Construction Specification 94—Contractor Quality Control

1. Scope

The work consists of developing, implementing, and maintaining a quality control system to ensure that the specified quality is achieved for all materials and work performed.

2. Equipment and materials

Equipment and material used for quality control shall be of the quality and condition required to meet the test specifications cited in the contract. Testing equipment shall be properly adjusted and calibrated at the start of operations and the calibration maintained at the frequency specified. Records of equipment calibration tests shall be available to the engineer at all times. Equipment shall be operated and maintained by qualified operators as prescribed in the manufacturer's operating instructions, the references specified, and as specified in section 10 of this specification. All equipment and materials used in performing quality control testing shall be as prescribed by the test standards referenced in the contract or in section 10.

All equipment and materials shall be handled and operated in a safe and proper manner and shall comply with all applicable regulations pertaining to their use, operation, handling, storage, and transportation.

3. Quality control system

Method 1—The contractor shall develop, implement, and maintain a system of quality control to provide the specified material testing and verification of material quality before use. The system activities shall include procedures to verify adequacy of completed work, initiate corrective action to be taken, and document the final results. The identification of the quality control personnel and their duties and authorities shall be submitted to the contracting officer in writing within 15 calendar days after notice of award.

Method 2—The contractor shall develop, implement, and maintain a system adequate to achieve the specified quality of all work performed, material incorporated, and equipment furnished before use. The system established shall be documented in a written plan developed by the contractor and approved by the contracting officer. The system activities shall include the material testing and inspection needed to verify the adequacy of completed work and procedures to be followed when corrective action is required. Daily records to substantiate the conduct of the system shall be maintained by the contractor. The quality control plan shall cover all aspects of quality control and shall address, as a minimum, all specified testing and inspection requirements. The plan provided shall be consistent with the planned performance in the contractor's approved construction schedule. The plan shall identify the contractor's onsite quality control manager and provide an organizational listing of all quality control personnel and their specific duties. The written plan shall be submitted to the contracting officer within 15 calendar days after notice of award. The contractor shall not proceed with any construction activity that requires inspection until the written plan is approved by the contracting officer.

All methods—The quality control system shall include, but not be limited to, a rigorous examination of construction material, processes, and operation, including testing of material and examination of manufacturer's certifications as required, to verify that work meets contract requirements and is performed in a competent manner.

4. Quality control personnel

Method 1—Quality control activities shall be accomplished by competent personnel. A competent person is: One who is experienced and capable of identifying, evaluating, and documenting that materials and processes being used will result in work that complies with the contract; and, who has authority to take

prompt action to remove, replace, or correct such work or products not in compliance. Off-site testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, laboratory certification or inspection information. The Contractor shall submit to the Contracting Officer, for approval, the names, qualifications, authorities, certifications, and availability of the competent personnel who will perform the quality control activities.

Method 2—Quality control activities shall be accomplished by competent personnel who are separate and apart from line supervision and who report directly to management. A competent person is one who is experienced and capable of identifying, evaluating, and documenting that material and processes being used will result in work that complies with the contract, and who has authorization to take prompt action to remove, replace, or correct such work or products not in compliance. Offsite testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, laboratory certification or inspection information. The contractor shall submit to the contracting officer, for approval, the names, qualifications, authorities, certifications, and availability of the competent personnel who will perform the quality control activities.

5. Post-award conference

The contractor shall meet with the contracting officer before any work begins and discuss the contractor's quality control system. The contracting officer and the contractor shall develop a mutual understanding regarding the quality control system, including procedures for correcting quality control issues.

6. Records

The contractor's quality control records shall document both acceptable and deficient features of the work and corrective actions taken. All records shall be on forms approved by the contracting officer, be legible, and be dated and signed by the competent person creating the record.

Unless otherwise specified in section 10 of this specification, records shall include:

a. Documentation of shop drawings including date submitted to and date approved by the contracting officer, results of examinations, any need for changes or modifications, manufacturer's recommendations and certifications, if any, and signature of the authorized examiner.

b. Documentation of material delivered including quantity, storage location, and results of quality control examinations and tests.

c. Type, number, date, time, and name of individual performing quality control activities.

d. The material or item inspected and tested, the location and extent of such material or item, and a description of conditions observed and test results obtained during the quality control activity.

e. The determination that the material or item met the contract provisions and documentation that the engineer was notified.

f. For deficient work, the nature of the defects, specifications not met, corrective action taken, and results of quality control activities on the corrected material or item.

