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A MORRISON KNUDSEN COMPANY

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UMTRA PROJECT
BELFIELD AND BOWMAN, NORTH DAKOTA
REMEDIAL ACTION INSPECTION PLAN

REVIEW COPY



Document Number: MK-F-UMTRA-42

Revision Number: A

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RAIP-1

Testing and Inspection

REV. A



STATEMENT OF POLICY

This Remedial Action Inspection Plan identifies the means by which the remedial action activities at the Belfield and Bowman, North Dakota, sites 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 portions of ANSI/ASME NQA-1, 1979 with the 1981 Addendum 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, and the 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 is to be tested and inspected as required by the specifications. Where testing and inspection is not stated in the 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.



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REMEDIAL ACTION INSPECTION PLAN
UMTRA PROJECT
Prime Contract No. DE-AC04-83AL18796

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SITE: BEL/BOW

DATE

October 24, 1990

DESIGNATED CONTACT

PHIL D. CATE

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 specification requirements.

2.0 SCOPE

2.1 This procedure covers the testing and inspection of remedial action construction and radiological monitoring activities at Belfield and Bowman, North Dakota. Types of tests, test frequencies and acceptability, documentation and reporting requirements are contained in this procedure. Procedures for performing the individual tests are per the applicable ASTM Standards or other referenced methods.

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 ANSI/ASME NQA-1 1979 with 1981 Addendum
- 5.3 Contract DE-AC04-83AL18796
- 5.4 ASTM
- 5.5 AASHTO
- 5.6 H.S. & E. Procedures/Plans
- 5.7 DOE Order 5700.6A
- 5.8 DOE Order 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 Belfield and Bowman, North Dakota, 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-1557, ASTM D-2167, ASTM D-2216, D-2487, ASTM D-4643, 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. General Fill, Tailings, or Radon Barrier 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 shall again be performed.

6.1.3 When the nuclear density gauge is used for density determinations, a correlation sand-cone density test shall be performed a minimum of once for every ten nuclear density tests performed. If there is a difference in results obtained which exceeds 2 percent, the sand-cone test results shall be used. All test results which were recorded using the nuclear gauge since the last correlation shall be reevaluated. Any test results which may be indicated as failures as a result of this reevaluation shall have a retest taken. 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 radon barrier 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 frequencies:

- a. One test per 1,000 cubic yards placed of contaminated materials, and uncontaminated materials placed at the disposal site.
- b. One test per 500 cubic yards placed of infiltration/radon barrier materials and select fill materials.
- c. One test per 10,000 cubic yards placed of general fill material for backfilling the Belfield processing site.
- d. One test for each 1,500 square yards placed of subgrade for the wastewater retention basins.
- e. At least two tests for each day of material placement in excess of 150 cubic yards for each material.
- f. There shall be a minimum of one test for each full shift of compaction operations.

6.1.4.1 A test may be performed at any time the Inspector or Site Manager determines the need to verify moisture

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content or the compaction effort. There shall be a 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, backfill, and subgrade 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 the infiltration/radon barrier and select fill materials, the moisture content shall be maintained within optimum moisture to plus three percent of optimum moisture as determined by ASTM D-698.

6.1.5.3 The moisture content of the preceding in-place infiltration/radon barrier lift, with the exception of the top 2 inches, shall be maintained at not less than the optimum moisture content minus one percent until the succeeding infiltration/radon barrier lift, or type 2 bedding material is placed. The specified moisture content shall be verified by taking samples 2 to 4 inches beneath the top surface of the compacted infiltration/radon barrier lift.

6.1.5.4 The moisture content of the preceding in-place select fill material lift, with the exception of the top 2 inches, shall be maintained at not less than the optimum moisture content minus one percent until the succeeding select fill material lift, or type 1 bedding material is placed. The specified moisture content shall be verified by taking samples 2 to 4 inches beneath the top surface of the compacted select fill material lift.

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6.1.5.5 During compaction, the moisture content of contaminated materials shall be maintained between five percent below optimum moisture content and the optimum moisture content as determined by ASTM D-698. Uniform moisture distribution shall be obtained by disking, blading, or other methods approved by the Contractor prior to compaction of a lift.

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. Whenever 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 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 in-place 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.

6.2 Gradation Testing of Infiltration/Radon Barrier Materials and Select Fill Materials

6.2.1 Gradation testing of infiltration/radon barrier materials and select fill materials shall be performed a minimum of once for each 1,000 cubic yards of material placed. There shall be at least one gradation test performed on radon barrier materials for each day of significant material placement (in excess of 150 cubic yards).

6.2.2 Gradation testing of infiltration/radon barrier materials and select fill materials shall be performed in accordance with ASTM D-1140 for determining the percent passing the No. 200 sieve and ASTM D-422 for the percent passing on the 1/4 inch sieve.

