |
|      | 9c      | 8.2              |
| 4    | 11a     | 9.8              |
|      | 11b     | 10.5             |
|      | 11c     | 9.6              |
| 5    | 3a      | 7.4              |
|      | 3b      | 7.3              |
|      | 3c      | 7.7              |
| 6    | 7a      | 7.3              |
|      | 7b      | 7.3              |
|      | 7c      | 7.4              |
| 7    | 6a      | 7.4              |
|      | 6b      | 7.2              |
|      | 6c      | 7.3              |
| 8    | 4a      | 8.0              |
|      | 4b      | 8.8              |
|      | 4c      | 7.6              |

# S.H.R.P. Moisture Content Proficiency Sample Program

## Data Sheet

**Law Engineering  
Atlanta, Georgia**

Laboratory No. 16

## WEIGHT OF PLASTIC BAGS

| Set# | Sample# | WT. OF<br>PLASTIC BAG<br>GRAMS | Set# | Sample# | WT. OF<br>PLASTIC BAG<br>GRAMS |
|------|---------|--------------------------------|------|---------|--------------------------------|
| 1    | 9a      | 7.35                           | 9    | 13a     | 7.44                           |
|      | 9b      | 7.50                           |      | 13b     | 7.20                           |
|      | 9c      | 7.32                           |      | 13c     | 7.37                           |
| 2    | 12a     | 7.71                           | 10   | 1a      | 7.03                           |
|      | 12b     | 7.46                           |      | 1b      | 7.21                           |
|      | 12c     | 7.25                           |      | 1c      | 7.50                           |
| 3    | 11a     | 7.70                           | 11   | 14a     | 7.15                           |
|      | 11b     | 7.64                           |      | 14b     | 7.52                           |
|      | 11c     | 7.38                           |      | 14c     | 7.54                           |
| 4    | 8a      | 7.60                           | 12   | 6a      | 7.59                           |
|      | 8b      | 7.48                           |      | 6b      | 7.58                           |
|      | 8c      | 7.71                           |      | 6c      | 7.57                           |
| 5    | 16a     | 7.31                           | 13   | 5a      | 7.53                           |
|      | 16b     | 7.78                           |      | 5b      | 7.64                           |
|      | 16c     | 7.13                           |      | 5c      | 7.61                           |
| 6    | 3a      | 7.32                           | 14   | 4a      | 7.35                           |
|      | 3b      | 7.34                           |      | 4b      | 7.25                           |
|      | 3c      | 7.54                           |      | 4c      | 7.53                           |
| 7    | 10a     | 7.68                           | 15   | 2a      | 7.63                           |
|      | 10b     | 7.80                           |      | 2b      | 7.60                           |
|      | 10c     | 7.81                           |      | 2c      | 7.24                           |
| 8    | 7a      | 7.21                           | 16   | 15a     | 7.27                           |
|      | 7b      | 7.55                           |      | 15b     | 7.34                           |
|      | 7c      | 7.46                           |      | 15c     | 7.42                           |

Each set of three samples is to be tested individually and in numerical order according to the set number. Please be certain to fill in the correct blanks on the data sheet.

Responsible Technician, Date: H. Johnson

Checked and Approved, Date: Walia Kabeel 10/5/20

# APPENDIX III

# *Steele Engineering, Inc.*

October 17, 1990

Robin High  
TRDF  
2602 Dellana Lane  
Austin, TX 78746

Dear Robin:

Subject: SHRP Soil Moisture Proficiency Sample Program.

Enclosed is a report which summarizes implementation activities to date concerning the subject program. All test data sheets are contained under the blue page titled Section 3, Returned Data Sheets. Information needed to construct the data array for a components of variance analysis as previously discussed is contained in other sections of the report.

Please proceed with the analysis as soon as possible. As indicated in the past, participating laboratories should be identified only by a number in the final report compiled for distribution to interested parties.

Call me if anything has been overlooked or further elaboration is needed. I will review the analysis report upon receipt and contact you by telephone if questions arise.

Yours very truly

Garland W. Steele, P.E.  
President, Steele Engineering, Inc.

enclosure: SHRP Soil H<sub>2</sub>O Proficiency Sample Report

cc: Adrian Pelzner (letter only)

# APPENDIX IV

# Steele Engineering, Inc.

January 11, 1991

Virgil Anderson  
48 Oaks Place  
Lago Vista, TX 78645

Dear Virgil:

Subject: SHRP Soil Moisture Proficiency Sample Program.

This will confirm the substance of telephone discussions with Robin during the past few days concerning the format for presenting precision data which can be determined from the analyses now underway of test data from the subject program.

The most desirable approach is to use a format that is generally used by AASHTO and ASTM. Examples are contained in ASTM C670, Standard Practice for Preparing Precision and Bias Statements for Construction Materials. For example, if the analysis yields an estimate of 2.1% for  $\sigma$  within laboratories by single operators, the statement could read-

Precision-The within laboratory single operator standard deviation has been found to be 2.1%.<sup>A</sup> Therefore, results of two properly conducted tests by the same operator in the same laboratory on the same soil with the same moisture content should not differ by more than 5.94%.<sup>A</sup>

<sup>A</sup>These numbers represent, respectively, the 1S and D2S limits as described in ASTM Practice C670, for Preparing Precision Statements for Test Methods for Construction Materials.

The data available from the subject program will, of course, yield considerably more information concerning the components of variance and, as discussed with Robin, will hopefully allow an estimate of bias to be determined.

As originally discussed during the design of this program, the within sample variance could be quantified by comparing the odd numbered (1 through 63) samples to the even numbered (2 through 64) samples for each of the 16 sample types. The between sample variance could be quantified by comparing the first two samples (1 and 2) of each group of four samples to the second two samples (3 and 4) of the same group of four etc. for all 16 groups of four in each of the 16 sample types. Likewise, the within material-same condition variance can be quantified by comparing the 64 samples from split A to the 64 samples from split B for each of the 8 pairs of A and B splits.

In addition, the within material-different condition variance of variances could be quantified by comparing the variance of the 128 samples from sample types 1 and 2 to the variance of the 128 samples from sample types 5 and 6 and similarly for each of the other three sets. Further the between material-same condition and the between material-different condition variance of variances could be quantified in a similar manner.

Each of the above would provide valuable insight to SHRP and to other researchers and practitioners concerning a necessary and widely used test procedure.

Enclosed is a copy of a proposed revision to ASTM D2216 which Adrian suggested should be made available to you and Robin for information. Note particularly section 13 on page 11 of the proposed revision. Apparently, SHRP results will provide information of considerable interest to those responsible for such standards.

Please call if you have further suggestions or if my terminology needs clarification.

I appreciate very much your and Robin's efforts to expedite the statistical analyses necessary to allow the highest and best use of data now available from this program.

Yours very truly

Garland W. Steele, P.E.  
President, Steele Engineering Inc.

enclosures: 12 pages

cc: Robin High  
Adrian Pelzner (letter only)  
Bill Hadley (letter only)

# *Steele Engineering, Inc.*

February 7, 1991

Virgil Anderson  
48 Oaks Place  
Lago Vista, TX 78645

Dear Virgil:

Subject: SHRP Soil Moisture Proficiency Sample Program.

This will confirm the substance of a previous telephone discussion with Robin concerning an "AMRL style" scatter diagram report to be distributed to the participants in the subject program.

