



MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY

UMTRA Project
Ambrosia Lake, New Mexico

**REMEDIAL ACTION
INSPECTION PLAN**

REVIEW COPY

9406270308 940617
PDR WASTE
WM-67 PDR



MK-FERGUSON COMPANY

A MORRISON KNUDSEN COMPANY

Document Number: MK-F-UMTRA-28

Revision Number: 3 Review B

AMBROSIA LAKE, NEW MEXICO
INDEX

RAIP-1

Testing and Inspection

Rev. 3 Review B



STATEMENT OF POLICY

This Remedial Action Inspection Plan identifies the means by which the remedial action activities at Ambrosia Lake, New Mexico are controlled, verified, and documented. This plan was developed in adherence to the scope of the MK-Ferguson Quality Assurance Program Plan and complies with the applicable parts of ASME NQA-1-1989 and DOE order 5700.6C.

The procedures defining Organization, Qualification and Certification of Inspection and Test Personnel, Quality Assurance Records Control, Control of Measuring and Test Equipment, Nonconformance and Corrective Action shall be in accordance with the applicable sections of the Quality Assurance Program Plan as follows: Organization - QAPP-1, Qualification and Certification of Inspection and Test Personnel, Lead Auditors, and Auditors - QAPP-2, and Nonconformance and Corrective Action - Project Procedures Manual, Section 12; Quality Assurance Records Control - QAPP-4, Control of Measuring and Test Equipment - QAPP-5.

This Remedial Action Inspection Plan and the Quality Assurance Program Plan describe the means by which the MK-Ferguson Company ensures that the Environmental Protection Agency's requirements and Nuclear Regulatory Commission's guidelines for Testing and Inspection Plans During Construction of DOE's Remedial Action at Inactive Uranium Mill Tailings Sites are satisfied.

It is the intent that this plan be applied to all permanent installations and work. Temporary facilities, installations, and work are to be tested and inspected as required by the Design Specifications. Where testing and inspection are not specified in the Design Specifications for temporary work, (e.g., access roads, temporary ditches, etc.) the work is to be tested and inspected to the degree necessary to ensure its integrity for the anticipated period of usage.



MK-FERGUSON COMPANY
A MORRISON KNUDSEN COMPANY
REMEDIAL ACTION INSPECTION PLAN
UMTRA Project
Prime Contract No. DE-AC04-83AL18796

RAIP NO. 1 Site: AMB	REV. NO. 3 REVIEW B
DATE April 19, 1994	
DESIGNATED CONTACT Steven D. Martz	

PROCEDURE TITLE:

TESTING AND INSPECTION

1.0 PURPOSE

1.1 To describe the methods by which the construction activities will be tested and inspected to verify compliance with the Design Specification requirements.

2.0 SCOPE

2.1 This procedure defines the testing and inspection of remedial action construction activities at Ambrosia Lake, New Mexico. Types of tests, test frequencies and acceptability, documentation, and reporting requirements are contained in this document. Procedures for performing the individual tests shall be in accordance with the applicable ASTM Standards, the referenced methods, and the Design Specifications.

3.0 DEFINITIONS

None

4.0 ATTACHMENTS

None

5.0 REFERENCES

- 5.1 Nuclear Regulatory Commission (NRC) Staff Technical Position on Testing and Inspection Plans During Construction of DOE's Remedial Action at Inactive Mill Tailings Sites, Revision 2 dated January, 1989.
- 5.2 ASME NQA-1-1989
- 5.3 Contract DE-AC04-83AL18796
- 5.4 ASTM Standards
- 5.5 AASHTO Standards
- 5.6 MK-F/CWMFES Health Physics Monitoring Plans and Procedures
- 5.7 DOE 5700.6C
- 5.8 DOE AL 5700.6B
- 5.9 UMTRA Quality Assurance Plan



- 5.10 MK-Ferguson Quality Assurance Program Plan
- 5.11 MK-F QA/QC Work Procedures
- 5.12 Ambrosia Lake, New Mexico Design Specifications and Drawings

6.0 PROCEDURES

6.1 Field Density Control

6.1.1 Soil density and moisture testing shall be performed in accordance with ASTM D-698, ASTM D-1556, ASTM-1557, ASTM D-2167, ASTM D-4643, ASTM D-2216, ASTM D-2922, or ASTM D-3017, as applicable.

