

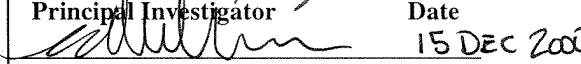


**NYE COUNTY NUCLEAR WASTE REPOSITORY
PROJECT OFFICE**

TECHNICAL PROCEDURE

TITLE: MAGNETIC SUSCEPTIBILITY FOR CORE, CUTTINGS AND OTHER SAMPLES	Revision: 0 Date: 11-02-00 Page: 1 of 6
PROCEDURE No.: TP-8.8	SUPERSEDES: DRAFT, 02-22-95
APPROVAL  Project Manager Date	CONCURRENCE  Principal Investigator Date  Project Quality Assurance Officer Date

1.0 PURPOSE

The purpose of this procedure is to describe the use of a magnetic susceptibility meter in the collection of apparent susceptibility (K') data using cuttings from samples collected by Nye County's independent oversight drilling program, and samples collected at or near Yucca Mountain from outcrops, from trenches, and as surface samples.

2.0 SCOPE

This procedure will be used in studying the magnetic susceptibility of Yucca Mountain tuffs and sediments. The magnetic susceptibility of Yucca Mountain tuffs vary with stratigraphic position and these properties are therefore important in characterizing the cuttings obtained during drilling.

2.1 APPLICABILITY

This procedure applies to NWRPQ principal investigators (P1) studying the magnetic susceptibility of Yucca Mountain tuffs and sediments analyses for the NWRPO.

2.2 TRAINING

The preparer of this procedure is deemed as qualified user and can train other personnel to this procedure. GMI personnel trained in this procedure by the P1 shall use this procedure.

3.0 DEFINITIONS

N/A

4.0 RESPONSIBILITIES

4.1 The Principal Investigator is responsible for the preparation of this procedure.

4.2 The P1 has the responsibility of performance of this procedure, unless those operations are assigned to other trained personnel - in which case the Principal Investigator is responsible for the oversight of the operations. A laboratory notebook will record activities performed on each sample. A Geophysics Analysis form will be used

5.0 PROCESS

5.1 Calibration

The magnetic susceptibility meter is internally calibrated. No further calibration is necessary. However, a calibration test is made to insure that: a) the instrument is working in a consistent manner; and b) the environment is magnetically similar for each sample run. The calibration test involves pre-made standards run prior to running an unknown sample. A measurement drift greater than 0.05 SI is designated unacceptable. Unacceptable calibration readings require a work over of the unit. Sample data can be acquired only if standard test calibration data are acceptable. Results of the calibration test will be documented in the laboratory notebook.

5.2 Environmental Conditions

No special environmental conditions are necessary for this procedure.

5.3 Susceptibility Meter

A Kappameter model KT-5C will be used to acquire apparent susceptibility data. The serial number of the unit will be recorded in the laboratory notebook.

5.4 Parameters

Measurements are taken in SI units where $1 \times 10^{-5} \text{ SI} = 0.8 \times 10^{-3} \text{ cgs}$. Apparent susceptibility differs from true susceptibility in the dependence of shape and size of the rocks measured. The instrument is internally calibrated for the idealized case where the pickup coil is attached to an absolutely smooth plane confining a half-space filled with magnetically homogenous and isotropic medium with the susceptibility K. In this case:

$$K = K' / (1 - K' / 2) \text{ (SI system)}$$

where: K = True Susceptibility
K' = Apparent Susceptibility

For susceptibility values lower than 100×10^{-3} SI units, $K = K'$ with an error of less than 5%. When there is a gap between the rock face and the active face of the susceptibility meter, the values acquired are less than apparent susceptibility of that rock. It is important to reduce this gap as much as possible during measurement, and to uniformly take the measurements at the same gap conditions for all samples. A rock face directly against the active face of the susceptibility meter will have about 90% of the displayed apparent susceptibility values originating from within 20 mm of depth into the rock from the surface face of the rock. An additional 9% will come from the next 20-60 mm of rock depth. Most of the signal comes from near the rock surface measured; however, enough of a signal comes from rock depth to consider this a factor when making uniform measurements on many samples. Samples measured need to be thicker than 100 mm.