7. Reporting results

The results of contractor quality control inspections and tests shall be communicated to the engineer immediately upon completion of the inspection or test. Unless otherwise specified in section 10, the original plus one copy of all records, inspections, tests performed, and material testing reports shall be submitted to the engineer within one working day of completion. The original plus one copy of documentation of material delivered shall be submitted to the engineer before the material is used.

8. Access

The contracting officer and the engineer shall be given free access to all testing equipment, facilities, sites, and related records for the duration of the contract.

9. Payment

Method 1—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds, after presentation by the contractor of invoices showing related costs and evidence of charges by suppliers, subcontractors, and others for furnishing supplies and work performed. If the total of such payments is less than the lump sum contract price for this item, the remaining balance is included in the final contract payment. Payment of the lump sum contract price constitutes full compensation for completion of the work.

Payment is not made under this item for the purchase cost of material and equipment having a residual value.

Method 2—For items of work for which lump sum prices are established in the contract, payment is prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating shall be the number estimated to complete the work. The final month's prorate amount is made with the final payment. Payment as described above constitutes full compensation for completion of the work.

Payment is not made under this item for the purchase cost of material and equipment having a residual value.

All methods—Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 10.

10. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction detail are:

a. ***Bid Item 34, Contractor Quality Control***

(1) This item consists of developing, implementing, and maintaining a quality control system to ensure that the specified quality is achieved for all materials and work performed.

(2) In Section 1, Scope:

(a) Quality Control is defined as a rigorous examination and inspection of construction materials, processes and operations to verify that the work being performed meets contract requirements and shall be performed by a qualified Inspector employed by or under contract to the Contractor.

(b) The burden of proof that work performed meets contract requirements rests upon the Contractor. Quality assurance inspections and tests by the OWNER are for the sole benefit of the OWNER. The use of such words as "as approved by the Engineer or Contracting Officer" and similar words in the specifications or drawings which refer to approval by the Engineer are considered to be a part of the OWNER's Quality Assurance program and does not relieve the Contractor in any part for the Contractor's Quality Control Responsibilities as specified.

(3) In Section 3, Quality Control System:

(a) Method 2 shall apply.

(b) The Contractor's quality control system shall be approved and operational before commencement of work.

(c) Quality control tests shall be conducted in accordance with the standard test methods identified in the specifications. The Contractor shall provide all equipment required to perform all quality control tests. Testing equipment shall - meet the requirements as specified by ASTM test methods and be properly calibrated and serviced.

(d) The degree of quality control specified shall be defined as:

i. Periodic review or inspection is defined as the intermittent presence of the Inspector to observe construction operations and/or perform tests and take measurements as needed to determine and document that the work being performed complies with the specifications.

ii. Full time inspection is defined as the full time presence of the Inspector to observe one or more construction operations and/or perform tests and take measurements at critical points in various operations to determine and document that the work being performed complies with the specifications and to be available for consultation in case of emergency or changes in work conditions.

iii. Continuous inspection is defined as the continuous presence of the Inspector to observe one construction operation and/or perform tests and take measurements at critical points in the operation to determine and document that the work being performed complies with the specifications and to be immediately available for consultation in case of emergency or changes in work conditions.

(e) The Contractor's inspection system shall include the following items of work that will require the Contractor's quality control. Any item of work not listed below shall be performed or constructed as shown on the drawings and as specified in the

construction and material specifications.

i. The Contractor's inspection on all items not listed in (ii) through (xiv) below shall consist of periodic review of those items to assure that all contract specifications are being met and that the items are being properly installed or carried out.

ii. Disking, Seeding, and Mulching - Quality control shall consist of determining that the vegetative materials and fertilizer supplied comply with the specifications; that the areas to be vegetated are properly smoothed and graded; that disking and hay mulching are performed as specified; and that the sprigging and mechanical seeding are performed as specified. Full time inspection shall be required.

iii. Excavation - Quality control shall consist of full time inspection to determine that all excavation is being accomplished as specified and that the specified excavation has removed all required or unsuitable materials and that grades are properly documented. The Inspector shall determine that all materials selected for use in backfill of the specified works are free of undesirable materials and that all materials are placed in the designated waste, stockpile or fill areas.

iv. Earthfill - Quality control shall consist of full time inspection of earthfill placement. The Inspector shall select materials from the required excavations, stockpiles and/or borrow area(s) to insure the completed earthfills are constructed in accordance with the drawings and specifications.

