

### REVIEW OF GEOTECHNICAL AND SITE CHARACTERIZATION ACTIVITIES

PROGRAM APPLICABILITY: 2501, 2502

#### 45052-01 INSPECTION OBJECTIVES

To verify that the applicant's proposed quality assurance (QA) program, as applicable to early site permit (ESP) or combined license (COL) geotechnical activities, is being implemented in accordance with the requirements of Appendix B to 10 CFR Part 50.

#### 45052-02 INSPECTION REQUIREMENTS

02.01 For each onsite organization with QA responsibilities for geotechnical activities, review QA programs, work instructions, and/or technical specifications, and observe geotechnical field activities to determine that the QA elements conform to the criteria in Appendix B to 10 CFR Part 50.

02.02 Verify that procedures, instructions and drawings prescribing site exploration, inspection and testing activities are developed and implemented, and include appropriate quantitative and qualitative acceptance criteria, as applicable, for the areas below:

- a. Test control (e.g., surveying, subsurface exploration, standard penetration and cone penetration testing, bearing and downhole/crosshole testing, soil testing, and others as appropriate).
- b. Measuring and test equipment.
- c. Handling, storage, and shipping of soil samples obtained from borings or excavations.
- d. Applicant/contractor oversight (e.g., audits, surveillance).

02.03 Verify that records of geotechnical activities are approved by the proper authority, appropriately stored, and maintained in accordance with QA Program requirements.

02.04 Verify that personnel associated with geotechnical activities are qualified to perform their assigned work.

02.05 Observe work in progress and verify that work is performed in accordance with the appropriate procedures. Section 45051-05, "References," lists the typical ASTM and other Standard geotechnical field tests commonly performed during site investigations. The inspector should observe in-process testing activities for conformance to the standards. The listing of standards is not all-inclusive and the inspector should be alert to the use of other or newly emerging standards, if applicable.

#### 45052-03 INSPECTION GUIDANCE

General Guidance. This inspection provides an assessment of the effectiveness of QA requirements implemented at an early stage in the application development process. Early involvement of NRC staff will facilitate and support prompt identification and resolution of issues, and timely completion of the acceptance review process following submission of the application.

The team will review a suitable sample of in-process documents related to ESP or COL site characterization activities to verify consistency with standard industry practices for the successful completion of the activities. Observation of these activities should determine if QA program requirements are being adequately implemented as required by the applicant and/or contractor's procedures. If the observation of activities or the review of specifications or implementing procedures identifies significant inadequacies that may indicate weaknesses in the implementation of QA program requirements by the responsible organization, the inspector will inform appropriate NRC management. The issue should be addressed at the appropriate level of the potential applicant's management prior to the submittal of the application and the corrective action should be included in the application or in a separate submittal to the NRC.

03.01 QA Program. Verify that a QA program has been established and implemented (including plans, procedures, and instructions), and addresses safety-related work related to activities in support of the ESP or COL application. In particular, verify the following attributes of the QA program:

- a. Verify that the applicant retains the overall responsibility for the establishment and implementation of all QA requirements, including those aspects of the program delegated to contractors and consultants.
- b. Verify that activities affecting quality, such as, preparation of analyses, calculations, design drawings, specifications and procurement documents, related verification reviews, and control of documents and document changes are accomplished in accordance with established instructions, procedures and drawings.
- c. Verify that management of the organizations implementing the QA program, or portions thereof, regularly assess the adequacy of that part of the program for which they are responsible to assure its effective implementation.

- 03.02 Procedure Review. Verify the implementation of work and quality instructions, procedures, and drawings related to surveying, subsurface exploration, standard penetration tests, cone penetrometer tests, bearing tests, soil testing, and others (as appropriate) for the areas detailed below.
- a. Test Control. Select a sample of completed tests and determine if controls for testing have been adequately implemented by performing the following:
    1. Verify that a test program is established to ensure that all testing required for site characterization is identified.
    2. Verify that test procedures:
      - (a) Incorporate or reference the requirements and acceptance limits contained in the applicable design or regulatory documents.
      - (b) Include provisions for ensuring that all prerequisites for the given test have been met.
      - (c) Ensure that adequate test instrumentation is available and used.
      - (d) Ensure that testing is performed under suitable environmental conditions.
    3. Field testing and laboratory procedures must provide for verification of correct material usage and correct selection of reference standards, and should prohibit discretionary selection of inspection and testing parameters.
    4. Verify that the test program provides for documentation and evaluation of test results to ensure that test requirements have been satisfied. Results of testing should be reviewed by qualified personnel and a determination of acceptability of the results made.
    5. Conduct field observations to determine if work is being performed using the proper revision of the respective procedure(s) for the test activity witnessed.
  - b. Measuring and Test Equipment (M&TE). Select a sample of M&TE equipment documents (e.g., records, logs) and determine if controls for calibration have been adequately implemented by performing the following:
    1. Verify that procedures establish measures to ensure that tools, gages, instruments, and other measuring and testing equipment used in site characterization activities are of the proper range, type, and accuracy.
    2. Verify that procedures provide for inspection, calibration, adjustment, and maintenance of measuring and test equipment at prescribed intervals, using national standards as a basis for calibration. When such standards are not available, verify that the basis for calibration or method used is documented.