6.1.2 When the microwave oven or nuclear density gauge is used in the determination of moisture content, a correlation sample will be oven dried a minimum of once every tenth moisture test performed. Moisture correlation test results shall be within plus or minus one percent. If the difference in results is greater than plus or minus one percent, all test results obtained since the previous correlation test shall be re-evaluated. Test results which may be indicated as failures as the result of re-evaluation, shall be retested in the area represented by the failing test result. Oven dry moisture content test results will be used to determine the acceptability of the moisture test where moisture correlation test results are greater than plus or minus one percent.

6.1.2.1 When determining the moisture content of soil by the microwave oven method, an initial control on the microwave oven method shall be performed and evaluated, as prescribed below, prior to using microwave oven test results for acceptance.

- a. A minimum of ten consecutive moisture correlation tests between the conventional oven dry and microwave oven dry methods shall be performed for each type of soil (e.g., common/general fill, buttress, tailings, radon barrier).
- b. A minimum of ten consecutive moisture correlation results shall each be within plus or minus one percent for each test, for each soil type.
- c. Once the ten consecutive moisture correlation results are evaluated and found to be within plus or



minus one percent, moisture correlations shall be performed in accordance with Section 6.1.2 above.

- d. When two consecutive moisture correlation test results performed in accordance with Section 6.1.2 above exceed plus or minus one percent for a specific soil type, the procedure prescribed in Section 6.1.2.1 shall again be performed.

- 6.1.3 When the nuclear density gauge is used for in-place density determinations, a correlation sand-cone density test shall be performed a minimum of once for each ten nuclear density tests performed. Nuclear gauge and sand-cone density test correlation results shall be within plus or minus two percent. If there is a difference in correlation results greater than plus or minus two percent, the sand-cone test results will be used to determine the acceptability of the density test. All test results recorded from the nuclear density gauge results since the last acceptable correlation results shall be re-evaluated. Test results which may be indicated as failures as the result of re-evaluation, shall be retested in the area represented by the indicated failing test result.

The nuclear density gauge shall be used in materials with a nominal maximum particle size of 3/4-inch or less. The nuclear density gauge shall not be used in radioactively contaminated materials, or in areas where the gauge may be affected by background radiation or the chemical composition of the soil (e.g., the first lift of radon barrier material).

- 6.1.4 In-place field density and moisture tests for compacted materials, where density requirements are specified by the site Subcontract Documents, shall be tested at the following minimum frequency:
 - a. One test per 1,000 cubic yards of contaminated materials.
 - b. One test per 1,000 cubic yards of uncontaminated materials.
 - c. One test per 500 cubic yards of radon barrier materials.
 - d. At least two tests for each day of material placement in excess of 150 cubic yards for each type material.
 - e. There shall be a minimum of one field density test performed for each full shift of compaction operations. A test may be performed at any time by the inspector or as the Site Manager determines the need to verify the compaction effort.



- f. There shall be minimum of one in-place field density and moisture test per lift.

With the various design slopes associated with each cell embankment and with staggered lift placements, it is feasible to test each lift and, thereby, have certain horizontal elevations which are void of in-place field density and moisture tests. Even fill placements on relatively flat surfaces are constructed to slope in order to facilitate drainage of moisture.

- 6.1.5 Each layer of embankment and backfill shall be compacted to the minimum percentage of maximum dry density, as determined by ASTM D-698, in accordance with the percentages prescribed by the Design Specifications.

- 6.1.5.1 During compaction, the moisture content of fill material shall be maintained to achieve the minimum specified density and moisture shall be uniformly distributed throughout each lift.

- 6.1.5.2 Radon barrier material shall be moisture conditioned a minimum of two hours prior to compaction. Moisture shall be added as necessary to maintain a moisture content for two hours prior to compaction equal to or greater than optimum moisture content, as determined by ASTM D-698. Moisture shall not be mixed or otherwise worked into the first lift of radon barrier material after placement of the material over the contaminated materials.

- 6.1.5.3 During compaction of radon barrier material, the moisture content shall be maintained within minus one to plus three percent of the optimum moisture content, as determined by ASTM D-698.

