MK-FERGUSON COMPANY
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UMTRA Project
Mexican Hat, Utah/
Monument Valley, Arizona

REMEDIAL ACTION INSPECTION PLAN

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MEXICAN HAT, UTAH/ MONUMENT VALLEY, ARIZONA INDEX

STATEMENT OF POLICY

This Remedial Action Inspection Plan identifies the means by which the remedial action activities at Mexican Hat, Utah/Monument Valley, Arizona are controlled, verified, and documented. This plan has been developed within the scope of the MK-Ferguson Quality Assurance Program Plan and complies with the applicable parts of 10 CFR 50 Appendix B and ASME NQA-1-1989.

The procedures defining Organization, Qualification and Certification of Inspection and Test Personnel, Quality Assurance Records Control, Control of Measuring and Test Equipment, and Nonconformance and Corrective Action is 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, Nonconformance and Corrective Action - QAPP-3, 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 will ensure that the Environmental Protection Agency's requirements and the applicable 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, or 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.

PROCEDURE TITLE:

TESTING AND INSPECTION

1.0 PURPOSE

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

This procedure defines the testing and inspection of remedial action construction activities at Mexican Hat, Utah/Monument Valley, Arizona. Type of tests, test frequencies and acceptability, documentation, and reporting requirements are contained in this procedure. Procedures for performing the individual tests shall be in accordance with the ASTM standards, MK-F QA/QC Work Procedures, the referenced or other approved methods, and the Design Specification.

3.0 DEFINITIONS

None.

4.0 ATTACHMENTS

None.

5.0 REFERENCES

5.1 10 CFR 50 APP. B, Criteria 5, 10, 11, 14

5.2 ASME NQA-1 1989

5.3 Contract DE-AC04-83AL18796

5.4 ASTM

5.5 AASHTO

5.6 ES&H Procedures/Plans

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 Mexican Hat/Monument Valley Design Specification

5.13 American Petroleum Institute

5.14 International Society for Rock Mechanics

5.15 Nuclear Regulatory Commission, Staff Technical Position (STP) on Testing and Inspection Plans during Construction of DOE's Remedial Action at Inactive Uranium Mill Tailings Sites

6.0 PROCEDURES

6.1 Field Density Control

6.1.1 Soil density and moisture testing shall be in accordance ASTM D-698, ASTM D-1556, 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 the 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, where possible. In any event, any test results outside of the Design Specification tolerances shall be retested. Oven-dry moisture content test results will be used as the record test results 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.

- 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, tailings, radon barrier materials).

- A minimum of ten consecutive moisture correlation results shall each be within plus or minus one percent for each soil type.

- 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.

- When two consecutive moisture correlation test results 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. If there is a difference in correlation results greater than plus or minus two percent, the sand-cone test results will be used as the record test results. All test results recorded from the nuclear density gauge results since the last acceptable correlation results shall be re-evaluated. Re-testing shall be performed when re-evaluation results yield failure. The nuclear density gauge shall be used in materials with a nominal maximum particle size of 3/4-inches or less. The nuclear density gauge shall not be used in radioactively contaminated materials, or in areas where the gauge is obviously affected by radioactively contaminated materials or the chemical composition of the soil (e.g., the first lift of radon barrier material).

6.1.4 Where there are density requirements in the Design Specifications, in-place field density and moisture tests for compacted materials shall be tested at the following minimum frequency:

a. One test per 1,000 cubic yards of contaminated materials placed.

b. One test per 1,000 cubic yards of uncontaminated materials placed.

c. One test per 500 cubic yards of radon barrier materials placed.

d. One test per 30,000 square feet shall be taken on the surface of previously placed materials after a seasonal shutdown or period of prolonged exposure.

e. At least two tests for each day of material placement in excess of 150 cubic yards for each type material.

f. A minimum of one in-place field density and moisture test performed for each full shift of compaction operations.

g. A minimum of one in-place field density and moisture test per lift.

h. The MK-F Inspector or Site Manager may request a test at any time to verify moisture content or compaction efforts. With 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 During compaction of radon barrier materials, the moisture content shall be maintained within zero to plus three percent of the optimum moisture content. Optimum moisture content shall be determined in accordance with ASTM D-698.