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6.2.3 Infiltration/radon barrier material shall comprise soils with a minimum of 85 percent by weight passing the No. 200 sieve and a minimum of 95 percent by weight passing the 1/4 inch sieve.

6.2.4 Select fill materials shall comprise soils with a minimum of 65 percent by weight passing the No. 200 sieve and a minimum of 95 percent by weight passing the 1/4 inch sieve.

6.3 Classification Testing of Infiltration/Radon Barrier and Select Fill Materials

6.3.1 Classification testing of radon barrier and select fill materials shall be performed in accordance with ASTM D-2487.

6.3.2 Classification testing of infiltration/radon barrier and select fill materials shall be performed a minimum of once for each 1,000 cubic yards of material placed. There shall be at least one classification test performed on infiltration/radon barrier and select fill materials for each day of significant material placement (in excess of 150 cubic yards).

6.3.3 Infiltration/radon barrier materials shall consist predominantly of soils with classification of CL or CH.

6.3.4 Select fill materials shall consist predominantly of soils with classification of ML, CL or CH.

6.3.5 The materials shall not contain more than 5% of undesirable deleterious materials such as organic material and lignite coal.

6.4 Erosion Protection Materials Testing

6.4.1 The Riprap types A, B, and C, and bedding materials shall be tested by a commercial testing laboratory during production in accordance with the following:

Riprap Types A, B, and C, and Bedding Materials

Specific Gravity (SSD)	ASTM C 127
Absorption	ASTM C 127
Sodium Sulfate Soundness (5 cycles)	ASTM C 88 (coarse aggregate)
Los Angeles Abrasion (100 cycles)	ASTM C 131

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6.5.1 Excavation

Inspections 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 Health Physics Supervisor that the contaminated material has been removed, 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 foundations 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 placing contaminated material fill, the subgrade for the contaminated material embankment shall be proof rolled by a minimum of four passes of a 50-ton pneumatic tired roller or substitute approved by the Contractor. Soft zones identified by the Contractor shall be excavated and replaced with compacted fill as directed by the Contractor.

6.5.3 Embankment Fill and Backfill

Inspections shall assure that the proper material is placed as designated on the Design Drawings. The loose thickness of the lifts of material shall be verified frequently to ensure compliance to the 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.

6.5.3.1 Visual observation shall assure that placement of organics in the encapsulation cell is uniform and evenly distributed, and 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.



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.

6.5.4 Infiltration/Radon Barrier and Select Fill Materials

The placement of the infiltration/radon barrier and select fill materials 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.

6.5.5 Subcontractor-Furnished General Fill Materials

Fill materials shall not exhibit a swell greater than 5 percent when tested according to ASTM D4546, Method B, on samples prepared at optimum moisture content and compacted to maximum dry densities specified in section 02200 of the subcontract documents, using a vertical pressure of 500 psf.

A certificate of compliance or laboratory test results indicating compliance with these requirements shall be submitted to the Contractor for each 2000 cubic yards of Subcontractor furnished fill materials. The certificate or test results shall be generated by an independent testing laboratory, and shall be submitted by the Subcontractor.

6.5.6. Erosion Protection

The excavation, production, stockpiling, transportation, placement, and compaction of the Erosion Protection materials shall receive adequate inspection to assure (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 provided at the material source as required to assure compliance to the specification requirements.

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



The shape of at least 75 percent of the material, by weight, shall be such that the minimum dimension is not less than one third of the maximum dimension.

6.5.7 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.

6.5.8 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, which by the 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.

6.5.9 Seasonal Shutdowns

During the periods of time when work is interrupted for seasonal shutdowns, the exposed surfaces of the tailings material will be stabilized in a manner to prevent offsite spread of contamination.

During this period, surveillances shall be performed and documented at least once a week to assure that the integrity of the method of stabilization is maintained.

Prior to commencing work following the 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.

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7.0 RECORDS

- 7.1 Test and inspection records shall be reported the same day in which a test or inspection is performed. The inspection and test status shall be identified by charts, as-builts, or periodic status reports. The status will be available at all times in order to prevent inadvertently bypassing an inspection 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.
 - 7.2.8 Person evaluating test results, if different than person named in paragraph 7.2.3.
- 7.3 Test and inspection records shall be filed and maintained in accordance with "QAPP-6. Quality Assurance Records Control".
- 7.4 Daily Inspection Reports shall be generated describing the adequacy, discrepancies, progress, dispositions and details of each days construction activities.
- 7.5 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.
- 7.6 Permanent QA/QC records shall be periodically evaluated through internal and external surveillances and audits.

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