Enclosed, as promised, is a copy of some information concerning such reports. It is my understanding, based on discussions with AMRL, that the quadrants are now formed by intersecting mean lines rather than intersecting median lines. Also, that laboratory results eliminated (last paragraph of attachment) are those results outside the 3 $\sigma$  limits of the data as calculated using all results. The remaining results are then recalculated and no further eliminations are made.

Such a report would only be compiled after the currently scheduled analyses are completed.

Please let me know if there are any questions or recommended modifications to the above.

Yours very truly

Garland W. Steele  
President, Steele Engineering, Inc.

cc: Adrian Pelzner(letter only)  
Bill Hadley(letter only)

# APPENDIX V

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SHRP • LONG TERM PAVEMENT PERFORMANCE PROGRAM

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TECH MEMO: AU-181      *RH*      DATE: June 12, 1991  
AUTHOR: Robin High      FILE: P-001  
DISTRIBUTION: Garland Steele, Bill Hadley  
SUBJECT: Variance Components and Bias Estimation for SHRP Moisture Content  
Proficiency Sample Program

This memorandum summarizes the test results from the analysis of the SHRP moisture content proficiency sample program. When a test procedure is applied repeatedly to a set of identical material samples the same results rarely occur. An experimental design was structured to evaluate this variability when testing both aggregate and soil material samples for moisture content. Its purpose is to present the within-laboratory and between-laboratory variance components estimated from the data collected during this experiment.

The different factors of the experiment which represent sources of variability and how the materials were to be processed in each laboratory were originally developed as Design 4 in Technical Memorandum AU-95 (Ref 1). The analysis of data from these designs were described in Technical Memorandum AU-108 (Ref 2). The word "material" in this analysis represents both aggregate and soil samples and will be used throughout this report to refer to the applicable type of sample.

Due to the lack of an accepted reference value, an estimate of the amount of bias in the testing procedure for moisture content in the samples has not previously been evaluated. This study presents a unique opportunity to estimate the amount of bias due to the moisture measurement process. Results corresponding to this portion of the study will also be provided.

#### DATA DESCRIPTION

A brief description of the data is included in this report for completeness. Further details are available in the AMRL report (Ref 3). In this document a description of the experimental design, testing procedures,

and and a list of all of the data provided by AMRL collected by the 17 laboratories who participated in the experiment were provided.

Two types of material were used in the experimental plan (aggregates and soils). For both aggregates and soils, material from two different sources was acquired for the study. At each of the two levels of the factor representing the source of the material (MATL) the batch was randomly split into two portions (A or B).

For one-half of each split, moisture was added to the samples; the remaining samples were air dried. One level of the moisture factor refers to the Saturated Surface Dry (SSD) condition for aggregates and Plastic Limit (PLM) condition for soils. The other level for each material refers to the air dry condition.

Table 1 gives a brief summary the factors in the design. Sixteen different types of samples were created and then shipped to the laboratories. Sample numbers 1 through 4 refer to aggregates in the wet condition and samples 5 through 8 refer to aggregates in the dry condition. Sample numbers 9 through 12 refer to soils in the wet condition and 13 through 16 refer to soils in the dry condition. Each laboratory received 3 sets of the nearly identical subsamples from each of the sixteen samples processed by AMRL. Since the magnitude and the variability in the test results for soils was much larger than for aggregates, two separate analyses for each type of material will be given.

#### VARIANCE COMPONENT ANALYSIS

The experimental plan was developed to estimate the variance components associated with testing the moisture content of both aggregate and soil samples. Three replicate sets of material samples for each combination of the design factors were provided to the seventeen laboratories.

The analysis phase for the determination of moisture content first creates an analysis of variance table (ANOVA). The results are then used to

Table 1. Factor levels and sample type identification.

| FACTOR | DESCRIPTION | TYPE OF EFFECT |
|--------|-------------|----------------|
| MST    | Moisture    | Fixed          |
| MATL   | Material    | Fixed          |
| LAB    | Laboratory  | Random         |

| SAMPLE<br>TYPE NO. | SAMPLE DESCRIPTION |
|--------------------|--------------------|
|--------------------|--------------------|

#### AGGREGATES

##### SSD Condition

|   |       |                      |
|---|-------|----------------------|
| 1 | ..... | Aggregate 1, Split A |
| 2 | ..... | Aggregate 1, Split B |
| 3 | ..... | Aggregate 2, Split A |
| 4 | ..... | Aggregate 2, Split B |

##### Air Dry Condition

|   |       |                      |
|---|-------|----------------------|
| 5 | ..... | Aggregate 1, Split A |
| 6 | ..... | Aggregate 1, Split B |
| 7 | ..... | Aggregate 2, Split A |
| 8 | ..... | Aggregate 2, Split B |

Aggregate 1: WA - Supplied by University of Reno, Nevada

Aggregate 2: PL - Supplied by University of Reno, Nevada

| SAMPLE<br>TYPE NO. | SAMPLE DESCRIPTION |
|--------------------|--------------------|
|--------------------|--------------------|

#### SOILS

##### Plastic Limit Condition

|    |       |                 |
|----|-------|-----------------|
| 9  | ..... | Soil 1, Split A |
| 10 | ..... | Soil 1, Split B |
| 11 | ..... | Soil 2, Split A |
| 12 | ..... | Soil 2, Split B |

##### Air Dry Condition

|    |       |                 |
|----|-------|-----------------|
| 13 | ..... | Soil 1, Split A |
| 14 | ..... | Soil 1, Split B |
| 15 | ..... | Soil 2, Split A |
| 16 | ..... | Soil 2, Split B |

Soil 1: M1 - Supplied by Department of Highways, Maryland

Soil 2: M2 - Supplied by Department of Highways, Maryland

estimate the magnitudes of the between- and the within-laboratory testing variations ( $\sigma^2_{\text{LAB}}$  and  $\sigma^2$  respectively) for both types of materials.

#### Estimation of the Variance Components

The experimental design under which the data were collected has a direct impact on how the statistical analysis should proceed. The statistical model used to summarize these data takes the following form:

$$\text{MSTLAB} = \mu + \text{MST} + \text{MATL} + \text{LAB} + \text{SPLT}(\text{MATL}) + \text{ERROR}$$

The terms MST, MATL, and SPLT(MATL) remove the variability due to the planned moisture content and material type. This allows more accurate estimates of the random variation due to laboratories (LAB) and the random variation due to other unknown factors (ERROR).

Tables 2 and 3 provide the Analysis of Variance (ANOVA) tables for the results. From these summary statistics the two variance components representing the between-laboratory ( $\sigma^2_{\text{LAB}}$ ) and the within-laboratory ( $\sigma^2$ ) components are estimated and appear in the lower portion of the tables.

#### Differences Among Means

Tables 2 and 3 are also used to identify the laboratories which produce statistically different results from other laboratories. The average test results from each laboratory are presented in a column and are ranked from largest to smallest. Groups of laboratory means are underlined to indicate which ones are not statistically different from one another. The averages to be most concerned with are those which lie on either end of the row. If one continuous line does not appear underneath these averages, there is evidence to suggest the mean from that laboratory exceeds the two standard deviation control limits and does not conform with the remainder of the data.