The Inspector shall select and obtain representative samples of the materials and have moisture-density curves made (according to ASTM D698 test procedures) of each Unified Soil Classification material to be placed in the specified earthfills. Moisture density curves shall be completed as necessary to provide data needed when earthfill operations begin and may be needed as earthfill progresses to insure correct selection and specified compaction of earthfill materials. A "One-Point Family of Curves Method" (hereafter referred to as the one point method) shall be employed to determine the optimum moisture and maximum density values for all earthfill materials. The procedure for performing the one-point method is as follows: (1) construct a family of curves using compaction test data compiled on soil samples tested in accordance with the procedure set forth in ASTM D698, (2) make a one point compaction test specimen from soil material representing the earthfill material that is being placed (moisture content shall be on the dry side of optimum), (3) plot the one-point moisture-density values, obtained from the test, on the family of curves, (4) using the curves above and below the plotted point as a guide, draw a new compaction curve through the plotted point, (5) use this curve as the control for the moisture and density of the material being placed. Unless otherwise directed by the Engineer, at least one one-point test shall be conducted for every three in-place moisture density tests that are taken.

In-place moisture density tests shall be conducted a rate of at least one test for each 1,000 cubic yards of Class A earthfill placed. In-place tests shall be conducted in accordance with Construction Specification 23, Earthfill, Section 8. More frequent tests shall be required if compaction correlation is not being obtained or if compaction requirements are not being met. More frequent testing is also required where earthfill is being placed in critical areas such as conduit and concrete structure backfills. In the event that compaction correlation or requirements are not being met, continuous inspection shall be required during all earthfill and backfill placement to determine that foundation conditions are

satisfactory; that earthfills materials are of the type selected for placement and are free of undesirable materials; that proper compaction and moisture requirements are being maintained; and that hand and mechanical compaction are being accomplished as specified.

v. Drainfill - Quality control shall consist of full time inspection of drainfill placement. It shall include testing of the gradation of drainfill material; determining that the material complies with specified qualities and that the specified compaction is accomplished and the grades are properly documented. The Inspector shall have at least one sieve analysis prepared for each type of drainfill placed. These analyses shall be made from materials as delivered to the job site. If changes in gradation of drainfill appear to develop additional sieve analysis shall be made.

vi. Reinforced Concrete - Quality control shall consist of continuous inspection during the placement of concrete. In addition, the Inspector shall assure that the concrete design mix meets contract requirements and that proper certifications are provided. The Inspector shall inspect all formwork prior to concrete placement to assure integrity of the forms and compliance with design detail with proper documentation. Slump, time of cement induction, and temperature and air content measurements shall be determined on each mixer load of concrete prior to placement to assure compliance with specifications. At least one set of cylinders (4 cylinders) shall be taken between each construction joint for the inlet structure and impact basin and one set per day or a minimum of one set per 40 cubic yards, along the conduit cradle. An additional set of cylinders shall be taken when indicator tests or visual observations indicate a change in the concrete mix. One cylinder from each set shall be tested at 7 days and the other two tested at 28 days. The remaining cylinder shall be tested, if necessary, to verify results of a suspect cylinder. The Inspector shall also assure that the concrete is cured according to specifications, the forms removed as specified and the concrete is repaired and finished as required. No repair or finish work shall begin until such work has been inspected and authorized by the Contracting Officer or Engineer.

vii. Steel Reinforcement - Quality control shall consist of continuous inspection during concrete placement. The Inspector shall also determine that the steel reinforcement complies with the specified quality and is placed in accordance with the drawings and specifications with proper documentation. The Inspector shall check to determine that it is adequately secured to prevent its displacement during concrete placement and that it has not been displaced during concrete placement. These inspections shall also take place immediately before and during placement of the concrete.

viii. Reinforced Concrete Pressure Pipe - Quality control shall consist of continuous inspection while the pipe is being installed. The Inspector shall also determine and document that the pipe meets the specified requirements, that the pipe has not been damaged in shipment and delivery, that the pipe is properly bedded and laid at specified grade and alignment and that all joints are fully closed and properly sealed.