- 6.1.5.4 Moisture shall only be added to contaminated materials for environmental dust control requirements or as required for compaction. Moisture required for dust control or compaction shall be added to contaminated fill materials at the place of excavation preceding placement of the materials in the tailings embankment.



The moisture content of contaminated materials will be tested, as determined necessary by the Site Manager, to confirm that moisture addition to contaminated materials by the Subcontractor does not result in materials with a moisture content greater than optimum moisture content according to ASTM D-698.

If moisture added by the Subcontractor causes materials to exceed optimum moisture content, as determined by the Site Manager, the Subcontractor shall revise his operations immediately to avoid adding excess moisture.

- 6.1.6 Maximum density determinations shall be performed prior to the start of embankment or backfill placement when possible. The inspector or technician shall be alert for changes in material such as color, size distribution, etc. When different material types are encountered, a complete maximum density determination test shall be performed. There shall be a minimum of one maximum density determination test for each 10 to 15 field density tests performed for each type material, depending on the variability of materials. Maximum density determinations shall be accomplished in accordance with ASTM D-698.
- 6.1.7 In order to assure that the correct maximum dry density is being used to determine the relative compaction, a one-point proctor test shall be performed. The material shall be as close to optimum moisture as possible and shall be compacted in accordance with the requirements of ASTM D-698, as applicable. There shall be a minimum of one one-point check for each five field density tests performed, for each type material.
- 6.1.8 When the level of work activity is such that sand-cone density tests are being performed throughout the day, the sand used for determining the volume of the test hole shall be calibrated twice a day and for each new bag of sand. The calibration data shall be documented on the density test record. In addition, sand-cone density sand shall be checked tested for Coefficient of Uniformity, per each new shipment of density sand received in accordance with ASTM D-1556.
- 6.1.9 All density test results shall be recorded and logged on the applicable forms, along with the test location and elevation.



6.2 Gradation Testing

6.2.1 Gradation testing of select bedding, riprap, and radon barrier materials shall be performed in accordance with the applicable ASTM standards (e.g., D-1140, C-136, D-422) or other referenced testing methods. Test results shall be in accordance with the Design Specifications.

6.2.2 Gradation testing of radon barrier material shall be performed a minimum of once for each 1,000 cubic yards of material placed. Additionally, material shall be tested for gradation a minimum of once per day during placement in excess of 150 cubic yards.

Radon barrier material shall be graded with a maximum particle size of 2-inches, with a minimum of 40 percent passing the No. 200 sieve. A maximum of one gradation test in each consecutive five tests may have a minimum of 25 percent passing the No. 200 sieve.

6.2.3 General fill materials shall be visually inspected to ensure that the maximum particle size is not greater than the compacted lift thickness, except as noted in the Design Specifications. A gradation test may be performed at any time the inspector or Site Manager determines the need to physically verify gradation of the material.

6.3 Classification Testing

6.3.1 Classification tests for radon barrier materials shall be performed in accordance with ASTM D-2487 and ASTM D-4318, as applicable. Classification test results shall satisfy the requirements of the site Subcontract Documents and shall be tested at the following minimum frequency:

- a. One test per 1,000 cubic yards of radon barrier materials placed.
- b. One test per day that an appreciable amount of radon barrier material is placed (in excess of 150 cubic yards).

6.4 Erosion Protection Materials Testing

6.4.1 Select bedding material and each type of riprap material shall be tested by a commercial testing laboratory during production in accordance with the following:



Riprap Types A, B, C, and Select Bedding

~~1. La Cuchilla Ridge Source~~

~~Specific Gravity (SSD) ——— ASTM C-127~~

~~Soundness (5 cycles) ——— ASTM C-88~~

Subcontractor-Proposed Sources and La Cuchilla Ridge Source

Specific Gravity (SSD) ASTM C-127

Soundness (5 cycles) ASTM C-88

Absorption ASTM C-127

Abrasion (100 revolutions) ASTM C-131

Schmidt Hammer ISRM Method

Splitting Tensile Strength ISRM Method
(Modified-loading rate shall cause failure in 1 to 3 minutes)

Petrographic Examination ASTM C-295

6.4.2 Select bedding material and each type of riprap shall be tested for gradation in accordance with the applicable ASTMs (D-422, D-1140, C-117 and C-136), and other referenced testing methods. Test results shall be in accordance with the Design Specification requirements.