The mean results from laboratory 17 for aggregates appears to be considerably smaller than the means from the other laboratories. A closer

Table 2. Variance component analysis for aggregate samples.

| Source          | Degrees of Freedom | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|--------------------|----------------|-------------|---------|--------|
| Model           | 18                 | 659.049        | 36.6138     | 470.41  | 0.0001 |
| MST             | 1                  | 614.220        | 614.2196    | 7891.49 | 0.0001 |
| MATL            | 1                  | 43.343         | 43.3428     | 556.87  | 0.0001 |
| LAB             | 16                 | 1.486          | 0.0929      | 1.19    | 0.2699 |
| Error           | 385                | 29.966         | 0.07783     |         |        |
| Corrected Total | 403                | 689.015        |             |         |        |

#### Variance Components

$$\sigma^2_{\text{LAB}} = 0.0006345$$

$$\sigma^2 = 0.07783$$

Student-Newman-Keuls test for variable: MSTLAB

Means with the same underline are not significantly different.

| SNK Grouping | Mean   | LAB |
|--------------|--------|-----|
|              | 1.5937 | 09  |
|              | 1.5583 | 07  |
|              | 1.5562 | 01  |
|              | 1.5467 | 04  |
|              | 1.5467 | 12  |
|              | 1.5438 | 15  |
|              | 1.5246 | 16  |
|              | 1.5221 | 05  |
|              | 1.5208 | 02  |
|              | 1.5154 | 06  |
|              | 1.5096 | 08  |
|              | 1.4974 | 14  |
|              | 1.4909 | 13  |
|              | 1.4871 | 03  |
|              | 1.4817 | 10  |
|              | 1.4379 | 11  |
|              | 1.1677 | 17  |

Table 3. Variance component analysis for soil samples.

| Source          | Degrees of Freedom | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|--------------------|----------------|-------------|---------|--------|
| Model           | 18                 | 66999.245      | 3722.180    | 292.19  | 0.0001 |
| MST             | 1                  | 45014.471      | 45014.471   | 3533.67 | 0.0001 |
| MATL            | 1                  | 21723.755      | 21723.755   | 1705.33 | 0.0001 |
| LAB             | 16                 | 261.019        | 16.314      | 1.28    | 0.2059 |
| Error           | 388                | 4942.622       | 12.739      |         |        |
| Corrected Total | 406                | 71941.867      |             |         |        |

#### Variance Components

$$\sigma^2_{LAB} = 0.1493$$

$$\sigma^2 = 12.739$$

Student-Newman-Keuls test for variable: MSTLAB

Means with the same underline are not significantly different.

| SNK Grouping | Mean   | N  | LAB |
|--------------|--------|----|-----|
|              | 17.628 | 24 | 11  |
|              | 17.621 | 23 | 13  |
|              | 17.583 | 24 | 09  |
|              | 17.554 | 24 | 01  |
|              | 17.390 | 24 | 14  |
|              | 17.354 | 24 | 07  |
|              | 17.301 | 24 | 02  |
|              | 17.252 | 24 | 04  |
|              | 17.154 | 24 | 08  |
|              | 17.017 | 24 | 03  |
|              | 16.780 | 24 | 16  |
|              | 16.598 | 24 | 15  |
|              | 16.255 | 24 | 06  |
|              | 15.932 | 24 | 17  |
|              | 15.904 | 24 | 12  |
|              | 15.388 | 24 | 10  |
|              | 14.958 | 24 | 05  |

examination of the raw data for this laboratory is required to determine a reason for this difference.

#### PRECISION STATEMENTS FOR MOISTURE CONTENT

The within laboratory variance components for the moisture contents of the two material types are given in Tables 2 and 3. This section provides the within-laboratory precision statements for moisture content testing. The two standard deviation limits for the difference between two observations are given. These values imply that within one laboratory, a pair of measurements selected at random will differ by more than  $2\sqrt{2}\sigma$  in only 5% of all cases.

##### Aggregates

Precision - The within-laboratory single operator standard deviation for aggregates is determined to be  $\sigma = \sqrt{0.07783} = 0.2790$ . Therefore, results of two properly conducted tests by the same operator in the same laboratory on this aggregate should not differ by more than  $2\sqrt{2}\sigma = 0.7891$  from each other.

These numbers represent, respectively, the 1S and D2S limits as described in ASTM Practice C670, for Preparing Precision Statements for Test Methods for Construction Materials.

##### Soils

Precision - The within-laboratory single operator standard deviation for aggregates has been found to be  $\sigma = \sqrt{12.739} = 3.5692$ . Therefore, results of two properly conducted tests by the same operator in the same laboratory on this aggregate should not differ by more than  $2\sqrt{2}\sigma = 10.0951$  from each other.

These numbers represent, respectively, the 1S and D2S limits as described in ASTM Practice C670, for Preparing Precision Statements for Test Methods for Construction Materials.

## BETWEEN LABORATORIES PRECISION STATEMENTS FOR MOISTURE SAMPLES

The between-laboratory variance components for the moisture content of the two material types, are given in Tables 2 and 3. This section provides between-laboratory precision statements based on these results for resilient modulus testing. The two standard deviations limits for the difference between two observations from different laboratories are given. These values imply that the difference between one measurement selected at random from each of two laboratories will differ from each other by more than  $2 \sqrt{2(\sigma_{LAB}^2 + \sigma^2)}$  in only 5% of all cases.

### Aggregates

Precision - The between laboratory single operator standard deviation for moisture content has been found to be  $\sqrt{\sigma_{LAB}^2 + \sigma^2} = 0.28012$ . Therefore, the results of properly conducted tests from two laboratories on the same aggregate should not differ by more than  $2 \sqrt{2(\sigma_{LAB}^2 + \sigma^2)} = 0.7923$  from each other.

These numbers represent, respectively, the 1S and D2S limits as described in ASTM Practice C670, for Preparing Precision Statements for Test Methods for Construction Materials.

### Soils

Precision - The between laboratory single operator standard deviation for moisture content has been found to be  $\sqrt{\sigma_{LAB}^2 + \sigma^2} = 3.5900$ . Therefore, the results of properly conducted tests from two laboratories on the same soil should not differ by more than  $2 \sqrt{2(\sigma_{LAB}^2 + \sigma^2)} = 10.1541$  from each other.

These numbers represent, respectively, the 1S and D2S limits as described in ASTM Practice C670, for Preparing Precision Statements for Test Methods for Construction Materials.

## ESTIMATION OF BIAS

The precision of the standard test method for the determination of moisture content of aggregates and soils in a laboratory was the primary topic of the two previous sections. These results showed the degree of mutual agreement of individual measurements both within and across laboratories. The accuracy of a test procedure takes the precision statements one step further. It covers both the precision and bias of the test method. The bias of a result, often called the systematic error, involves consistent deviations from a reference value. That is, the mean of the test will consistently be larger or smaller than its true value. Further explanations of precision and accuracy can be found in the ASTM publication E177 (Ref 3).

In order to have a valid statement on the bias of a test procedure, a reference value is required. Because data to support this requirement have not been available no estimate of bias has ever been determined. If an acceptable reference value for moisture content can be derived, then the data obtained from these test results may be used in estimating the bias of the test procedure.

The material samples, processed by AMRL, were bagged and shipped to the participating laboratories. An important requirement for estimating moisture content is to test the samples as soon as possible so that they do not remain in the bags for long periods of time. They should also have been stored at the proper temperature and kept away from direct sunlight. If any of these conditions were not satisfied, the possible impact on the bias calculations remains unknown.

