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UMTRA PROJECT SPOOK, WYOMING REMEDIAL ACTION INSPECTION PLAN

# **REVIEW COPY**



Document Number: MK-F-UMTRA-36

Revision Number: B

SPOOK, WYOMING INDEX

RAIP-1

Testing and Inspection

REV. B

MK-FERGUSON COMPANY

#### STATEMENT OF POLICY

This Remedial Action Inspection Plan identifies the means by which the remedial action activities at Spook, Wyoming are controlled, verified, and documented. This plan is developed within the scope of the MK-Ferguson Quality Assurance Program Plan and it complies with the applicable parts of ANSI/ASME NQA-1 and 10CFR50 Appendix B.

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 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-4, Control of Measuring and Test Equipment - QAPP-5, Quality Assurance Records Control - QAPP-6, and Nonconformance and Corrective Action - QAPP-8.

This Remedial Action Inspection Plan and The Quality Assurance Program Plan describe the means by which the MK-Ferguson Company will assure that the Environmental Protection Agency's requirements, Nuclear Regulatory Commission's guidelines for Testing and Inspection Plans During Construction of DOE's Remedial Action at Inactive Uranium Mill Tailings Sites, and State of Wyoming/Abandoned Mined Lands (AML) Program requirements specific to the embankment cell are satisfied.

It is the intent that this plan be applied to all permanent installations and work within the tailings embankment footprint. The tailings embankment footprint is defined as all UMTRA and AML materials vertically above and below, and horizontally within the boundaries of the outside perimeter of the low permeability materials at elevation 5027.5 feet, unless otherwise noted within this plan. Temporary facilities, installations, or work is to be tested and inspected as required by the Design Specifications. Where testing and inspection is not specified in the Design Specifications for temporary work, the work is to be tested and inspected to the degree necessary to ensure it's integrity for the anticipated period of usage, i.e. access roads, temporary ditches, etc.

Should a conflict exist between this Remedial Action Inspection Plan and the Spook, Wyoming Design Specifications and/or Drawings, the specified requirements prescribed by the Design Documents shall take precedence.

| MK-FERGUSON COMPANY  |       |   | RAIP NO. 1 REV NO.<br>SITE: SPK B<br>DATE<br>April 17, 1989<br>DESIGNATED CONTACT<br>PHIL D. CATE  |   |   |
|--|-------|---|--|---|---|
| REMEDIAL ACTION INSPECTION FLAN<br>UMTRA PROJECT<br>Prime Contract No. DE-AC04-83AL18796 |       |   |  |   |   |
| ROCEDU   | RE TI | TLE   | TESTING AND INSPECTIO  | N   |   |
| 1.0  | PURP  | OSE   |  |   |   |
|  | 1.1   | To describe t<br>tested and in<br>requirements.   | the methods by which the co<br>spected to verify compliance  | enstruction activitie<br>with the Design Spe  | es will be<br>cification  |
| 2.0  | SCOP  | E   |  |   |   |
|  | 2.1   | This procedur<br>construction<br>frequencies a<br>ments are cor<br>individual te<br>referenced me | re defines the testing and<br>activities at Spook, Wyor<br>and acceptability, document<br>tained in this procedure.<br>ests shall be in accordance<br>thods, and the Design Specif | inspection of remed<br>ming. Types of te<br>ation, and reporting<br>Procedures for perf<br>with the ASTM stan<br>fications. | ial action<br>sts, test<br>g require-<br>orming the<br>dards, the |
| 3.0  | DEFI  | NITIONS   |  |   |   |
|  | None  |   |  |   |   |

4.0 ATTACHMENTS

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None

5.0 <u>REFERENCES</u>

- 5.1 10CFR50 APP. B, Criteria 5, 10, 11, 14
- 5.2 ANSI/ASME NQA-1 1979 with addenda A-81 through C-82
- 5.3 Contract DE-AC04-83AL18796
- 5.4 ASTM
- 5.5 AASHTO
- 5.6 MK-F/CNSI Health Physics Monitoring Plans and Procedures
- 5.7 DOE 5700.6B

5.8 DOE AL 5700.68

5.9 UMTRA Quality Assurance Plan

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- 5.10 MK-Ferguson Quality Assurance Program Plan
- 5.11 MK-F QA/QC Work Procedures
- 5.12 Spook, Wyoming Design Specifications and Drawings

## 6.0 PROCEDURES

- 6.1 Field Density Control
  - 6.1.1 Soil density and moisture testing shall be in accordance with 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. In any event, any test results which would be outside of the Design Specification tolerances shall be retested, where possible. 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, prior to recording microwave oven test results as record test results.
      - 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 (i.e. common/general fill, Zone 1, 2, and 3 materials, tailings, granular fill, high permeability, low permeability, or leachate reduction materials).
      - 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.

