



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NRC INSPECTION MANUAL

LLUR

INSPECTION PROCEDURE 88001

ON-SITE CONSTRUCTION

PROGRAM APPLICABILITY: 2600, 2801

88001-01 INSPECTION OBJECTIVES

01.01 To determine by direct observation if on-site construction is being accomplished in accordance with the license application, license conditions and construction specifications.

01.02 To determine whether the system for preparing and maintaining records is functioning properly.

01.03 To determine whether records reflect work accomplishment consistent with the license application, license conditions, and construction specifications.

01.04 To determine if the records and/or work activities indicate any generic problems, inadequacies, or other weaknesses that could impact the facility operations.

88001-02 INSPECTION PREPARATION

Applicable portions of the license application, license conditions, the final design, and the construction specifications should be reviewed to determine construction requirements.

88001-03 WORK OBSERVATION

By direct observation of earthwork and other activities in progress, the reviewer should ascertain whether applicable activities are being controlled and accomplished in accordance with the requirements of the documents reviewed. Reviews will generally be conducted by a geotechnical engineer, surface water hydrologist, hydrogeologist, or health physicist as appropriate, depending on the nature of the review item. Inspections should be conducted in order to observe the key construction milestones listed in Table 1. During construction reviews, the reviewer should also determine the locations of ground-water monitoring wells and observe their condition. If ground-water sampling is in progress, the procedures should also be observed. Specific procedures applicable to particular construction and monitoring activities that may be viewed on a site-specific basis are as follows:

03.01 Test Fill Construction

- a. Observe placement and compaction operations to ensure that procedural and equipment requirements are being followed.
- b. Visually check the barrier test zone to ensure proper thickness and material type.
- c. Observe gradation, bentonite amendment operations (if applicable), plasticity index, and moisture/density testing, and compare results of tests with specifications.
- d. Observe installation of instrumentation/testing/monitoring equipment, including infiltrometers where applicable.
- e. Review quality control plan and infiltration test results.

03.02 Foundation and Subgrade Preparation

- a. Check to ensure that the subgrade is cleared of all vegetation and topsoil, shows no deterioration due to frost action or erosion, and exhibits no rutting from construction vehicles.
- b. Check to ensure that the subgrade exhibits no areas of subsidence, extreme surface drying, or localized ponding (overly wet areas).
- c. Observe proof rolling operations or density testing; if density testing is performed, compare results of tests observed in the field with specifications.

03.03 Placement of Capillary Break

- a. Observe placement and compaction operations to ensure that procedural and equipment requirements are being followed.
- b. Observe the capillary break zone to verify proper thickness and material type, and to ensure that segregation of materials has not occurred.
- c. Observe gradation and/or moisture/density testing and compare results of tests observed with specifications.

03.04 Placement of Seepage Barrier/Liner

- a. Observe placement and compaction operations to ensure that procedural and equipment requirements are being followed.
- b. Visually check the liner zone to ensure proper thickness and material type.
- c. Observe gradation, plasticity index, and/or moisture/density testing and compare results of tests observed with specifications.

03.05 Placement of Contaminated Materials

- a. Observe placement and compaction operations to ensure that procedural and equipment requirements are being followed. This includes checking the loose-lift thickness (during placement) against the specifications.

- b. Visually check the quantity, maximum size, and distribution of foreign material, and the distribution of organics against the allowable criteria of the specifications. Also, note if non-homogeneous areas exist.
- c. Observe moisture/density testing and compare results of tests observed with specifications. Note any ponding, runoff, or dust conditions.
- d. Observe radiological monitoring (health and safety, as well as radionuclide concentration measurement).

03.06 Placement of Soil Cover (Radon Cover)

- a. Observe placement and compaction operations to ensure that procedural and equipment requirements are being followed. This includes checking required loose-lift thickness and proper blending of any additives, and if method specifications for density have been established by test fill, verification of number of equipment passes.
- b. Visually check cover layer(s) to ensure proper material type and final thickness for each layer.
- c. Observe gradation, plasticity index, and/or moisture/density testing and compare results of tests observed with specifications.

03.07 Placement of Frost Protection Layer

- a. Observe placement and compaction operations to ensure that procedural and equipment requirements are being followed. Check required loose-lift thickness, and if method specifications for density have been established, verify number of equipment passes.
- b. Visually check the frost protection cover layer to ensure proper thickness and material type.
- c. Observe gradation, plasticity index, and moisture/density testing and compare results of tests with specifications.

03.08 Placement of Bedding Layer(s) and Rock Cover (Riprap)

- a. Observe placement and compaction operations to ensure that procedural and equipment requirements are being followed. For the rock cover and other riprap layers, this includes checking that placement techniques are conducted in a manner that prevents material degradation, assures uniform distribution and minimizes voids.
- b. Visually check the bedding zones and riprap layers to ensure proper thickness and material type for each zone, measuring as necessary. If possible, excavate by hand to a sufficient depth to verify thickness by measurement.
- c. Visually check riprap for approximate size (maximum, average). If possible, excavate by hand to verify size of underlying rocks, measuring as necessary.
- d. Observe gradation testing to assure that representative samples are being tested.

