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# CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES QUALITY ASSURANCE SURVEILLANCE REPORT

PROJECT NO.:  
20-3704-022

REPORT NO.: <sup>90-001 LAB</sup>  
~~90-3704-022~~

PAGE 1 OF 3

**SURVEILLANCE SCOPE:**

Review of Thermohydrology Research Project Scientific Notebook

Entries: Separate Effects Experiment, Test #1 (3/6/90)

**REFERENCE DOCUMENTS:**

QAP-001 "Scientific and Laboratory Notebooks," COAM

STARTING DATE: 3/7/90

ENDING DATE: 3/8/90

**QA REPRESENTATIVE:**

R.D. Brient *LAB*

**PERSONS CONDUCTING TEST / EXAM / ACTIVITY:**

M. Lewis (06), S.Svedeman (04)

**SATISFACTORY FINDINGS:**

Calibration status was verified for Ohaus and Mettler balances, calibrated by Texas Scales (on the SwRI Qualified Vendors List). Most calibrations were performed before use, on the sensor, interfaces, and data acquisition system as an entire system (rather than on each component individually). Initial and periodic entries were made by M. Lewis and S. Svedeman. With the exception of the unsatisfactory findings and recommendations, the Scientific Notebook (Control Number 003) properly documents the method and results of the experiment.

**UNSATISFACTORY FINDINGS:**

See Attached

**NONCONFORMANCE REPORT NO.:**

90-001, 90-002, 90-003

**ATTACHMENTS:**

**RECOMMENDATIONS / ACTIONS**

See Attached

APPROVED: \_\_\_\_\_

*[Signature]*  
CENTER DIRECTOR OF QUALITY ASSURANCE

DATE: \_\_\_\_\_

3/12/90

**DISTRIBUTION:**

*Allen Whiting*  
ORIGINAL - CENTER QA DIRECTOR  
ORIGINATOR  
PRINCIPAL ENGINEER  
ELEMENT MANAGER *DR. Russell*  
*Row Green*

2/3/90

Unsatisfactory Findings

1. Data corrections were not made by a single line and initialed and dated by the individual making the correction as required by QAP-001. Individual occurrences: pgs. 13, 15, 16, 17 (beaker wt.), 20, 21, 27, 31.
2. The individual performing the glass bead size distribution analysis (Notebook pg. 18) has not been qualified nor has he received QA indoctrination as required by CQAM Section 2. The notebook does not indicate that the activity was performed in accordance with documented instructions (CQAM Section 5) or that the method was qualified (CQAM Section 9). These measurements were not identified as measurement parameters on page 12, nor is calibration of the measurement equipment documented. If this analysis was for information only, this should have been clearly indicated in the notebook.
3. QAP-001 requires that entries into the Scientific Notebook be made daily or other basis as appropriate. Entries made on notebook pages 23-45 are dated in the notebook as 3/6/90, however, the data was initially recorded (in a form other than the Scientific Notebook) on various earlier dates. The intent of Scientific Notebook control is that data are entered directly into the notebook as they are gathered.
4. Data copied from another source and affixed into the notebook on pages 26-45 are not suitable for reproduction as required by QAP-001, 4.3(1).
5. CQAM Section 12, "Control of Measuring and Test Equipment", requires that measurement standards have documented traceability to higher level standards. The notebook entries for the aluminum blocks used for the densitometer calibration do not provide an indication that their thickness ("calibration") was determined utilizing a calibrated dimensional measuring equipment.

Recommendations

1. Blue ink does not reproduce well on some copiers. The best practice is to use black ink exclusively.
2. Ref. page 13 - Sartorius Lab Scale does not have a serial number identified.
3. Ref. page 12 - Bead characterization measurement parameters are not included in the table; required accuracy is not established for mass and volume measurements.
4. Ref. page 20 - The purpose and objectives for determining the capillary pressure curve are not stated in the initial entries or in periodic entry #3. The calibration of the pressure transducer should indicate actual values of the standard (manometer) and corresponding values from the transducer. The statement that the calibration covered four points

and results were OK is insufficient objective evidence of a proper calibration. In addition, the accuracy capability of the manometer is not stated, nor is this pressure measurement listed as a parameter on page 12 (the required accuracy is not stated).

5. Ref. pages 12 & 25 - The calibration of the densitometer using 0% and 100% saturation readings plus the aluminum blocks is not described or its basis as a valid calibration method discussed in the notebook entries. The entries do not establish that the required accuracy of the saturation measurement parameter is met. Use of the aluminum blocks could indirectly provide an accuracy determination at intermediate saturation points through demonstration of a linear relationship between densitometer reading and total aluminum thickness, but only a graphic illustration is provided. A linear regression analysis could be applied to the aluminum block data to quantify the accuracy of measurement process.
6. Ref. pages 12 & 31 - The required accuracy of the matric suction is 0.5 cm. Hg. However the results statement of sensor accuracy is in terms of % of manometer reading. The calibration process should verify that accuracy requirements are met without having to convert units. In addition, the statement of accuracy within  $\pm 1\%$  (see "Results" pg. 31) is not met at the .71 psig point, and offsetting -.03 psig at 0 psig would increase the error in the 1.3 to 2.5 psig range, rather than improving accuracy across the scale.
7. Ref. pages 27 & 12 - The position accuracy requirement stated in the Results on page 27 (0.1") conflicts with the required accuracy of page 12 (0.5cm =0.2"). Again, units should be the same between the measurement parameters (pg. 12) and the actual units measured.
8. Ref. page 28 - The accuracy of the manometers utilized for the pressure transducer calibration is not stated. While calibration of a manometer is not required, the notebook entries should clearly identify the instrument by brand, range, scale divisions, etc.
9. Ref. Test #1 - The data acquisition files should be identified and location should be clearly referenced in the notebook. Since these files provide the primary source of test data and are QA records, a copy of the disk should be made and included in the notebook.
10. Ref. page 38 - Source of deionized water is incorrectly identified as "NRC Lab"; CNWRA or Center Lab is the correct identification.
11. Ref. page 39 - Photographs should be included in the notebook as part of the data.
12. Ref. page 45 - The two points labeled as the first and second sample points would be better described as calibration check or verification points. Also, the position readouts are to .001", which suggests accuracy several orders of magnitude greater than the 0.5 cm (0.2") required and the stated accuracy of 0.1" (page 27).