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- 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 shali again be performed.
- 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 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. Test results which may be indicated as failures as a result of a re-evaluation, shall be retested in the area represented by the indicated failing test result, where possible.

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 may be affected by background radiation or the chemical composition of the soil (i.e. the first lift of low permeability material).

- 6.1.4 In-place field density and moisture tests for compacted materials, where density requirements are specified by the Design Specifications, shall be tested at the following minimum frequency:
  - One test per 1,000 cubic yards of contaminated materials a. placed within the tailings embankment footprint (UMTRA).
  - b. One test per 1,000 cubic yards of uncontaminated materials placed within the tailings embankment footprint (UMTRA).
  - One test per 500 cubic yards of low permeability materials с. placed, with a minimum of one test per lift on the tailings embankment side slopes (UMTRA).
  - d. One test per 1,000 cubic yards of high permeability materials placed within the embankment footprint and at the toe of the embankment (AML).
  - e. One test per 1,000 cubic yards of granular fill materials placed at the toe of the embankment (UMTRA).

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- f. One test per 1,000 cubic yards of leachate reduction and Zone 1, 2, and 3 materials placed within the tailings embankment footprint.
- g. One test per 5,000 cubic yards of foundation fill materials placed in the bottom of Spook Pit outside of the tailings embankment footprint (UMTRA).
- h. At least two tests for each day of material placement in excess of 150 cubic yards for each type material.
- i. 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 the Inspector or Site Manager determines the need to verify the compaction effort. To the extent possible, as allowed by placement methods and operations, there shall be a minimum of one test each lift. The test elevation and location shall be documented for each test.

- 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 low permeability materials, moisture content shall be maintained within optimum to plus three percent of the optimum moisture content, as determined by ASTM D-698.
  - 6.1.5.3 During compaction of tailings material within the embankment, moisture content shall be maintained within optimum to minus six percent of optimum moisture content, as determined by ASTM D-698.
  - 6.1.5.4 During compaction of leachate reduction, Zone 1, 2, and 3, and high permeability materials, the moisture content shall be maintained between minus two and plus four percent of optimum moisture content, as determined by ASTM D-698.

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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 5 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.
- 6.1.9 All test results shall be recorded and logged on the applicable forms.
- 6.2 Gradation Testing
  - 6.2.1 High permeability, foundation fill, granular fill, leachate reduction, Zone 1, 2, and 3, and general fill materials (random fills) shall be visually inspected to ensure gradation requirements of the Design Specifications are satisfied, except as specified in Section 6.2.3 below. A gradation test may be performed at any time the Inspector or Site Manager determines the need to physically verify gradation of the material.
  - 6.2.2 Low permeability soils materials shall be tested for gradation in accordance with ASTM C-136, ASTM D-1140, and ASTM D-422, as applicable. Gradation test results shall meet the requirements of the Design Specifications. Gradation Tests shall be performed a minimum of once for each 1,000 cubic yards of low permeability materials placed.
  - 6.2.3 Granular fill placed along the toe of the tailings embankment, and foundation fill placed within the tailings embankment footprint shall be tested for gradation in accordance with ASTM C-136, ASTM D-1140, and ASTM D-422, as applicable. Gradation tests shall be performed a minimum of once for each 5,000 cubic yards placed, for each type material.

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6.2.4 There shall be a minimum of one gradation test for each day, for each type material specified in Sections 6.2.2 and 6.2.3 above, that an appreciable amount of material is placed (in excess of 150 cubic yards).

# 6.3 Classification Testing

- 6.3.1 Classification tests for soils shall be accomplished in accordance with ASTM D-2487 and ASTM D-4318, as applicable. Classification test results shall satisfy Design Specification requirements, and shall be tested at the following minimum frequency:
  - a. One test per 1,000 cubic yards of low permeability materials placed.
  - b. One test per 5,000 cubic yards of granular fill materials placed along the toe of the tailings embankment.
  - c. One test per 5,000 cubic yards of foundation fill materials placed within the tailings embankment footprint.
  - d. One test per day that an appreciable amount of low permeability material is placed (in excess of 150 cubic yards).

## 6.4 Inspections

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

## 6.4.1 Excavation

Verifications in cooperation with MK-F Field Engineers shall be performed to ensure that the correct line and grades are reached, as required. Where contaminated material is excavated, the inspector shall verify with the H.P. Supervisor that the 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 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

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verify that the foundation surface has been moistened, but there is 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 insure proper bonding of overlying material. Any unacceptable surface material shall be either removed or excavated and recompacted to Design Specification requirements.