ix. Rock Riprap - Quality control shall consist of full time inspection during the placement of the rock riprap. The Inspector shall also determine that the rock riprap complies with the specified quality and gradation limits, that proper certifications are provided, that the rock is placed as shown on the drawings and

as specified and that segregation of particle sizes has not occurred during delivery or placement. At least one onsite gradation test will be made by the Contractor.

x. Rock Riprap Bedding - Quality control shall consist of full-time inspection during the placement of the rock riprap bedding. The Inspector shall also determine that the rock riprap bedding complies with the specified quality and gradation limits, that proper certifications are provided, that the rock riprap bedding is placed as shown on the drawings and as specified and that segregation of particle sizes has not occurred during delivery or placement. At least one onsite gradation test will be made by the Contractor.

xi. Metal Fabrication - Quality control shall consist of periodic inspection during installation of metalwork. The inspector shall determine and document the fabricated metal work meets material specifications and dimensions, coatings are applied according to specifications and the erected work is to the lines and grades specified.

xii. Conduit Abandonment - Quality control shall consist of continuous inspection during the grouting operations to confirm that air is venting from the outlet pipe and that no air is trapped in the pipe. In addition, the Inspector shall assure that the grout design mix and the grouting procedure meet contract requirements and that proper certifications are provided. The inspector shall observe the cleaning operations to ensure that all sediment and debris has been removed from the pipe prior to grouting operations.

xiii. Bore and Jack – Quality control shall consist of continuous inspection during bore and jack and grouting operations. The Inspector shall determine and document that the installation complies with all of the requirements of the project drawings, specifications, and the Contractor's approved submittals. The Inspector shall also be responsible for ensuring that progress submittals documenting the installed works are prepared and submitted in a timely manner, including but not limited to survey data and drawings, test reports, mix designs, daily reports and records, and any other required information.

xiv. Conduit Slip-Lining - Quality control shall consist of continuous inspection during conduit slip-lining and grouting operations. The Inspector shall determine and document that the installation complies with all of the requirements of the project drawings, specifications, and the Contractor's approved submittals. The Inspector shall also be responsible for ensuring that progress submittals documenting the installed works are prepared and submitted in a timely manner, including but not limited to survey data and drawings, test reports, mix designs, daily reports and records, and any other required information.

(4) In Section 4, Quality Control Personnel:

(a) Method 2 shall apply.

(b) All mention of inspection or Inspector herein are referring to work performed by the Contractor's Quality Control Personnel unless otherwise noted.

(c) The skills, knowledge, abilities and experience needed by the Contractors Quality Control Personnel to perform the quality control shall be as follows:

i. Must have the ability to maintain communications with the Landowners, Contracting Officer and the Contractor.

ii. Knowledge of cut and grade staking and earthwork installations.

iii. Knowledge of soils, including foundation conditions, density and classifications.

iv. Knowledge of sampling of soils and determination of density of in-place soils.

v. When applicable, must have knowledge of acceptable moisture-density test methods and the ability to satisfactorily perform the test.

vi. Have the ability to interpret survey notes and to prepare quantity computations.

vii. Have the ability to maintain adequate files and records of construction inspection work.

viii. Have the ability to interpret construction drawings and specifications.

ix. Must have knowledge of tests required for placement of acceptable concrete and the procedures required for satisfactory placement.

x. Must have knowledge and ability to perform concrete tests that include slump test, air contents and temperature measurements, and preparation of compressive strength cylinders.

xi. Must have knowledge of steel placement details and the ability to interpret steel requirements from construction drawings.

xii. Must have knowledge of form construction and bracing for construction of concrete structures.

xiii. Have the ability to interpret survey notes and to prepare quantity computations.

xiv. Have the ability to maintain adequate files and records of construction inspection work.

xv. Must have knowledge of the United Soil Classification System and the ability to interpret soil classification requirements from the construction drawings.

(d) Concrete Laboratory Testing Technicians – Must have certification from the American Concrete Institute (ACI) for Concrete Laboratory Testing Technician.

(e) Quality control personnel shall also be responsible for maintaining a record of progress with photographs. Construction activities shall be documented with 5 megapixels or greater digital photography in a JPEG file format. Photographs of daily construction work, problems encountered, and unique construction practices shall be taken to insure full coverage of all work performed. The photographs shall be numbered, dated and time imprinted and indexed with documentation explaining construction activities shown, and must be submitted with request for final payment. Digital files of photographs shall also be provided on a monthly basis with each pay request.

(5) In Section 9, Payment, Method 2 shall apply.