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.

Supplementary maximum density determination tests shall be performed at an approximate frequency of one test for every 10 or 15 in-place field density tests performed, depending on the variability of materials.

6.1.7 In order to verify 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. A minimum of one, one-point proctor check shall be performed for each five fieid density tests performed.

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. In addition, sand-cone density sand shall be periodically checked for conformance with the prescribed requirements of ASTM D-1556.

6.1.9 All test results shall be recorded and logged on the applicable forms.

6.2 Gradation Testing

6.2.1 Radon barrier materials shall be tested for gradation in accordance with ASTM C-136, ASTM C-1140, and ASTM D-422, as applicable. Gradation tests shall be performed prior to mixing with bentonite, and test results shall meet the requirements of the Site Subcontract Documents. For distribution of particle sizes smaller than the No. 200 sieve, the use of a hydrometer is not required.

6.2.1.1 There shall be a minimum of one gradation test performed for each 1,000 cubic yards of material placed/processing.

6.2.1.2 There shall be a minimum of one gradation test taken for each day of material placement/processing.

6.3 Erosion Protection Materials Testing

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

Riprap Type A and B, and Bedding Material	Reference
Specific Gravity (SSD)	ASTM C-127
Absorption	ASTM C-127
Sodium Sulfate Soundness (5 cycles)	ASTM C-88 (course aggregate)
L.A. Abrasion (100 cycles)	ASTM C-131

Riprap Type C and D	Reference
Schmidt Rebound Hardness	ISRM Method
Splitting Tensile Strength	ISRM Method

Test results shall be submitted to MK-Environmental Services for analysis and subsequent acceptance or rejection of the material represented by the test results, based on engineering calculations.

6.3.2 Bedding material and each type of riprap shall be tested for gradation in accordance with ASTMs C-117 and C-136, and other approved testing methods. Test results shall be in accordance with the Design Specification.

6.3.3 Bedding material and each type of riprap material shall be tested, as delineated in Sections 6.3.1 and 6.3.2 above, a minimum of four times. The materials shall be tested as prescribed in Section 6.3.1 initially prior to the delivery of any of the materials to the site and as prescribed in Section 6.3.2 at the beginning of placement. 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). 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.

6.4 Inspections

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

6.4.1 Excavation

Inspections shall be performed to verify that the correct line and grades are reached, as required. Where contaminated material is excavated, the MK-F Quality Control Inspector and Health Physics Supervisor shall

verify that contaminated material has been removed prior to backfill or placing uncontaminated material in that area.

6.4.2 Foundation and Subgrade

Prior to placing the first layer of material on the foundation, a final inspection of the subgrade shall be made to verify 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 or excavated and recompacted in accordance with the Site Subcontract Documents.

Some areas on the surface of the existing lower tailings pile contain slime materials that causes soft spots, these can be corrected by placement of a minimal lift of relocated material to bridge the soft area.

6.4.3 Embankment Fill and Backfill

Inspections shall verify that proper materials are placed as delineated in the Site Subcontract Documents. The loose thickness of the lifts of material shall be verified frequently to verify compliance with the Design Specifications for each type of material. The inspections shall verify that applicable moisture requirements are maintained and that moisture is uniform throughout each lift.

Visual observation shall verify that the placement of organics in the encapsulation cell is uniform and evenly distributed. Also, the inspection shall verify that the maximum size of the emplaced organic material does not exceed requirements. Inspections shall verify that the percent by volume of organic material for all materials does not exceed the Design Specifications. Results of visual inspections shall be documented on a Daily Inspection Report.

6.4.4 Radon Barrier

The placement of the radon barrier shall receive frequent inspection to verify lift thickness, elevations, moisture content, and as required, the number of roller passes. The moisture content will be determined as frequently as is required to verify the specified moisture content is maintained during the compaction effort.