6.4.3 ~~For the La Cuchilla Source the s~~ Select bedding material and each type of riprap shall be tested, as delineated in Sections 6.4.1, Part 1 and 6.4.2 above, a minimum of four times. The materials shall be tested initially prior to the delivery of any of the materials to the site. Thereafter, the tests shall be performed at a minimum frequency of one test for each 10,000 cubic yards or fraction thereof produced/placed (durability tests for materials produced/gradation tests for materials placed). For materials where the total volume is less than 30,000 cubic yards, the test frequency shall be one test for each type material when approximately one-third and two thirds of the total volume of material has been produced/placed. A final set of durability tests shall be performed near completion of production for each type material. A final gradation test shall be performed near completion of placement for each type material.



An additional petrographic examination shall be performed in the event that unforeseen material types are encountered during production operations.

~~6.4.4 For subcontractor proposed sources, select bedding material, riprap type A, and riprap type B shall not be tested for schmidt hammer, splitting tensile strength, or and petrographic examination during production, and in lieu thereof for scoring, the initial test results obtained during investigating production/placement shall be used. An additional petrographic examination shall be performed in the event that unforeseen material types are encountered during production operations. Select bedding material and each type riprap shall be tested as delineated in Section 6.4.1 Part 2 and Section 6.4.2 at the frequency prescribed in Section 6.4.3., except as noted above.~~

6.5 Inspections

Daily visual inspections shall be performed to verify that quality related activities are performed in accordance with the requirements of the MK-F site Subcontract Documents, Remedial Action Inspection Plan, Quality Assurance Program Plan, and as required by the references in Section 5.0 of this procedure. Daily visual inspections shall be performed by qualified inspection personnel. Inspections shall be performed during execution of the various work activities to verify compliance with the documents listed above, and as follows:

6.5.1 Excavation

Inspection shall be performed to verify that the correct line and grades are reached, as required. Where contaminated material is excavated, the inspector shall verify with the Health Physics Supervisor/Designee that contaminated material has been removed prior to backfill or placement of uncontaminated material, as required.

6.5.2 Foundation and Subgrade

Prior to placing the first layer of material on the foundation, a final inspection of the subgrade shall be made to assure that it has no sign of deterioration due to frost action, erosion due to rainwater, rutting, areas of subsidence, or drying out of the surface. The inspection shall verify that the foundation surface has been moistened, with no standing water on the surface. In addition, the inspection shall also verify that the foundation surface of cohesive soils has been scarified or penetrated to ensure proper bonding of overlying material.



Any unacceptable surface material shall be either removed and recompactd in accordance with the site Subcontract Documents.

Prior to placement of materials, the top six inches of the subgrade surface shall be compacted to the minimum percent of maximum dry density and moisture conditioned, as required by the site Subcontract Documents.

6.5.3 Embankment Fill and Backfill

Inspections shall verify that proper materials are placed as delineated in the site Subcontract Documents, and as verified by the Health Physics Manager/Designee. The loose lift thickness of material shall be verified frequently to ensure compliance with the site Subcontract Documents. The inspections shall verify that applicable moisture requirements are maintained and that moisture is uniform throughout each lift.

Visual inspection shall verify that placement of organics in the encapsulation cell is uniform and evenly distributed. In addition, inspections shall verify the maximum size of in-place organic material does not exceed the specified requirements. Inspection shall verify that segregation of tailings slime pockets are avoided during tailings placement.

6.5.4 Radon Barrier

The placement of the radon barrier material shall receive frequent inspection to verify lift thickness, elevation, moisture content and the number of roller passes. The moisture content will be determined to ensure the specified moisture content is maintained during and after compaction effort.

The radon barrier moisture content of preceding lifts shall be maintained at not less than optimum, minus one percent with the exception of top two inches. The moisture content shall be maintained as specified until the next lift, including bedding material, is placed and compacted. The Contractor will verify the specification requirement, as necessary, by testing in-place moisture content of samples taken from two to four inches beneath the top surface of the compacted radon barrier lift.



6.5.5 Site Cell Radiological Characterization

The radiological characterization sampling and testing shall be performed, as delineated in Health Physics Procedure No. RAC-019. Monitoring activities performed by the site Quality Control shall be documented on MK-F Surveillance Checklist.

