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NRC DOCKET CONTROL CENTER
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October 23, 1986

Mr. Banad Jagannath, Project Manager
Engineering Branch
Division of Waste Management
Nuclear Regulatory Commission
1920 Norfolk Avenue
Bethesda, MD 20814

Dear Mr. Jagannath:

Enclosed are comments on our review of the document, "Geoengineering, Chapter 2 of the Site Characterization Plan for the NNWSI Project".

If we can provide further assistance for this review, please phone Kanaan Hanna at FTS 776-0724, or Dave Conover at 776-0755.

Sincerely,

R. L. Mundell

R. L. Mundell
Supervisory Mining Engineer

Attachment

cc: D. Forshey, Washington office
A. Bacho, Washington
E. Amey, Washington
K. Hanna, Denver
W. Lutzens, Denver

WM-RES
WM Record File B6934 BOM
WM Project 10, 11, 16
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Distribution:
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NNWSI-GEOENGINEERING

Document: Geoengineering, Chapter 2 of the Site Characterization Plan for the NNWSI Project.

Reviewers: K. Hanna, D. Conover, and W. Lutzens

Date Review Completed: October 22, 1986

COMMENTS

Pg. 2-40, Section 2.1.2.3.1.2, Predictive equations for cohesion and friction angle

The equations given on page 2-40 relating cohesion and angle of internal friction to porosity are inconsistent with the values tabulated in Table 2-5, p. 2-41. The attached plots of cohesion vs. friction angle and friction angle vs. porosity show no readily discernible correlation to the given equations. Since it is proposed to use the equations to estimate cohesion and friction angle values for tuff units having no measured mechanical data (paragraph 2, p. 2-40), a justification of the validity of the equations should be provided before accepting them as valid prediction tools.

Pg. 2-103 to 2-113, Section 2.6, In situ Stresses

Most of the discussion of in situ streses applies to the minimum horizontal stress, presumably because only hydraulic fracturing tests have been performed at the site. The magnitude of the major horizontal stress was estimated from hydraulic fracturing data to be about 0.6 times the vertical stress (Table 2-15, p. 2-111). Studies conducted in Rainier Mesa using the Bureau of Mines overcoring technique have shown the magnitude of the horizontal stresses to be greater than the vertical stresses (Ref. 1). Therefore, the effect of the major horizontal stress on shaft and drift stability should be more thoroughly investigated.

Anisotropy restrictions

In the second paragraph, p. 2-105, the report states that both techniques (overcoring and hydraulic fracturing) assume an isotropic and elastic material. However, determination of in situ stress from overcoring measurements is not restricted to isotropic materials and equations have been developed to include anisotropic conditions. (Ref. 2, 3)

Pg. 2-132, Section 2.8.2.3, Thermal effects on ground supports

The support requirements based on rock mass classifications and G-tunnel mining experience do not consider any effects from high temperatures in the repository environment. High temperatures may cause bolt anchor failure and degradation of shotcrete linings and may render these supports ineffective. Evaluation of support performance under high temperaatures should be performed.

Additional Comments

Pg. 2-20, para. 2 - Care should be taken to ensure that outcrop samples are representative of the repository host rock.

Pg. 2-22, Fig. 2-5 - Geoengineering properties of the Topopah Spring member should be well defined over the interval of 30 ft above and below the repository horizon.

P. 2-27, para. 3 - Modulus of rupture tests should be considered in addition to the Brazilian tests.

Characterization of southern area - In situ strength and elastic properties may be different in the southern region of the repository due to greater faulting and fracturing. Since this region is only marginally explored, there is high uncertainty regarding the rock quality in the area. Significantly greater ground control problems will likely be encountered in this area compared to the limited area intercepted by the exploratory shaft. The site characterization plan should include provisions for further examination of the southern area.