Moisture samples constructed by AMRL were developed such that water was added in a known quantity to one-half of the samples and no water was added to the other half. Since no water was added to the "dry" samples, the moisture determined by the test results in the laboratories for these samples is the best estimate possible of the amount which occurs naturally in air-dried material.

The following procedure for estimating the bias in the moisture content test method for aggregates was followed. Each laboratory was sent 3 subsamples for each of the 8 samples of material for a total of 24 subsamples. The only difference between sample 1 and sample 5 materials is the added moisture content. The same association exists between sample pairs (2,6), (3,7), and (4,8).

For each laboratory the average moisture content was found for the three subsamples of material produced by AMRL for sample number 1. This average was added to the average moisture content found by each laboratory for sample number 5. This total represents the best estimate of the average moisture content contained in the "wet" samples. The average moisture content of the 3 subsamples for sample 1 as determined by the respective laboratory was subtracted to determine a bias term. The same procedure was used for "wet" samples 2 through 4 and "dry" samples 6 through 8.

The resulting means for the aggregate samples from the 17 laboratories across the different levels of factors in the study are shown in Table 4. The analysis of variance performed on these data is given in Table 5. The results indicate that only a small amount of bias exists for the aggregate samples. The overall average is 0.03113. This positive number indicates the laboratories did not estimate as much water in the sample as one would have expected to find. The individual means found in the right hand column of Table 4 indicate most of the laboratories produced a positive bias with laboratory 11 having the largest bias of 0.1200. Another interesting result is that material from source WA generally produced large positive results (average = 0.0615) and material from source PL generally produced both positive and negative results (average = 0.0007). Thus, the magnitude of the bias depends on the source of material used.

The same procedure was also followed for the soils. Sample numbers 9 through 12 had specific amounts of moisture added by AMRL. The corresponding pairs are given by sample numbers 13 through 16 left in the air-dry condition.

Table 4. Bias estimates for aggregate samples 1 through 8 (SSD condition).

| M        | A  |   |          |         |          |          |         |
|----------|----|---|----------|---------|----------|----------|---------|
| S        | P  | T |          |         |          |          |         |
| L        | L  | L | WA       |         | PL       |          |         |
| A        | I  |   |          |         |          |          |         |
| B        | T  |   | A        | B       | C        | D        | Mean    |
|          | 01 |   | 0.14000  | 0.18000 | 0.08333  | -0.10333 | 0.0750  |
|          | 02 |   | 0.17667  | 0.03667 | 0.16333  | -0.06667 | 0.0775  |
|          | 03 |   | 0.16333  | 0.02667 | 0.04667  | -0.06667 | 0.0425  |
|          | 04 |   | 0.04000  | 0.01000 | 0.03333  | -0.13333 | -0.0125 |
|          | 05 |   | 0.00000  | 0.01667 | 0.02667  | -0.02333 | 0.005   |
|          | 06 |   | 0.02333  | 0.02000 | -0.00333 | -0.04667 | -0.0017 |
|          | 07 |   | -0.00333 | 0.09667 | 0.05667  | -0.06667 | 0.0208  |
|          | 08 |   | 0.01667  | 0.01000 | 0.06333  | -0.03667 | 0.0133  |
|          | 09 |   | 0.06667  | 0.02667 | 0.13333  | -0.09667 | 0.0325  |
|          | 10 |   | 0.02000  | 0.01000 | -0.01333 | -0.09000 | -0.0183 |
|          | 11 |   | 0.13333  | 0.15667 | 0.14000  | 0.05000  | 0.1200  |
|          | 12 |   | 0.10333  | 0.02667 | 0.11000  | 0.01333  | 0.0633  |
|          | 13 |   | 0.07333  | 0.10500 | 0.05333  | -0.07333 | 0.0396  |
|          | 14 |   | 0.08000  | 0.00000 | 0.00667  | -0.06167 | 0.00625 |
|          | 15 |   | 0.03333  | 0.01333 | -0.01667 | -0.12000 | -0.0225 |
|          | 16 |   | 0.11333  | 0.03667 | 0.08333  | -0.02667 | 0.05170 |
|          | 17 |   | 0.11333  | 0.02667 | 0.01333  | -0.00667 | 0.03667 |
| Averages |    |   | 0.0761   | 0.0470  | 0.0576   | -0.0562  |         |
|          |    |   | 0.0615   |         | 0.0007   |          |         |
|          |    |   | 0.03113  |         |          |          |         |

Table 5. Analysis of Variance for bias estimates in aggregate samples.

| Source          | Degrees of Freedom | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|--------------------|----------------|-------------|---------|--------|
| Model           | 17                 | 0.1576         | 0.00927     | 2.23    | 0.0143 |
| LAB             | 16                 | 0.0948         | 0.00592     | 1.43    | 0.1675 |
| MATL            | 1                  | 0.0628         | 0.06281     | 15.14   | 0.0003 |
| Error           | 50                 | 0.2075         | 0.00415     |         |        |
| Corrected Total | 67                 | 0.3650         |             |         |        |

Student-Newman-Keuls test for variable: BIAS

Means with the same underline are not significantly different.

| SNK Grouping | Mean    | N | LAB |
|--------------|---------|---|-----|
|              | 0.1200  | 4 | 11  |
|              | 0.0775  | 4 | 02  |
|              | 0.0750  | 4 | 01  |
|              | 0.0633  | 4 | 12  |
|              | 0.0517  | 4 | 16  |
|              | 0.0425  | 4 | 03  |
|              | 0.0396  | 4 | 13  |
|              | 0.0367  | 4 | 17  |
|              | 0.0325  | 4 | 09  |
|              | 0.0208  | 4 | 07  |
|              | 0.0133  | 4 | 08  |
|              | 0.0063  | 4 | 14  |
|              | 0.0050  | 4 | 05  |
|              | -0.0017 | 4 | 06  |
|              | -0.0125 | 4 | 04  |
|              | -0.0183 | 4 | 10  |
|              | -0.0225 | 4 | 15  |

The resulting means for the soil samples from the 17 laboratories across the levels of the factors in the study are shown in Table 6. The analysis of variance performed on these data is given in Table 7. The results indicate that a larger amount of bias exists for the soil samples, except now the difference is the negative value of -0.9834. This negative number indicates the laboratories overestimated the amount of water in the sample one would have expected to find. The individual means found in the right hand column of Table 6 indicate most of the laboratories produced a negative bias. However, laboratory 05 has a very large positive overall bias term of 1.614. Another interesting result is that material from source M1 generally produced positive results (average = 0.4749) and material from source M2 generally produced large negative results (average = -2.4418). Thus, the magnitude of the bias depends on the source of material used.

In summary, an interesting contrast emerges from these results. Bias is positive for aggregates and therefore the laboratories did not estimate as much water in the sample as one would have expected to find. The negative bias for soils indicates the laboratories overestimated the amount of water in the sample one would have expected to find. Also, for both aggregates and soils the source of the material influenced the size and the magnitude of the bias term.

#### PRECISION STATEMENTS FOR BIAS

The average laboratory bias components for the moisture contents of aggregates and soils are given in Tables 4 and 6. These means provide the basis for statements concerning the precision of the moisture content estimate. The appropriate standard deviation to apply depends upon the desired inference. Table 8 summarizes the calculations of the appropriate mean squares. Given the data provided for this experiment, confidence intervals for the true bias estimates will be provided.

