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# STATE OF COLORADO

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Re: Draft Technical Position on Design of Erosion Protection  
Covers

The State of Colorado Radiation Control Division appreciates the opportunity to comment on the draft Staff Technical Position, "Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites". Overall, the draft Staff Technical Position provides ample information, background and guidance about the design of erosion protection covers. However, there are some areas that need to be clarified or expanded since this position paper will ultimately be used to test all designs.

First, this position paper should be expanded to deal with infiltration and seismic stability which are the other two significant processes of concern with regard to covers. A balanced approach to cover design needs to include these items since these factors often work against one another. The inclusion of riprap on cover topslopes will actually increase infiltration in many instances while decreasing erosion. A technical position needs to be established that guides the balance of infiltration versus erosion protection. Section 2.2 on Design Considerations did not discuss the potential problems of seismic or gravitational stability. Layered covers are more prone to failure since potential failure surfaces are created by these layers. These layers may result in surface movement failures over the longterm due to creep or landsliding and may decrease seismic stability.

Sections 2.2.4 on vegetative covers does not address the problem of root penetration or provide any guidance on design measures to alleviate the problem. This issue should be addressed and the section expanded for the sake of completeness. The State of Colorado disagrees with the statements made in Section 2.2.4 regarding the use of vegetative covers. On slopes of 5% or less it appears that vegetative covers are equally as effective as riprap in reducing both erosion and infiltration. One way to improve the effectiveness of vegetation is to use a rock mulch together with vegetation on the cover topslopes. The goal is to produce a "desert pavement" that will increase the area of cover protected. This type of landform is observed in many arid and semi-arid areas yet has not been evaluated for use in design of cover topslopes.

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Division staff do agree with NRC regarding the placement of rock cover material on tailings pile sideslopes and in runoff control channels.

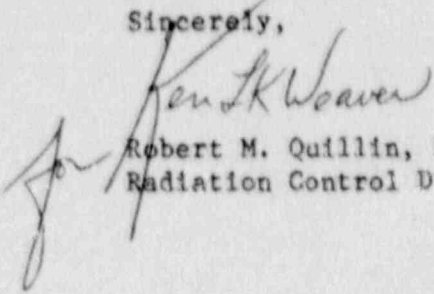
Rock durability is an area where some expansion of the NRC staff position is needed. The primary objective of a rock cover is to provide longterm erosion protection. In order to do so, the material should not break down in the longterm. The first thing to look for in the field is a formation that is stable in the existing environment. The methodology presented in the position paper is applicable primarily to metamorphic rocks. In arid and semi-arid areas there are additional methods available. Ridge forming formations that exhibit sound blocks of material through mass wasting processes are indicative of good quality rock material. Formations that exhibit high degrees of weathering and a general lack of "float" material should not be considered for rock cover material. This type of in-the-field geologic evaluation is perhaps the best starting point for sandstones or limestones that may be used in arid or semi-arid regions. Field examination should also include observations of jointing and fractures as well as secondary mineralization. The secondary minerals zones may be the first areas to breakdown and cause problems with durability. A petrographic analysis should then be conducted. It is important that not only a rating be given to the sample but also to obtain a listing of minerals that are the problem. At that point, durability tests may be performed to confirm that the engineering guidelines can be met. It would be desirable to develop a list of minerals that have been shown to cause problems with rock durability and include it in Section 2.2.6.

The other comment with regard to rock covers is that a distinction should be drawn between the rock cover on side and top slopes and riprap that is placed in channels and other areas of concentrated flow. The design criteria presented in the position paper are fine for areas of concentrated flow and follow standard engineering practice. However, the design criteria for sideslopes and topslopes should be re-examined. In many instances a large portion of these covers may not be subjected to submerged flow. The gradation specifications for riprap are relatively narrow since the materials are designed to be subjected to continuous flow conditions and submerged flow. These conditions may not exist on large portions of the top slope and sideslope covers. The narrow gradation limits together with large D<sub>50</sub> sizes to endure a PMF event lead to the need for filter layers if the technical guidance is followed. This leads to the placement of another layer on slopes where mass wasting could occur.

One method to avoid this problem would be to expand the rock cover gradation to include finer material sizes. There are methods for placement of this material by blading that will allow the finer material to migrate toward the bottom and the coarser materials to stay near the top. Instead of handling and placing two separate layers of material, one layer would be placed with a large gradation. From a geomorphic standpoint, a layer that contains various sizes of material is more stable than a layer made up of a single material size. These types of proven field techniques and observations should be evaluated and included in the guidance being provided. Overall, these types of changes to the design criteria would lead to easier constructability, more reliability, and therefore more effective covers.

If you have any questions about the State's comments do not hesitate to contact Mr. Donald Simpson of the Division at (303) 331-8480.

Sincerely,



*Ken K Weaver*

Robert M. Quillin, Director  
Radiation Control Division

RMQ/DHS/msta