6.4.5 Radon Emanation

Sampling and testing for site cell radiological characterization during construction, as delineated in Health Physics Procedure No. RAC-019, shall be routinely monitored to verify compliance with the prescribed requirements. Monitoring activities performed by MK-F Quality Control Department shall be documented on the CWMFES Surveillance Forms and Daily Inspection Report Forms, as applicable.

6.4.6 Erosion Protection

Material for erosion protection, including riprap and bedding materials, shall be obtained from sources approved by the Contractor.

The excavation, production, stockpiling, transportation, placement, and compaction of the erosion protection materials shall receive adequate inspection to verify that (1) proper techniques are employed to prevent degradation 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. The inspection shall also verify the lift thickness and elevations. Inspection will be performed at the material source, as required, to verify compliance with 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.

For placement control purposes, one test section for Riprap Types A and B each shall be constructed. The test sections shall be not less than 30 feet wide by 50 feet long in size, and shall be constructed either on or away from the embankment. Riprap material fully meeting the specified gradations shall be placed in the test sections by the same methods that will be used for production placement. The finished test sections, after testing to verify that the in-place gradation requirements have been met, shall be used as a visual sample for comparison of production work. After completion of riprap installation, the test sections, if constructed away from the pile, shall be blended into the final grading contours, as approved by the Contractor.

6.4.7 Erosion Resistant Rock

Erosion-resistant rock is determined by refusal of a power auger, drilling vertical, using a carbide steel bit. Trench bottoms will be tested on

maximum of 20-foot centers. Generally, erosion-resistant rock is natural, undisturbed, in tact rock which cannot be readily ripped, loosened or broken by a backhoe during normal excavation, or rings when struck with a geologist's rock hammer. Reference Design Specification for determining competent rock.

6.4.8 Health Physics

Weekly Health Physics (HP) surveillances shall be performed by the MK-F Quality Control Department to verify compliance with the applicable HP Procedures and Plans, as specified by the MK-F Quality Assurance Program Plan.

6.4.9 Weekly Environment, Safety and Health (ESH) surveillances shall be performed by the MK-F Quality Control Department. Surveillances shall verify compliance with applicable ESH procedures and plans, as specified by the MK-F Quality Assurance Program Plan.

6.4.10 Receiving

6.4.10.1 Equipment shall be inspected for damage, correct operations, and proper calibration records by the person responsible for using and maintaining it.

The inclusion of the calibration records in the calibration system shall be evidence of satisfactory inspection results. Equipment that does not meet the applicable requirements shall be returned to the vendor.

6.4.10.2 Materials supplied for permanent installation or which by the Design Specifications require certifications, will be verified by the MK-F Quality Control Department as having met the specified requirements. The inspector shall sign or initial the transmittal in the appropriate space, indicating acceptance or describing the reason(s) for nonacceptance.

6.4.11 Seasonal Shutdowns

When work is interrupted for seasonal shutdowns, the exposed surfaces of the tailings materials will be stabilized in a manner to prevent off-site spread of contamination. Prior to the 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. Manufacturer's 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 and documented routinely to verify that the integrity of the method of stabilization is maintained.

Prior to commencing work after a seasonal shutdown, a radiological survey shall be performed on all areas that could have been subject to contamination as a result of the method of stabilization.

Prior to commencing work after a seasonal shutdown, the compaction of previously accepted exposed permanent areas will be reverified. Density tests shall be performed in areas that are obviously or appear (i.e. soft, excessive moisture) fail to maintain the minimum specified density. In addition, randomly selected areas, representative of the in-place exposed permanent material, shall be verified as meeting the specified minimum density and moisture requirements. Areas that fail to meet these requirements shall be reworked or removed and replaced with acceptable fill, and compacted to meet specified density and moisture requirements.

6.5 Bentonite

6.5.1 Bentonite shall be high-swelling, unaltered, sodium montmorillonitic clay and shall meet the applicable requirements of the American Petroleum Institute (API) and Design Specifications.