Table 6. Bias estimates for soil samples 9 through 16 (PLM condition).

| M<br>S<br>P<br>L<br>A | T<br>L<br>I<br>B | M1       |          | M2       |          | Mean    |
|-----------------------|------------------|----------|----------|----------|----------|---------|
|                       |                  | A        | B        | C        | D        |         |
|                       |                  |          |          |          |          |         |
|                       |                  |          |          |          |          |         |
|                       | 01               | 1.07667  | -0.11000 | -2.70667 | -3.10333 | -1.2108 |
|                       | 02               | 1.66333  | -0.39000 | -3.52000 | -2.65667 | -1.2258 |
|                       | 03               | 0.80333  | 0.21333  | -5.23333 | -3.47000 | -1.9217 |
|                       | 04               | 0.69667  | -0.22333 | -2.84667 | -2.62667 | -1.2500 |
|                       | 05               | 0.92000  | -0.07333 | 5.56667  | 0.04333  | 1.6142  |
|                       | 06               | 0.80667  | 0.12000  | -0.19667 | -0.76333 | -0.0083 |
|                       | 07               | 1.13333  | -0.04333 | -3.30667 | -2.95000 | -1.2917 |
|                       | 08               | 1.05333  | -0.13333 | -2.99667 | -3.10000 | -1.2942 |
|                       | 09               | 1.52333  | 0.09000  | -3.24000 | -2.99333 | -1.1550 |
|                       | 10               | 1.23333  | -0.39333 | -3.79000 | -0.73333 | -0.9208 |
|                       | 11               | 0.70000  | 0.19667  | -3.94333 | -2.97000 | -1.5042 |
|                       | 12               | 0.89333  | 0.36000  | -0.26333 | -0.96333 | 0.0067  |
|                       | 13               | 0.81000  | -0.19000 | -2.88667 | -2.78667 | -1.2633 |
|                       | 14               | 1.10000  | 0.67333  | -2.94667 | -3.29667 | -1.1175 |
|                       | 15               | 0.36333  | -0.05000 | -2.24000 | -2.33667 | -1.0658 |
|                       | 16               | 1.75667  | 0.33667  | -4.23333 | -3.87333 | -1.5033 |
|                       | 17               | -0.38667 | -0.38333 | -4.02000 | -1.63667 | -1.6067 |
| Averages              |                  | 0.9498   | 0.0000   | -2.5178  | -2.3657  |         |
|                       |                  | 0.4749   |          | -2.4418  |          |         |
|                       |                  | -0.9834  |          |          |          |         |

Table 7. Analysis of Variance for bias estimates in aggregate samples.

| Source          | Degrees of Freedom | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|--------------------|----------------|-------------|---------|--------|
| Model           | 17                 | 188.612        | 11.0948     | 6.56    | 0.0001 |
| LAB             | 16                 | 43.993         | 2.7496      | 1.62    | 0.0966 |
| MATL            | 1                  | 144.618        | 144.6181    | 85.46   | 0.0001 |
| Error           | 50                 | 84.6079        | 1.6922      |         |        |
| Corrected Total | 67                 | 273.2194       |             |         |        |

Student-Newman-Keuls test for variable: BIAS

Means with the same underline are not significantly different.

| SNK Grouping | Mean   | N | LAB |
|--------------|--------|---|-----|
|              | 1.614  | 4 | 05  |
|              | 0.007  | 4 | 12  |
|              | -0.008 | 4 | 06  |
|              | -0.921 | 4 | 10  |
|              | -1.066 | 4 | 15  |
|              | -1.117 | 4 | 14  |
|              | -1.155 | 4 | 09  |
|              | -1.211 | 4 | 01  |
|              | -1.226 | 4 | 02  |
|              | -1.250 | 4 | 04  |
|              | -1.263 | 4 | 13  |
|              | -1.292 | 4 | 07  |
|              | -1.294 | 4 | 08  |
|              | -1.503 | 4 | 16  |
|              | -1.504 | 4 | 11  |
|              | -1.607 | 4 | 17  |
|              | -1.922 | 4 | 03  |

Table 8. Mean square calculations for the bias of aggregates and soils.

AGGREGATES

| Source          | DF | Sum of Squares | Mean Square |
|-----------------|----|----------------|-------------|
| Error           | 67 | 0.3650         | 0.005448    |
| Corrected Total | 67 | 0.3650         |             |
| Total           | 68 | 0.4309         |             |

| Source          | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|----|----------------|-------------|---------|--------|
| AGGR            | 1  | 0.0628         | 0.06281     | 13.72   | 0.0004 |
| Error           | 66 | 0.3022         | 0.004578    |         |        |
| Corrected Total | 67 | 0.3650         |             |         |        |
| Total           | 68 | 0.4309         |             |         |        |

SOILS

| Source          | DF | Sum of Squares | Mean Square |
|-----------------|----|----------------|-------------|
| Error           | 67 | 273.2194       | 4.0779      |
| Corrected Total | 67 | 273.2194       |             |
| Total           | 68 | 338.9847       |             |

| Source          | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|----|----------------|-------------|---------|--------|
| SOIL            | 1  | 144.6180       | 144.6180    | 74.22   | 0.0001 |
| Error           | 66 | 128.6013       | 1.9485      |         |        |
| Corrected Total | 67 | 273.2194       |             |         |        |
| Total           | 68 | 338.9847       |             |         |        |

### Precision Statements of Bias for Aggregates

Aggregates. Table 8 shows the within-laboratory single operator standard deviation for aggregates is determined to be  $\sigma = \sqrt{0.005448} = 0.0738$ . Therefore, the bias of a properly conducted test by one operator in the same laboratory on an aggregate material should not differ by more than  $2\sigma = 0.1476$  from the true value of the bias. When the experimental results were compared with a known reference value, the 95% confidence limits for the bias of a moisture test on an aggregate material was found to lie between  $0.0311 \pm 2\sigma$  or  $(-0.116, 0.179)$ .

#### Aggregates

from Source WA. The within-laboratory single operator standard deviation for aggregates from source WA is determined to be  $\sigma = \sqrt{0.004578} = 0.06766$ . Therefore, the bias of a properly conducted test by one operator in the same laboratory on an aggregate from this source should not differ by more than  $2\sigma = 0.1353$  from the true value of bias. A 95% confidence interval for the bias of the moisture content of aggregates from this source is  $0.0615 \pm 2\sigma$  or  $(-0.074, 0.197)$ .

#### Aggregates

from Source PL. The within-laboratory single operator standard deviation for aggregates from source PL is determined to be  $\sigma = \sqrt{0.004578} = 0.06766$ . Therefore, the bias of a properly conducted test by one operator in the same laboratory on an aggregate from this source should not differ by more than  $2\sigma = 0.1353$  from the true value of bias. A 95% confidence interval for the bias of the moisture content of aggregates from this source is  $0.0007 \pm 2\sigma$  or  $(-0.135, 0.136)$ .

These numbers represent, respectively, the 1S and 2S limits as described in ASTM Practice C670, for Preparing Precision Statements for Test Methods for Construction Materials.