6.5.6 Erosion Protection

The excavation, production, stockpiling, transportation, placement, and compaction of erosion protection materials shall receive adequate inspection to verify: (1) proper techniques are employed to prevent degradation and/or segregation of the material due to improper handling, (2) distribution is uniform, (3) voids are kept as minimal as possible, and (4) proper gradation is maintained. Inspections shall also verify lift thickness and elevation. Inspection will be provided at the material source, as required by the site Subcontract Documents.

Riprap material shall be visually inspected to verify that the material is sound stone, resistant to abrasion, and free from cracks, seams, weathering rinds, and other defects as shown in the petrographic examination.

6.5.7 Surveillance

The MK-F Site Quality Control Department shall perform weekly surveillance of Health Physics (HP), Environment, Safety and Health (ESH), and Measure and Test Equipment (M&TE) used by site Quality Control. Surveillance shall verify compliance with applicable HP, ESH and QA/QC Work Procedures, as specified by the MK-F Quality Assurance Program Plan. Surveillances shall be conducted in accordance with the MK-F QAPP Section 10.0.

6.5.8 Receiving

6.5.8.1 Instrumentation which is received shall be inspected by the person responsible for using and maintaining the instrument. The instrument shall be inspected for damage, correct operations, and proper calibration records. The inclusion of the calibration records into the calibration system shall be evidence of satisfactory inspection results. Equipment which does not meet the applicable requirements shall be returned to the vendor.



6.5.8.2 Materials supplied for permanent installation or when the site Subcontract Documents require certification, the site Quality Control Department shall verify the minimum specified requirement.

6.5.9 Seasonal Shutdowns

During the periods when work activities are interrupted by seasonal shutdowns, exposed surfaces of the tailings material will be stabilized in a manner to prevent off-site spread of contamination. Prior to application of protective erosion control measures, exposed surfaces shall be sloped to drain and compacted with a smooth drum roller to eliminate ruts and ridges formed by construction equipment. Manufacturers recommendations for the methods of handling, mixing, application, and/or installation of erosion control materials shall be verified.

During this period, weekly surveillances shall be performed by the site Quality Control Department. Surveillances shall verify that the tailings surface is in accordance with the site Subcontract Documents.

Prior to commencing work following a seasonal shutdown, a radiological survey shall be performed on all areas which may have been subject to contamination as a result of the method of stabilization. In addition, compaction of previously accepted exposed permanent areas will be reverified by one in-place field density test for each 30,000 square feet. Density tests shall be performed in areas that are obviously, or appear to be questionable to the MK-F QC Inspector, (i.e., soft, excessive moisture) in maintaining the minimum specified density. Areas that fail to meet the minimum specified density requirements shall be reworked, and/or removed and replaced with acceptable fill compacted to meet specified density and moisture requirements.

7.0 RECORDS

7.1 Test and inspection records shall be reported and filed in a timely manner, consistent with the status of work performed. Inspection and test status shall be identified by charts, blueprints, as-builts, or periodic status reports. The inspection and test status shall be available at all times to prevent inadvertently by-passing an inspection, test, or hold point.

7.2 Test and inspection records shall contain as a minimum the following:



- 7.2.1 items tested or inspected;
 - 7.2.2 date of test or inspection;
 - 7.2.3 tester, inspector or data recorder,
 - 7.2.4 type of test or inspection;
 - 7.2.5 results and acceptability, including the test or inspection acceptance criteria;
 - 7.2.6 instrument number used in performing the test or inspection;
 - 7.2.7 action taken in connection with any deviations noted, and
 - 7.2.8 person evaluating test results, if different than person named in paragraph 7.2.3.
- 7.3 Daily Inspection Reports shall be generated describing the adequacy, discrepancies, progress, dispositions and details of each day's construction activities.
- 7.4 A Weekly Quality Control Report shall be generated summarizing volume of emplaced materials and number of field and laboratory tests performed for each type material. A copy of the Weekly QC Report shall be transmitted to the MK-F Project Quality Manager.
- 7.5 Permanent QA/QC Records shall be periodically evaluated through internal and external surveillances and audits.
- 7.6 Test and inspection records shall be filed and maintained in accordance with QAPP No. 4 and QA/QC Work Procedure No. 6.