6.5.2 A Certified Material Test Report (CMTR) or Certificate of Compliance (C of C) shall be furnished with each lot number of bentonite delivered to the site. If a CMTR or C of C is not furnished, testing shall be performed to verify that all physical properties of the bentonite meet the requirements of API and the Design Specifications. All CMTRs, C of C's and/or test results shall satisfy the Design Specification requirements, or the material shall be rejected. No bentonite shall be placed prior to verifying that each lot meets Design Specification requirements.

6.5.3 The radon barrier soil materials shall be obtained from areas designated by the Design Drawings and Specifications, and shall meet all specified test criteria and test frequency requirements.

6.5.4 The bentonite soil mixture shall not contain less than 10 percent by weight of bentonite. Reference the Design Specification for suitable equipment used in mixing the bentonite soil mixture.

~~6.5.4 Bentonite and soils materials shall be thoroughly mixed in a dry condition, (soils materials less than optimum moisture), on an uncontaminated surface.~~

~~6.5.5 Bentonite shall be distributed over unrutted soils materials prior to adding water or compaction in two transverse passes with the spreader. Mixing shall be accomplished by overlapping transverse passes with the specified mixing equipment.~~

~~6.5.6 The Bentonite content shall not be less than 12 percent by weight. The percentage of Bentonite placed shall be determined by placing a one (1) foot by one (1) foot metal pan in randomly selected areas to obtain a representative sample of Bentonite during spreading/placing operations. The amount of Bentonite retained in the pan is weighed, and then divided by the combined dry weight of the Bentonite and soil mixture to obtain the percentage of Bentonite by weight.~~

~~6.5.7 Determining percentage of Bentonite by weight shall be accomplished a minimum of once each 25,000 square feet of Bentonite spread/placed.~~

~~6.5.8 Water shall be added only after the dry mixing of Bentonite and soils materials is completed. Water shall be added and mixed to provide a uniform moisture content so that the moisture content will be maintained between 0 to plus 3 percent of optimum moisture content during compaction.~~

6.5.5 Unfavorable Weather: Placing, spreading, rolling or compacting fill material that is frozen or thawing, or during unfavorable weather conditions shall not be permitted. If the placement of radon barrier material is interrupted by heavy rain or other unfavorable weather, such work shall not be resumed until ascertaining that the moisture content and density of the previously placed soil is acceptable.

6.5.6 The subcontractor shall only work on an area that can be completed in one working day. ~~Completion shall be defined as soil moisture adjustment, spreading of the bentonite, the mixing of the soil with the bentonite, and compaction of the soil bentonite layer.~~

6.5.7 The final surface of the radon barrier shall be compacted in a manner to prevent formation of ruts, depressions or low areas in which water can accumulate.

6.5.8 Loose thickness of each layer of radon barrier materials shall not be greater than that required to achieve the required compaction, but in no case shall exceed 10 inches.

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 available at all times to prevent inadvertent by-passing of an inspection or test.

7.2 Test and inspection records shall contain, at 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.

7.2.8 Person evaluating test results, if different from person named in paragraph 7.2.3.

7.3 Test and inspection records shall be filed and maintained in accordance with "MK-F QA/QC Work Procedure No. 7." ~~"QAPP 6. Quality Assurance Records Control."~~

7.4 A weekly surveillance shall be performed by the MK-F Quality Control Department of M&TE used by the Quality Department. Surveillances shall be conducted and documented in accordance with the requirements of MK-F QA/QC Work Procedure No. 2.

7.5 Daily Inspection Reports shall be generated, describing the adequacy, discrepancies, progress, dispositions and details of each day's construction activities.

7.6 Permanent QA/QC records shall be periodically evaluated through internal and external surveillances and audits.

7.7 A weekly Quality Control Report shall be generated, summarizing the volume of in-placed materials and the number of field and laboratory tests performed for each type of material. A copy of the weekly QC Report shall be transmitted to the MK-F Project Quality Manager.