### Precision Statements of Bias for Soils

Soils. Table 8 shows the within-laboratory single operator standard deviation for soils is determined to be  $\sigma = \sqrt{4.0779} = 2.0194$ . Therefore, the bias of a properly conducted test by one operator in the same laboratory on a soil material should not differ by more than  $2\sigma = 4.0388$  from the true value of the bias. When the experimental results were compared with a known reference value, the 95% confidence limits for the bias of a moisture test on a soil material was found to lie between  $-0.983 \pm 2\sigma$  or  $(-5.022, 3.056)$ .

#### Soils from

Source M1. The within-laboratory single operator standard deviation for soils from source M1 is determined to be  $\sigma = \sqrt{1.9485} = 1.3959$ . Therefore, the bias of a properly conducted test by one operator in the same laboratory on a soil from this source should not differ by more than  $2\sigma = 2.7918$  from the true value of bias. A 95% confidence interval for the bias of the moisture content of soils from this source is  $0.475 \pm 2\sigma$  or  $(-2.317, 3.267)$ .

#### Soils from

Source M2. The within-laboratory single operator standard deviation for soils from source M2 is determined to be  $\sigma = \sqrt{1.9485} = 1.3959$ . Therefore, the bias of a properly conducted test by one operator in the same laboratory on a soil from this source should not differ by more than  $2\sigma = 2.7918$  from the true value of bias. A 95% confidence interval for the bias of the moisture content of soils from this source is  $-2.442 \pm 2\sigma$  or  $(-5.234, 0.350)$ .

These numbers represent, respectively, the 1S and 2S limits as described in ASTM Practice C670, for Preparing Precision Statements for Test Methods for Construction Materials.

#### REFERENCES

1. High, R., "Materials Testing Sampling Designs", Technical Memorandum AU-95, TRDF, December, 1989.
2. Anderson, V., "Analysis of Material Testing Sampling Designs", Technical Memorandum AU-108, TRDF, January, 1990.
3. Uherek, G., "SHRP Moisture Content Proficiency Sample Program", AMRL, October, 1990.
4. American Society for the Testing of Materials, "Use of the Terms Precision and Accuracy as Applied to Measurement of a Property of a Material", E177, 1980.

# APPENDIX VI

# *Steele Engineering, Inc.*

November 18, 1991

Fred Martinez  
South Western Laboratories  
222 Cavalcade Street  
PO Box 8768  
Houston, TX 77249

Dear Fred:

Subject: SHRP Soil Moisture Proficiency Sample Program

Enclosed for your information is a copy of following four scatter diagrams showing results of tests on the subject Program.

- °Aggregate(SHRP Type I)-air dry condition
- °Aggregate(SHRP Type I)-saturated surface dry condition
- °Soil(SHRP Type II)-air dry condition
- °Soil(SHRP Type II)-plastic limit condition

The vertical and horizontal lines on each diagram are the means of the A and B samples respectively for each of the four conditions noted above.

The test data derived by your laboratory is identified by the letter H.

Yours very truly

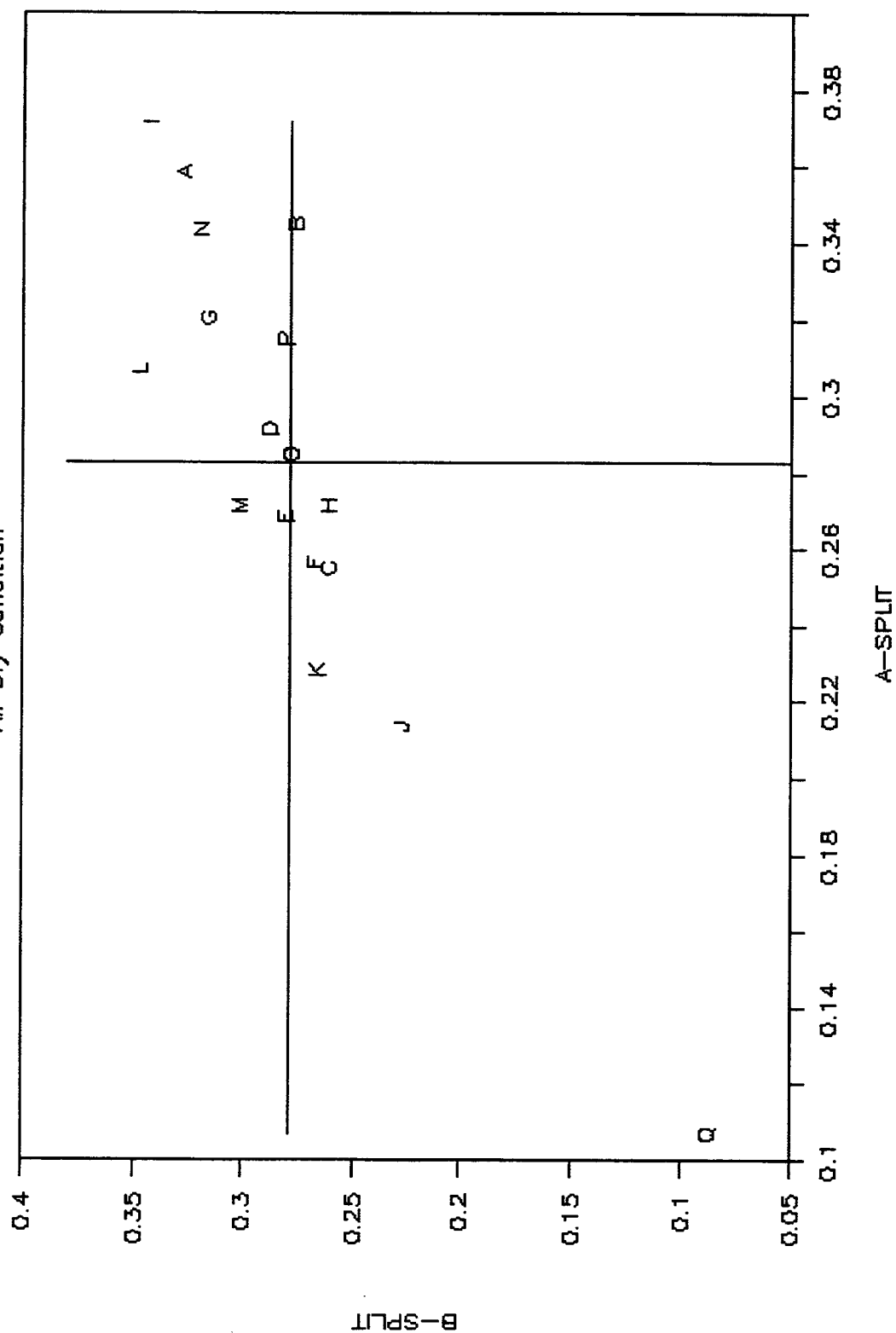
Garland W. Steele, P.E.  
President, Steele Engineering Inc.

enclosure: 4 pages

cc: Neil Hawks(letter only)  
Paul Teng(letter only)  
Dave Esch(letter only)  
Bill Hadley(letter only)  
Robin High(letter only)

