United States Department of the Interior

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May 7, 1986

Banad Jagannath, Project Manager
Engineering Branch
Division of Waste Management, NMSS
Nuclear Regulatory Commission
1920 Norfolk Avenue
Bethesda, Maryland 20814

Dear Mr. Jagannath:

Enclosed are review comments on the report "Spent Fuel Test-Climax Mineby Revisited".

If you have any questions regarding the comments, or if we can provide any additional information, please phone me at FTS 776-0741.

Sincerely,

Frederick K. Allgaier

for R. L. Mundell
Supervisory Mining Engineer

Enclosure

cc: D. R. Forshey, WO
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Spent Fuel Test-Climax Mineby Revisited

Comments by: M. DeMarco, D. Conover, K. Hanna, and F. Allgaier

Comments are provided under two general areas: 1) the report presenting the results and analysis and 2) the field instrumentation and monitoring program.

Report/Results Presentation

The apparent objective of this paper is to alert future investigators of potential problems with acquiring in situ test data from areas utilizing blasting techniques for room development. The hypothesis presented regarding the effects blasting had on pillar narrowing is rooted in fact, but is not proven by the data. The angled borehole extensometers do not collaborate the phenomenon seen in the horizontal installations (as stated in the conclusions). Available stress data was not presented, and therefore, could not support the instantaneous stress states during blasting to substantiate the hypothesis. In situ moduli and stress measurements are inadequately described; therefore, method, location, and levels of uncertainty are indiscernible.

The analysis discounts the effects of top heading and bench blasting on the horizontal extensometers. However, based on the geometry of the blastholes, extensometers (fig. 4) and openings described in the report, it appears that the displacements at the horizontal anchors caused by blasting are significant and should not be disregarded.

The report discusses the effect of the initial openings created by the short-delayed blastholes on reducing the deformations at the inclined extensometer anchors. This effect should also be present for the benching stage.

The report did not fully discuss the stress gauge monitoring results. It was stated that localized stress decreases were measured and explained by the JPLAXD model. However, the actual magnitude and distribution of measured and calculated stress changes were not described and the "localized" area was not defined. If creation of the opening provided stress relief in the pillars, then elastic behavior could partially explain the pillar narrowing.

Instrumentation and Monitoring Program

The weakness in this program lies in two areas: 1) inadequate instrumentation planning and 2) insufficient on-site monitoring. At the time the top heading was being created, mineby of the first extensomenter installation surely showed the pillar narrowing phenomenon. This should have indicated to the investigator that supplementary measurements (closure, stress, borehole deformation, etc.) would be required to confirm this phenomenon during top heading mineby of the second extensomenter installation. This would not have been necessary had an adequate instrumentation plan been implemented. Preliminary modeling efforts should have identified more potential measurement areas than the few shown in fig. 1. Closure

measurements are very inexpensive and would have readily verified this phenomenon. Similarly, the Asse Mine experiments are not considered to contain a high level of certainty, simply due to poor instrumentation planning and implementation.

The modeling results showing permanent deformation occurring around a blasthole may provide a partial explanation of the apparent pillar narrowing measured by the extensometers. However, the actual mechanism of deformation is uncertain. To obtain the observed pillar deformations the rock must either be compressed (closure of fractures) or redistributed (flow into openings). Because the measuring rate was infrequent during development (one reading in four days), it is difficult to determine whether the deformation was related to blasting (immediate) or to some other action (occurring over several days). If the extensometer data were obtained immediately before and after each mining sequence, a more definitive conclusion regarding the timing of pillar deformation as a function of individual mining sequences could have been made.