Prior to placement of materials, the in-place density and moisture, as required, of the top 6-inches of the subgrade area to receive fill, shall be compacted to a minimum of 90 percent of the maximum dry density, and moisture conditioned as prescribed by the Design Specifications.

# 6.4.3 Embankment Fill and Backfill

Inspections shall assure that the proper material is placed as designated on the Design Drawings, Design Specifications, and as verified with the Health Physics Manager/Designee. The loose thickness of the lifts of material shall be verified frequently to ensure compliance to the Design Specification requirements for the particular type of material. The inspections shall assure that the applicable moisture requirements are maintained and that the moisture is uniform throughout each lift.

Visual observation shall assure that placement of organics in the encapsulation cell is uniform and evenly distributed. Also, the inspection shall assure that the maximum size of the emplaced organic material does not exceed the specified requirements. Inspection shall assure that segregation of tailings slime pockets are avoided during tailings placement.

## 6.4.4 Low Permeability

The placement of the low permeability material 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 assure 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 ensure compliance with the prescribed requirements. Monitoring activities performed by quality control shall be documented on CNSI Surveillance Forms and Daily Inspection Report Forms as applicable.

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6.4.6 Coversoil and Revegetation

Inspection shall assure that the proper material is placed, as required by the Design Drawings and Specifications. Coversoil shall not be contaminated with sandstone material, and coversoil stockpiles shall be protected from erosion and contamination. Coversoil placement, seedbed preparation, seeding, fertilizing, and mulching operations shall be monitored to verify compliance to Design Specification requirements.

6.4.7 Health Physics

The Health Physics (H.P.) activities shall be inspected a minimum of once weekly to assure compliance with the applicable H.P. procedures as specified by the MK-F Quality Assurance Program Plan.

- 6.4.8 Receiving
  - 6.4.8.1 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.

- 6.4.8.2 Materials supplied for permanent installation or which by the Design Specifications require certifications, will be verified by the Quality 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.
- 6.4.9 Seasonal Shutdowns

During the periods of time when work is interrupted for seasonal shutdowns (in excess of 30 consecutive days), the exposed surfaces of the tailings materials will be stabilized in a manner to prevent offsite spread of contamination.

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During this period, surveillances shall be performed and documented routinely to assure that the integrity of the method of stabilization is maintained.

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.

Also prior to commencing work following 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 to be questionable, (i.e. soft, excessive moisture) in maintaining the minimum specified density. In addition, randomly selected areas, representative of the in-place exposed permanent material, shall be reverified as meeting the specified minimum density requirements. Areas that fail to meet the minimum specified density requirements shall be reworked to meet specified density and moisture requirements, or removed and replaced with acceptable fill compacted to meet specified density test shall be performed for each 2,500 square yards of previously accepted exposed permanent materials.

## 7.0 NONCONFORMING ITEMS

7.1 Nonconforming items shall be identified, documented, evaluated, segregated when practical, dispositioned, and affected organizations will be notified in accordance with MK-Ferguson's Quality Assurance Program Plan (QAPP) - QAPP No. 8 (Nonconformance and Corrective Action). The organizational structure, functional responsibilities, levels of authority, lines of communication, and responsibility to halt work and control further processing are delineated in QAPP No. 8 and QAPP No. 2 (Organization).

### 8.0 AUDITS AND SURVEILLANCES

- 8.1 Quality Assurance Audits and Surveillances
  - 8.1.1 Site Quality Assurance Audits and Surveillances shall be performed under the direction of MK-Ferguson Project Quality Manager.

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8.1.2 Site Quality Assurance Audits and Surveillances will be performed to assure implementation of the Quality Assurance Program Plan and Remedial Action Inspection Plan, and to verify that subcontractors performing quality related activities, or supplying services affecting the quality of the project, conduct their activities in accordance with the specified requirements.

## 9.0 RECORDS

- 9.1 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.
- 9.2 Test and inspection records shall contain as a minimum the following:
  - 9.2.1 Items tested or inspected.
  - 9.2.2 Date of test or inspection.
  - 9.2.3 Tester, inspector or data recorder.
  - 9.2.4 Type of test or inspection.
  - 9.2.5 Results and acceptability, including the test or inspection acceptance criteria.
  - 9.2.6 Instrument number used in performing the test or inspection.
  - 9.2.7 Action taken in connection with any deviations noted.
  - 9.2.8 Person evaluating test results, if different than person named in paragraph 7.2.3.
- 9.3 Daily Inspection Reports shall be generated describing the adequacy, discrepancies, progress, dispositions and details of each days construction activities.
- 9.4 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.
- 9.5 Permanent QA/QC records shall be periodically evaluated through internal and external surveillances and audits.
- 9.6 Test and inspection records shall be filed and maintained in accordance with "OAPP-6, Quality Assurance Records Control".

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