3. Verify that procedures require that inaccurate M&TE is identified and removed from service or otherwise segregated from inadvertent use, and provide for verification of the validity of previous tests and inspections.
  4. Verify that calibration results are documented and traceable to M&TE.
  5. Verify that M&TE is uniquely identified and displays the status of calibration or is otherwise traceable to calibration records.
  6. Conduct field observations to determine if work is being performed using the proper revision of the respective procedure(s) for the calibration activity witnessed.
- c. Handling, Storage, and Shipping. Select a sample of documents (e.g., procedures, inventory logs) and determine if controls for handling and storage of soil samples obtained from borings or excavations have been adequately implemented by performing the following:
1. Verify that instructions have been established for marking and labeling, packaging, handling and storage of items to adequately identify, maintain, and preserve the item, including indication of special environments or the need for special controls. Also verify that sample identification is maintained either on the sample or on records traceable to the sample throughout use.
  2. Verify that special protective measures (e.g., containers, special moisture content levels, and temperature levels) have been specified and provided to maintain acceptable quality.
  3. Conduct field observations to verify that handling, storage, and shipping activities are being performed in accordance with prescribed procedures.
- d. Applicant/Contractor Oversight. Select a sample of audit/surveillance procurement reports and assess the adequacy of oversight activities by performing the following:
1. Verify that the applicant implements planned and periodic audits to confirm that activities affecting quality comply with the QA program and that the QA program has been effectively implemented.
  2. Verify that procedures and responsibilities have been established for auditing, documenting, and reviewing audit results.
  3. Verify that audit/surveillance results are reported to and reviewed by responsible management. Verify if followup action of deficient areas is initiated when necessary.

03.03 Record Control. Select a sample of QA records generated during the conduct of site characterization activities for review and assess QA records controls by performing the following:

- a. Verify that procedures identify the designated person or organization responsible for records access, including receipt control, processing, corrections, and safekeeping.
- b. Verify that the records sampled are complete, legible, adequate, retrievable, adequately protected, and traceable to markings, identification tags, or other means of identifying materials, components, and activities important to safety.
- c. Verify that records are reviewed and approved by the responsible authority.
- d. Verify that records are stored in a manner that prevents deterioration, environmental effects, damage, and loss.

03.04 Training and Qualification of Personnel. Select a sample of training records and determine if controls have been adequately implemented by performing the following:

- a. Verify that programs are implemented for the indoctrination and training of personnel performing activities affecting quality to ensure that suitable proficiency is achieved and maintained.
- b. Verify that qualification records and certifications exist for inspection/test personnel, auditors, calibration, repair personnel, and similar specialists performing activities affecting quality. Verify that qualification records of personnel are certified in accordance with industry and/or vendor's program requirements.
- c. Conduct interviews with personnel associated with geotechnical activities to ensure they have an understanding of the activities they are performing commensurate with their responsibilities.

03.05 Corrective Action. Select a sample of corrective action documents and determine if controls have been adequately implemented by performing the following:

- a. Verify that measures exist to promptly identify and resolve non-conformances and conditions adverse to quality in a timely manner. In the case of significant conditions adverse to quality, verify the measures ensure that the cause of the condition is determined and corrective action taken to prevent recurrence, and such measures are documented and reported to the appropriate management.
- b. Review a sample of identified problems and verify that the applicant or contractor(s) adequately implemented these controls.

This inspection procedure is used for pre-docketing audits of ESP or COL applications. The resource estimate for this inspection procedure is about 50 hours of direct inspection effort.

#### 45052-05 REFERENCES

Regulatory Guide 1.132, "Site Investigation for Foundations of Nuclear Power Plants," October 2003.

Regulatory Guide 1.138, "Laboratory Investigation of Soils for Engineering Analysis and Design of Nuclear Power Plants," December 2003

Regulatory Guide 1.198, "Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites," November 2003.

ANSI/ASME N45.2.20, "Supplementary Quality Assurance Requirements for Subsurface Investigations for Nuclear Power Plants."

U.S. Army Corps of Engineers, "Soil Sampling", Engineer Manual (EM) 1110-2-1907.

Electric Power Research Institute (EPRI), Report TR-102293, 1993; "Guidelines for Determining Design Basis Ground Motions, Sections 7 and 8."

American Society for Testing and Materials (ASTM), Book of Standards, as follows:

ASTM D 1586-99; "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils."

ASTM D 1587-00; "Standard Practice for Thin-Walled Tube Sampling for Geotechnical Purposes."

ASTM D 5778-95 (2000); "Standard Test for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils."

ASTM D 4633-05; "Standard Test method for Energy Measurements for Dynamic Penetrometers."

ASTM D 4220-95 (2000); "Practices for Preserving and Transporting Soil Samples."

ASTM D 4750-87 (2001); "Standard Test Method for Determining Subsurface Liquid levels in a Borehole or Monitoring Well (Observation Well)."

ASTM D 5753-05; "Standard guide for Planning and Conducting Borehole Geophysical Logging."

ASTM D 4428/4428M-07; Standard Test Methods for Crosshole Seismic testing."

ASTM G 57-06; “Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method.”

ASTM D 2113-06; “Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation.”

ASTM D 420-98; “Standard Guide to Site Characterization for Engineering, Design and Construction Purposes.”

ASTM D 1452-80 (2000); “Standard Practices for Soil Investigation and Sampling by Auger Borings.”

ASTM D 2487-06; “Standard Practice for Classification of Soils for Engineering Purposes.”

ASTM D 2488-06; “Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).”

END

Attachments:

1. REVISION HISTORY

## ATTACHMENT 1

Revision History Sheet  
IP 45052

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Matrix ADAMS Accession #
	05/29/03	Initial issuance	No	N/A	
	10/03/07 CN 07-030	1. Incorporation of new requirements of 10 CFR Part 52 and SRP 17.5 guidance  2. Incorporation of guidance provided by the Geosciences & Geotechnical Engineering Branch  3. Researched commitments for 4 years and found none.	No	N/A	ML072620473