There are corrections for problems with gap (uneven surface), specimen size, and shape:

Correction for surface unevenness

<u>Surface Unevenness</u> (maximum depth) (mm)	<u>Correction Factor</u>
1	1.07
2	1.15
3	1.23
4	1.32
5	1.41
6	1.51
7	1.61
8	1.72
9	1.84
10	1.96

Correction for specimen size

<u>Rock Object Size</u> (diameter) (mm)	<u>Correction Factor</u>
60	1.19
70	1.11
80	1.05
90	1.03
100	1.01

Correction for cylindrical shape of core samples

<u>Diameter of Rock</u> (mm)	<u>Correction Factor</u>
60	1.63
70	1.53
80	1.47
90	1.41
100	1.38
110	1.35
120	1.33

Measurements have a sensitivity of 1×10^{-5} SI units with in a range of 0.01 to 999.99×10^{-3} SI units. The operating frequency is 10KHz, and the display is digital. The active face is 65 mm in diameter. The active face needs to be 100% covered during measurement.

5.5 Unit Operation

- 5.5.1 Turn on power switch
- 5.5.2 Press C/M Touch Switch to Clear/Measure
- 5.5.3 Press RCL Touch Switch for Memory Recall
- 5.5.4 Place Active Face of the unit against the rock surface to be measured. Measurement takes about 0.5 seconds and is acoustically indicated. At the end of this cycle, the K' value is displayed in 10^{-3} SI units. Rocks measured require preparation prior to measurement. This preparation is to acquire uniform measurements.

5.6 Standardization of Uneven Sample Surface, Sample Shape, Sample Diameter and Sample Thickness. Preparation of Sample

- 5.6.1 All samples will be milled to 0.2mm grain size using a Webber pulverizing mill or with a ceramic mortar. All samples will be sieved to insure proper grain size. All equipment will be cleaned between running samples.
- 5.6.2 Pulverized sample will be placed in a glass or plastic dish that has a diameter of 100 mm. Enough sample material will be pulverized to hand pack this container to a depth of 50 mm. At 50 mm thickness 98.5% of the display value is acquired. A small correction factor is applied to the apparent susceptibility K'. The sample is pressed into the container with a plastic or glass piston so that the surface of the sample is very smooth and that packing is even and tight. The container is marked on the outside of the container at the 50-mm mark for internal height. The magnetic susceptibility of the empty container is measured on a wood block that is 12" thick and the susceptibility has to be 0.00 prior to making any sample measurements.

5.6.3 Outcrop samples can be run without preparation. The unit's active face needs to be placed on a flat rock surface. Surface characteristics need to be recorded in the field notebook. If comparative data is needed with the cuttings samples, then field or core samples should be run with 5.6.1 and 5.6.2.

5.7 Standardization Test

A standard powder packed container of the same size (diameter and height) will be made from pure talc and 10 % magnetite. This column will be impregnated with plastic to insure long term value. The surface will be smooth and the sample will be marked "Standard-1". Additional standards may be used and indicated on the *Geophysics Analysis* form. Their manufacture needs to be recorded in the laboratory notebook. Standard measurements need to be taken and recorded in the lab notebook prior to each and every pulverized rock measurement. Other standards may contain 1%, 5%, 25% magnetite, or be composed of different components. Magnetite is a good standard since 1% magnetite = $3 \times 10^{-\text{cgs}}$.

5.8 Sample Splits

Samples from cuttings used in this procedure should be considered splits. These samples can then be used for bulk chemical analysis and/or X-ray diffraction analysis, or other analyses as required. The number of split samples taken from a five-foot cuttings bag shall be based upon the condition of the samples in the bag with respect to rock color, texture or other variability.

6.0 REFERENCES

NWRPO Quality Assurance Program Plan

7.0 RECORDS

Notebook for magnetic susceptibility data collection.
Master logbook notation of split sample.
Geophysics Analysis form

8.0 ATTACHMENTS

A: Geophysics Analysis form

GEOPHYSICS ANALYSIS FORM

Name: _____ **Date:** _____

Organization: _____

Sample Number: _____ **Split:** _____

Field Sample

Location: _____

I TYPE OF ANALYSIS: _____

II EQUIPMENT USED: _____

Model Numbers: _____

III PURPOSE AND REMARKS: _____

IV CALIBRATION DATA:

V ROCK TYPE(s): _____

VI CUTTINGS SAMPLE FROM HOLE NUMBER: _____

VII LABORATORY CONDITIONS:

QA Data Level _____ **Operator** _____

Signature

Date