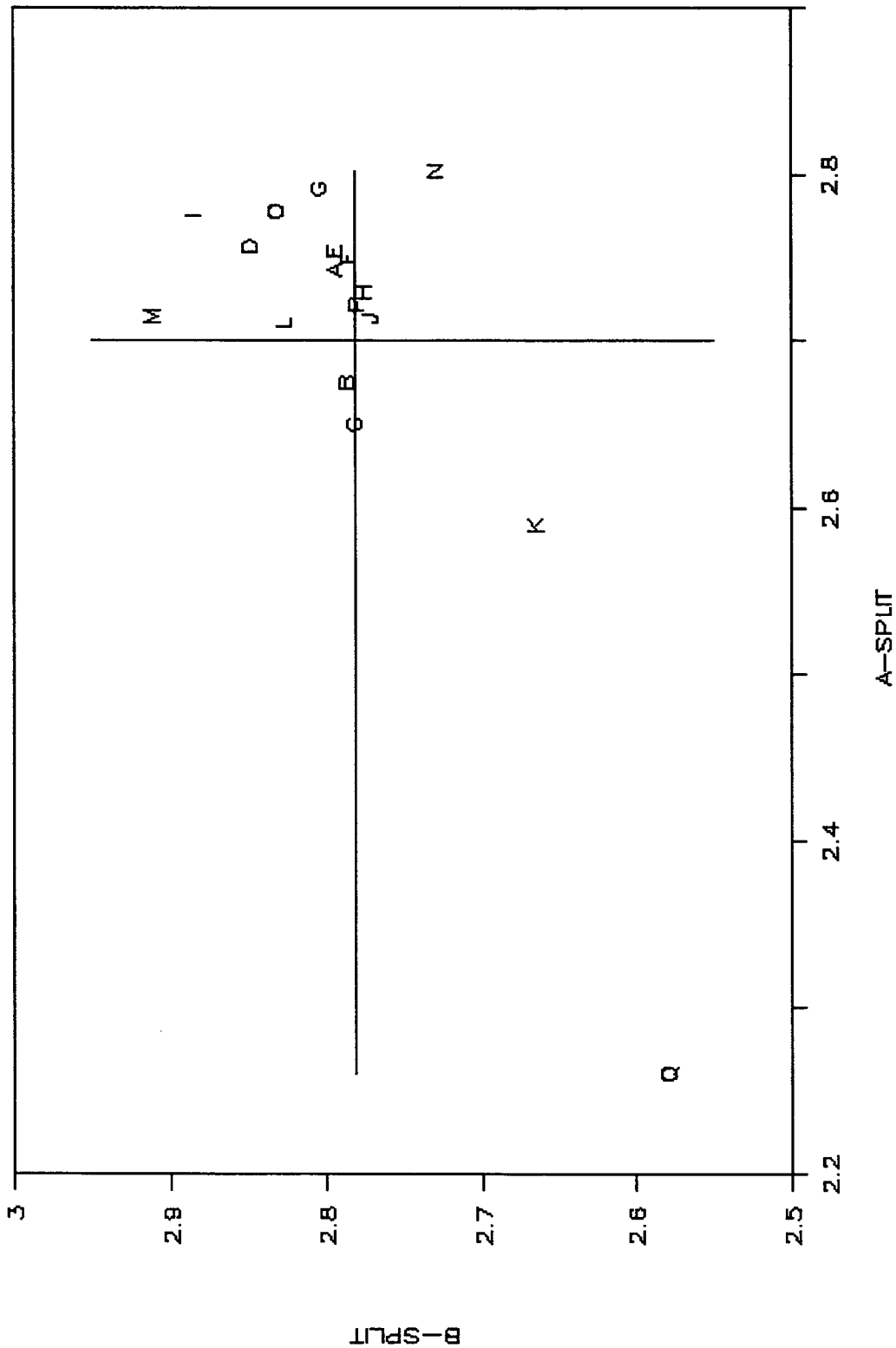
# AGGREGATES

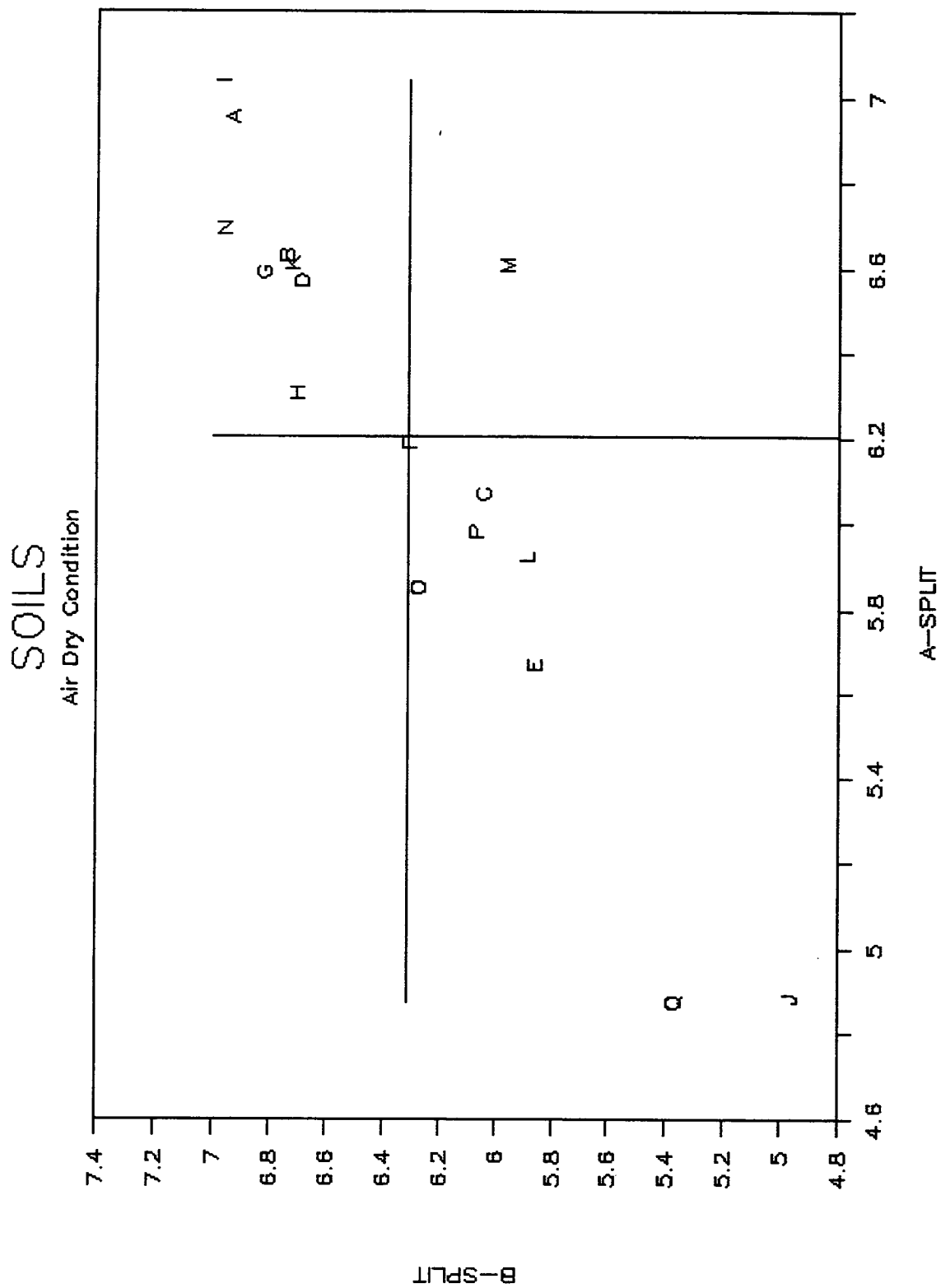
Air Dry Condition



# AGGREGATES

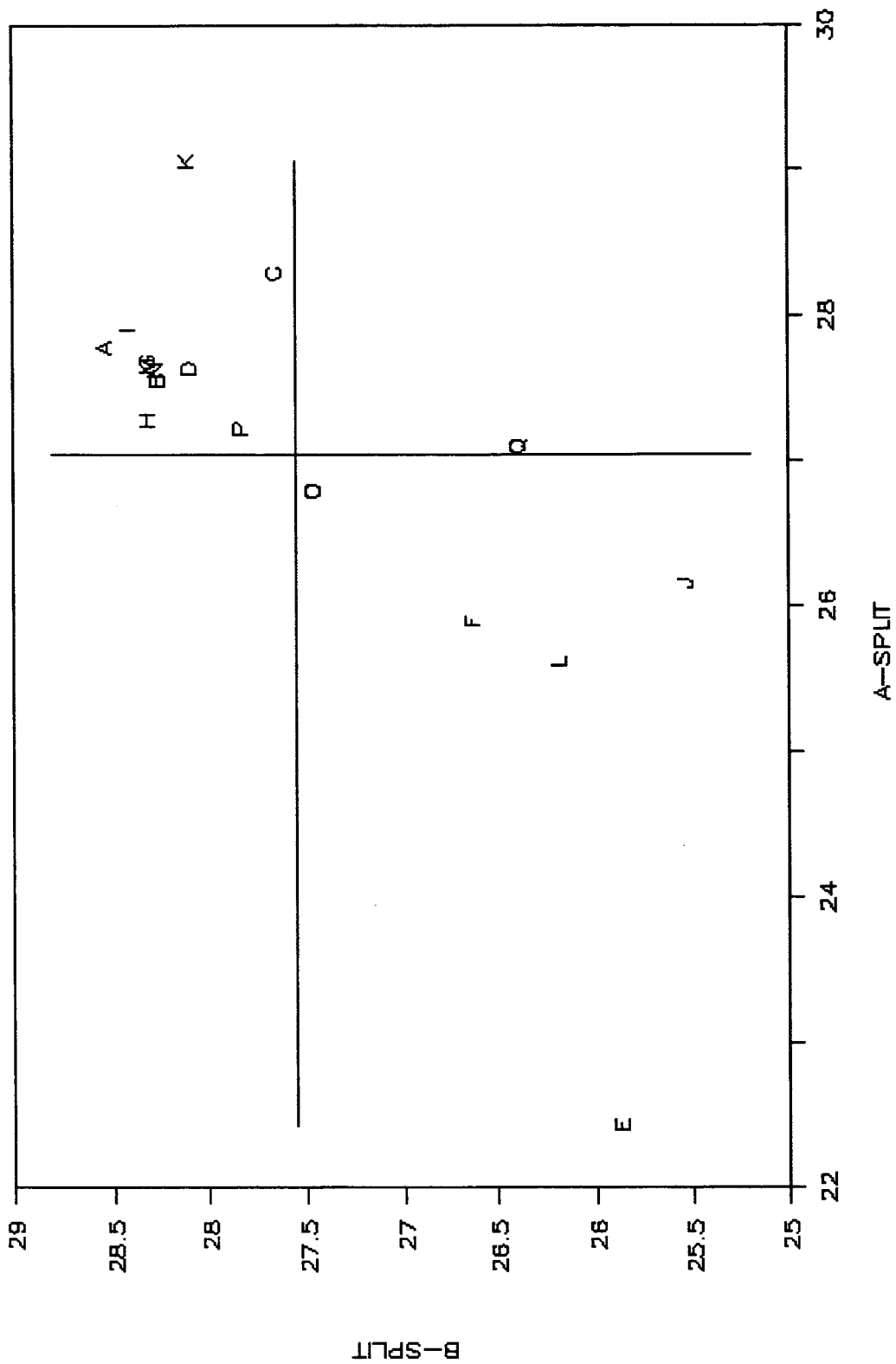
SSD Condition





# SOILS

PLM Condition



# APPENDIX VII

## Moisture Content-Aggregates

### Precision

The within-laboratory single operator standard deviation for moisture content of aggregates has been found to be  $\sigma = 0.2790\%$ . Therefore, results of two properly conducted tests by the same operator in the same laboratory on the same type of aggregate sample should not differ by more than  $2\sqrt{2} \sigma = 0.7891\%$  from each other.

The between-laboratory single operator standard deviation for moisture content of aggregates has been found to be  $\sqrt{(\sigma^2_{lab} + \sigma^2)} = 0.28012\%$ . Therefore, results of properly conducted tests from two laboratories on the same aggregate should not differ by more than  $2\sqrt{(2(\sigma^2_{lab} + \sigma^2))} = 0.7923\%$  from each other.

These numbers represent, respectively, the  $\Delta 1S$  and  $\Delta D2S$  limits as described in ASTM Practice C670, Preparing Precision Statements for Test Methods for Construction Materials.

### Bias

When experimental results are compared with known values from accurately compounded specimens:

The bias of moisture tests on one aggregate material has been found to have a mean of  $+0.0615\%$ . The bias of individual test values from the same aggregate material has been found with 95% confidence to lie between  $-0.074\%$  and  $+0.197\%$ .

The bias of moisture tests on a second aggregate material has been found to have a mean of  $+0.0007\%$ . The bias of individual test values from the same aggregate material has been found with 95% confidence to lie between  $-0.135\%$  and  $+0.136\%$ .