- e. Observe gradation testing of filter and rock layers and compare results of gradation and durability tests observed with specifications and RAP requirements.

03.09 Other Potential Construction Observations

- a. Check operations at borrow areas and quarries; verify that any procedures for moisture control are properly conducted; and visually check that material type(s) are consistent with specifications and are representative of materials actually being placed.
- b. Check layout of diversion ditches. Check for conformance to design configuration and riprap requirements.
- c. Check overlap and integrity of geotextile separators, if they are used.
- d. If an approved vegetative cover is used in place of rock cover, check to ensure uniform seeding, use of specified seed type, seed density, etc.
- e. Check overall site grading to assure that cut and fill procedures will not result in grading which would be susceptible to future surface erosion.
- f. Observe verification soil sampling and Opposed Crystal System (OCS) analysis.
- g. Observe gamma surveying and, if possible, alpha surveying.

03.10 Monitoring Well Observations

- a. Check locations of existing wells. Verify that the field locations correspond to the location depicted on site drawings. Verify that the well is properly and permanently labeled.
- b. Verify that existing well locations are adequately marked with flagging or some other identification placard to avoid inadvertent destruction by heavy equipment.
- c. Verify that the water protective casing, padlock, concrete pad, and other surface expressions are in good repair. Verify that well caps are secure to minimize inadvertent dust invasion inside the well casing. Note any irregularities, such as bent or damaged casing, animal burrows or erosion around the well, and proximity of equipment tracks.
- d. Check the locations of previously abandoned monitoring wells. Verify the field locations with respect to the site drawings. Verify that the surface expression has been completed in accordance with the Monitoring Well Abandonment Specification. Note any irregularities, such as concrete shrinkage, surface depressions, or exposed well pipe.

03.11 Ground-Water Sampling Observations

- a. Observe any monitoring well sampling or well measurements that may be occurring. Verify that the equipment is handled in accordance with the project specifications. Verify that equipment use and decontamination

procedures have been followed in accordance with appropriate standard operating procedures.

- b. Verify that calibrations have been performed and documented on equipment used to make field measurements.
- c. Verify that accurate and legible records are maintained during the field sampling, including chain-of-custody documentation. Sampling information should be recorded on the DOE or contractor forms identified in the Quality Control (QC) project documents and in sufficient detail to support later quality assurance reviews. Verify that samples are collected, handled, and stored in accordance with procedures identified in the QC plan.
- d. Verify that potentially contaminated ground water removed during well purging and sampling is handled in accordance with standard procedures.

The reviewer may not be able to directly observe all facets of the activities identified above. Activities which should be observed include the Key Construction Milestones identified in Table I, as well as major construction activities which are unique to the site. Such unique activities may include slurry wall construction, bentonite amendments to radon barriers, ground modification, monitoring well activities, or other phases of work identified in the license application. Observation of some field testing should be made at all inspections. In some cases, it will be necessary to observe a completed activity rather than work in progress. The intent of the review is to determine whether the activities and/or the end product meet the requirements of the license application, license conditions and applicable regulations.

Additionally, during work observation, informal interviews with the licensee inspection personnel should be randomly conducted to determine how well employees know their work activity. The reviewer should ascertain whether a sufficient number of adequately qualified inspection personnel are at the site, commensurate with the work in progress, and whether they are adequately performing their assigned duties through the established organizational structure. A determination of personnel qualifications should be based on the published position description/job standards which is available at the project office.

88001-04 RECORDS REVIEW

The reviewer should examine selected documentation maintained on site to ascertain the following:

04.01 Records confirm that required material characteristics and other specification requirements were met.

04.02 Records confirm that specified materials were installed in accordance with specifications.

04.03 Records indicate that adequate corrective action is being taken following non-conformance/deviation occurrences.

04.04 Records confirm that the required inspections and testing were performed adequately and at required frequencies.

04.05 Records establish that inspection personnel are adequately qualified for their assigned duties and responsibilities.

04.06 Records confirm that any field measurements of parameters for radon barrier analysis meet those presented in the license application and license. The licensee must notify the NRC if deviations are noted and the license must be amended to incorporate a new analysis before the radon barrier is completed.

END

TABLE I, 88001

CONSTRUCTION INSPECTIONS FOR 11E.(2) BYPRODUCT MATERIAL DISPOSAL SITES AND FACILITIES (11E.(2) SITES) LICENSED AND REGULATED UNDER 10 CFR PART 40

KEY CONSTRUCTION MILESTONES

- a. Early Stages of Construction:
 - 1. Test Fill Construction *
 - 2. Foundation and Subgrade Preparation *
 - 3. Placement of Capillary Break *
 - 4. Placement of Seepage Barrier/Liner *
 - 5. Placement of Contaminated Materials **
- b. Soil Cover:
 - 1. Placement of Radon Barrier **
 - 2. Placement of Frost Protection Layer *
- c. Placement of Bedding Layer(s) and Rock Cover ***
- d. Completion of Disposal (Closeout) ***

* May or may not apply to a particular site depending on site-specific design.

** Will apply to all sites.

*** Will apply to nearly all sites (vegetative cover may be proposed for 1 or 2 sites).