U.S. Department of Energy
Grand Junction Office
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Grand Junction, CO 81503

FEB 23 2000

Mr. Thomas Essig, Chief
Uranium Recovery Branch
U.S. Nuclear Regulatory Commission
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
Mail Stop T7J8
Washington, D.C. 20555

Dear Mr. Essig:

The purpose of this letter is to request NRC concurrence on a revision to an attachment to the document entitled *Long-Term Surveillance Plan for the UMTRA Disposal Site, Lakeview, Oregon, August 1994.*

In March 1998, DOE submitted *Attachment 8, Procedure for Gradation Testing of Riprap,* to NRC as a page change revision to the Long-Term Surveillance Plan (LTSP).

The DOE implemented the testing procedure in 1998 and 1999 during annual inspections of the Lakeview site. DOE's experience with the procedure on those two occasions is the basis for further revision of the procedure enclosed with this letter.

The original procedure called for a stack of three sieves, each with progressively smaller openings. The revised procedure adds a fourth sieve to the stack. The DOE believes the fourth sieve provides a better measure of the true size distribution of the riprap on the disposal cell.

The DOE has discussed the proposed change with your staff and believes the additional sieve to be an improvement rather than a significant departure from the original procedure.

Changes from the original procedure are underlined and marked with sidebars in the revision.

We would like to implement the revised testing procedure during the next annual site inspection scheduled for May 2000.

Please call me at 970/248-6037 if you have questions or comments on the revised procedure.

Sincerely,

Russel Edge

Russel Edge
LTSM Program Manager

Enclosure

RECORD

Procedure for Gradation Testing of Riprap

Implementation

DOE will implement the following procedure for gradation testing of riprap in 1998. The procedure will be repeated annually, usually in conjunction with DOE's annual inspection of the site. Results of the gradation testing will be included in DOE's annual site inspection report.

Rationale

DOE is concerned for the long-term survival of the riprap. When the disposal cell was built, stones placed on the armored surface of the disposal cell were of sufficient size to survive the design Probable Maximum Flood (PMF). Since placement, some stones in the riprap have shown a tendency to break into smaller pieces after several years of subareal weathering. If a sufficient number of these stones weather into smaller pieces, the riprap may eventually no longer meet the design specification. Annual gradation testing will permit DOE to gauge the rate of weathering and to demonstrate that the size of the rock remains sufficient to meet the design specification.

Equipment

- 8-inch diameter sieve stack, including: 4-inch opening, 3-inch opening, 2 ½-inch, and 1 ½-inch opening.
- 2-foot by 2-foot wire mesh with 25 equally spaced intersections at 4-inch centers.
- white paint with ¼-inch wide brush.

Procedure

1) Determine 10 random locations distributed systematically across the west face. All distances are measured in feet from the top of the side slope on the south end of the disposal cell.
   - determine 10 pairs of random numbers between 0.0 and 1.0.
   - the first number of the pair is the longitudinal number (x), the second is the transverse number (y); enter numbers into the following table and perform the computations indicated. For example; to determine the location of sample number (3), multiply the first random number, (x), by 100 and add 200 to the product, then multiply the second random number, (y), by 270. Enter these results in the table columns on the far right.

2) Locate each sample location on the side slope with a wire flag.

3) Place the wire mesh at the sample location. Orient the mesh perpendicular to the slope with the southwest corner adjacent to the wire flag.

4) Paint a white dot on each stone lying directly beneath a wire intersection.

Table 1. Sample Locations for Stone Dimension Determination

Sample Number	Random Numbers Pairs (x,y)		Multiplier		Sample Locations	
	Longitudinal (x)	Transverse (y)	Longitudinal (ft)	Transverse (ft)	Longitudinal Distance From South End (ft)	Transverse Distance from Top Slope (ft)
1			100x	270y		
2			100x + 100	270y		
3			100x +. 200	270y		
4			100x + 300	270y		
5			100x + 400	270y		
6			100x + 500	270y		
7			100x + 600	270y		
8			100x + 700	255y		
9			100x + 800	215y		
10			100x + 900	130y		

5) Remove the mesh, and pass each marked stone through the sieve stack until the stone is retained on a sieve.

6) Record the number of stones retained on each sieve on a copy of the attached form, verify that the total number of stones equals 25.

7) Replace sampled stones within the 2-foot by 2-foot sample location.

Data reduction procedure

At each sample location determine the stone size corresponding to the sample point D_{50} according to the following procedure:

1) Determine the percent retained on each of the four sieves by using equation (1):

$$R_i = \frac{N_i}{A} \times 100 \quad (1)$$

where: R_i = percent retained on sieve i,
N_i = number of stones retained on sieve i,
A = total number of stones sampled (25),
i = sieve size, i.e. 4-inch, 3-inch, 2 ½-inch, and 1 ½-inch.

For example, when 5 stones are retained in the 4-inch sieve;

$$R_{4\text{-inch}} = \frac{5}{25} \times 100 = 20\%$$

2) Determine the percent passing each sieve size by subtracting the sum of percentages retained from 100 as shown in equation (2):

$$P_i = (100 - \Sigma R_i) \quad (2)$$

where: P_i = percent passing sieve i,
Ri = previously defined.

For example:

when $R_{4\text{-inch}} = 30\%$ and $R_{2\ 1/2\ inch} = 35\%$;

$$P_{2\,1/2\text{-inch}} = 100 - (30 + 35) = 35\%$$

3) Determine D_{50} as the size where 50 percent of the stones are smaller. Compute D_{50} by linear interpolation (proportioning). The following equation illustrates this process:

$$D_{50} = S_{i+} - \frac{(P_{i+} - 50 \times (S_{i+} - S_{i-})}{(P_{i+} - P_{i-})} \quad (3)$$

where: D_{50} (inch) = size for which 50 percent of the stones are smaller,
S_{i+} (inch) = sieve size that more than 50 percent passes,
S_{i-} (inch) = sieve size that less than 50 percent passes,
P_{i+} = percentage passing greater than 50,
P_{i-} = percentage passing less than 50.

For example:

when $P_{4\text{-}inch} = 70\%$, $P_{2\ 1/2\text{-}inch} = 35\%$, $S_{i+} = 4$-inch, and $S_{i-} = 2\ ½$-inch;

$$D_{50}(inch) = 4\ inch - \frac{(70 - 50) \times (4\ inch - 2\ 1/2\ inch)}{(70 - 35)} = 3.1\ inch$$

4) Determine and report the mean ($\bar{x}$) of the in situ slope D_{50} by using data collected from all ten sample locations by using equation (4):

$$\bar{x} = \frac{\sum_{j=1}^{10} x_j}{10} \quad (4)$$

where: $\bar{x}$ = mean in situ slope D_{50}
x = computed sample location D_{50},
j = sample location counter from 1 to 10.

Lakeview, Oregon
Type-B Riprap Gradation Monitoring

Sample Location Number	Number of Stones Retained				
	4-inch	3-inch	2 ½-inch	1 ½-inch	Total
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

ATTACHMENT 8
PROCEDURE FOR GRADATION TESTING OF RIPRAP
Revised February 2000

cc w/enclosure:
Project Record File LLKV 01.01 (Helen Salter)

cc w/o enclosure:
C. Jacobson, MACTEC-ERS
C. Jones, MACTEC-ERS

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