The bias of moisture tests overall on both aggregate materials has been found to have a mean of  $+0.0311\%$ . The bias of individual test values overall from both aggregate materials has been found with 95% confidence to lie between  $-0.116\%$  and  $+0.179\%$ .

## Moisture Content-Soil

### Precision

The within-laboratory single operator standard deviation for soils has been found to be  $\sigma = A3.5692\%$ . Therefore, results of two properly conducted tests by the same operator in the same laboratory on the same type soil should not differ by more than  $2\sqrt{2} \sigma = B10.0951\%$  from each other.

The between-laboratory single operator standard deviation for moisture content of soils has been found to be  $\sqrt{(\sigma^2_{lab} + \sigma^2)} = A3.5900\%$ . Therefore, results of properly conducted tests from two laboratories on the same soil should not differ by more than  $2\sqrt{(2(\sigma^2_{lab} + \sigma^2))} = B10.1541\%$  from each other.

These numbers represent, respectively, the A1S and B2S limits as described in ASTM Practice C670, Preparing Precision Statements for Test Methods for Construction Materials.

### Bias

When experimental results are compared with known values from accurately compounded specimens:

The bias of moisture tests on one soil material has been found to have a mean of  $+0.475\%$ . The bias of individual test values from the same soil material has been found with 95% confidence to lie between  $-2.317\%$  and  $+3.267\%$ .

The bias of moisture tests on a second soil material has been found to have a mean of  $-2.442\%$ . The bias of individual test values from the same soil material has been found with 95% confidence to lie between  $-5.234\%$  and  $+0.350\%$ .

The bias of moisture tests overall on both soil materials has been found to have a mean of  $-0.983\%$ . The bias of individual test values overall from both soil materials has been found with 95% confidence to lie between  $-5.022\%$  and  $+3.056\%$ .