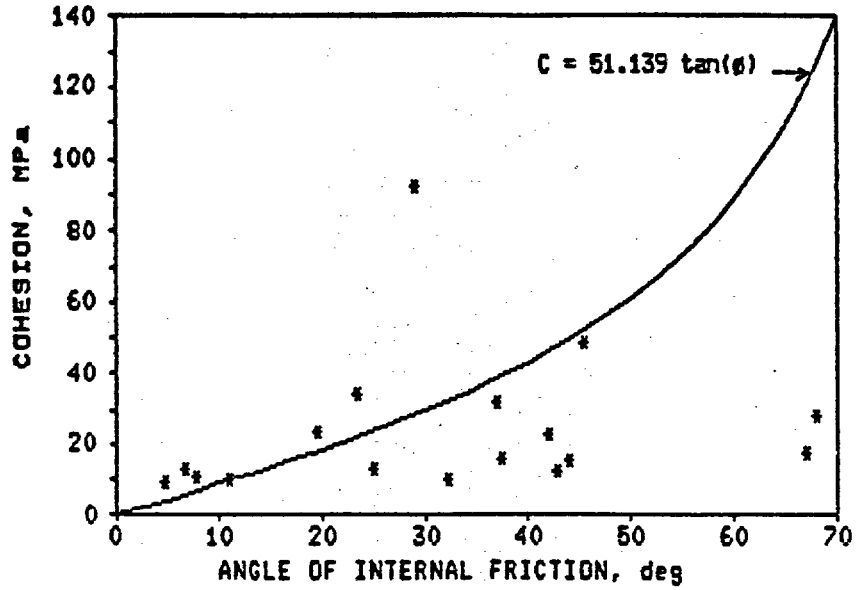
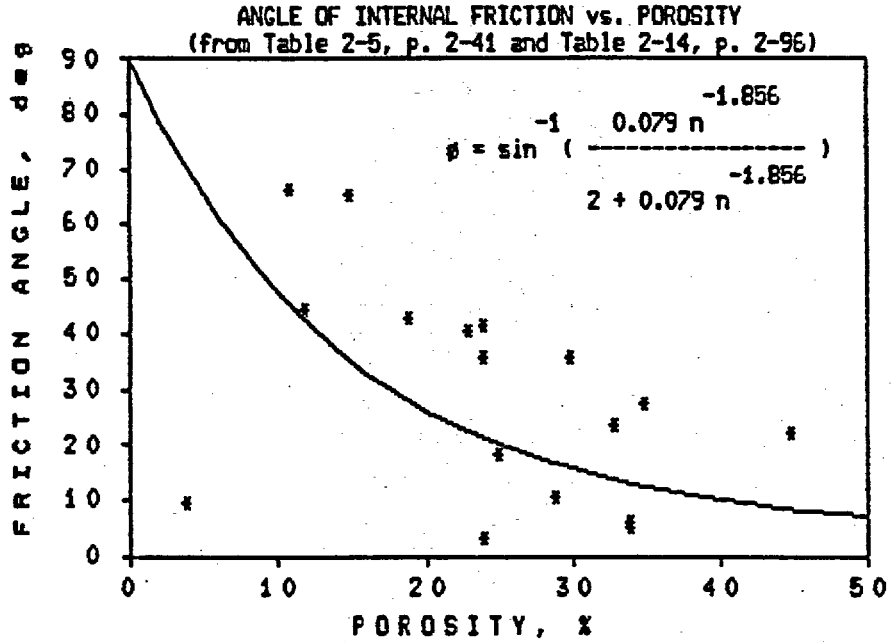
References

1. Hooker, V. E., J. R. Aggson, and D. L. Bickel, "Report of In Situ Determination of Stresses, Rainier Mesa, Nevada Test Site", U.S. Bureau of Mines Report, Denver Mining Research Center, Denver, CO, 1971.

2. Becker, M. R., 1968, "An Anisotropic Elastic Solution for Testing Stress Relief Cores", U.S. Bureau of Mines Report of Investigation 7143.

3. Becker, M. R., and V. E. Hooker, 1969, "A Method of Determining In-Situ Stress in Anisotropic Rock", Trans. Society of Mining Engineers, AIME, December, pp. 436-445.

COHESION vs. ANGLE OF INTERNAL FRICTION
(from Table 2-5, p. 2-41)



ANGLE OF INTERNAL FRICTION vs. POROSITY
(from Table 2-5, p. 2-41 and Table 2-14, p. 2-96)