
Chapter 3

Contractor Quality Control and NRCS Quality Assurance

Issued November 2011

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Chapter 3

Contractor Quality Control and NRCS Quality Assurance

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645.0300 Introduction

Construction quality is a team effort. Each team member is responsible for performing specific duties that contribute to the overall objective of attaining a quality product. The team's success in achieving project quality depends on having:

- well-defined and clearly expressed project goals
- specific, clearly defined objectives focused on attaining the project goals
- responsibilities allocated to attain the objectives
- responsibilities allocated among team members in a fair and reasonable manner
- team members who articulate their requirements to each other
- team members who fulfill their roles and responsibilities to meet contractual and professional obligations

The size of the team generally depends on the size and/or complexity of the job. For small, less complex jobs, the team may only consist of the owner, contractor, and government quality assurance (QA) inspector. In this case, each team member has responsibilities including those related to job quality, but there is less of a distinction between quality control (QC) and QA. On larger jobs or those of a more complex nature, the team generally consists of QC and QA personnel who are devoted solely to job quality. In this case, each team member has distinct roles and responsibilities, and the line between QC and QA is well defined.

The details and tolerances of each conservation measure constructed with U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) funds ensure its proper function. The purpose of this chapter is to explain the roles and responsibilities of the team members who verify quality.

For the purpose of this handbook, the term “contract” refers to a legal agreement between an owner or contracting agency and a contractor that obligates the owner or contracting agency to pay for goods and ser-

vices rendered to them by the contractor. The contract may be a simple verbal or written agreement between a landowner and a contractor, written contract between a local sponsor (Contracting Local Organization (CLO)) and a contractor, or Federal contract between the NRCS and a contractor.

645.0301 Contractor quality control

Contractor quality control (CQC) refers to activities performed by a contractor including developing, implementing, and maintaining a QC system to ensure and document that the work installed meets the minimum requirements of the contract. It is in the contractor's and NRCS's best interest to have a detailed and functional CQC plan. On the contractor's side, a good CQC plan should significantly decrease any additional costs or time delays related to rework due to quality issues. On the government's side, a good CQC plan means less chance of delay, proper documentation of QC and fewer quality-related issues.

The contractor should develop a CQC system that is project specific. The system should be geared to ensure conformance with applicable project plans and specifications with respect to materials, quality of workmanship, schedule, construction, finish, and functional performance. It should focus on documenting proper procedures and responsibilities for the work, delineating the type and amount of testing and verifying that testing is included in the project schedule, clarifying communications among subcontractors, and translating the plans and specifications into quality physical structures and systems.

The contractor, supported by subcontractors, suppliers, and vendors, is responsible for submitting complete and technically accurate documentation as required by the contract. The preparation and processing of submittals are essential to achieving a smooth workflow. Submittal preparation, review, and approval processes should be geared to avoid delays. Attention to these responsibilities is an essential aspect of the CQC system, as well as a key responsibility of the QA personnel.

A typical CQC system includes:

- recruiting and assigning a skilled work force for the CQC team
- organization of the CQC system and team
- submittal process and schedule
- inspection plan (type, frequency, level of detail)

- testing plan (type and frequency)
- documentation of CQC activities
- procedures for corrective action when CQC and/or acceptance criteria are not met

NRCS Construction Specification 94, Contractor Quality Control (CS-94) is included in most federally awarded contracts and in many nonfederally awarded contracts that are funded by the NRCS. The purpose for including CS-94 is to expand and explain further the requirements for CQC beyond the standard contract clauses (FAR 52.246-1, 2, 4, 12, 13, 17, 18 and/or 21). If CS-94 is not included in a non-Federal contract, the contracting officer (CO) should ensure that the party contracting for services includes similar requirements for the provision and documentation of quality supplies and workmanship.

CS-94 provides for two levels of CQC, which are identified as method 1 and method 2. Both methods require the contractor to have a CQC plan, but only method 2 requires this plan to be documented in writing. Method 1 is more applicable for simpler, less complex projects or installations, whereas method 2 should be used for any work that is more complex or larger in scope.

A typical CQC plan includes:

- an onsite CQC manager and organizational listing of all CQC personnel, their specific duties and, as applicable, their qualifications, authorities, and certifications as applicable
- testing laboratories and their specific duties
- a list of required submittals with deadlines for submittal and approval that correlate to the contractor's construction schedule
- measures to ensure that subcontractors are qualified, certified, and/or licensed as required
- procedures for testing of materials and equipment to be incorporated into the work
- procedures for testing and inspecting the installation of materials and equipment
- segregation and disposition of nonconforming materials, equipment, or components
- identification, inventory, and proper storage of materials and equipment pending incorporation into the work

- maintenance and calibration of measuring and test equipment
- specific testing and inspection requirements
- procedures to be followed whenever corrective action is required
- maintenance of records specified by the contract and required by the CQC system to document activities affecting quality

Note that the CQC manager's role may vary depending on the size and complexity of a project or installation. Typically, the CQC manager should operate independently from the jobsite superintendent and should report to a level within the construction firm that is above the superintendent. However, for simpler and/or less complex projects, the CQC manager may be one of the project supervisory staff. Even on small jobs, CQC results should still be reported to a higher authority within the contractor's organization.

The contractor may not be relieved of QC responsibilities due to the presence or absence of owner quality assurance personnel. Normally, the contractor's responsibilities related to QC include:

- maintaining an inspection system that will ensure adequate quality is attained
- maintaining adequate inspection records
- providing facilities, labor, and materials needed for performing necessary inspections and tests
- promptly replacing or correcting poor quality work
- promptly removing any rejected materials from the site that do not conform to specified requirements

645.0302 NRCS quality assurance

QA is the planned and systematic actions necessary to provide adequate confidence that the work is being constructed in accordance with applicable standards and contract requirements. The level of QA and the duties of the QA inspector are contingent on job specific factors. These factors include the size and complexity of the work, hazard class of the work, and type of contract used to implement the work. For example, consider the difference in the QA inspector's role in the following scenarios.

Scenario No. 1—A fixed-price, sealed-bid contract requires the contractor to understand in detail what is to be constructed before bidding to do the work. The price is fixed when the contract is signed and, except for minor quantity variations, can only be changed by a written contract modification signed by the CO. This requires a design that includes detailed drawings, specifications, and a bid schedule containing a bid item for each major item of work. It places full responsibility on the contractor to perform the work as detailed in the contract for an "up-front" established price. The contractor provides QC to ensure the work quality meets specified requirements. The QA inspector does not direct the work, but observes CQC and verifies that the work is accomplished as detailed in the contract documents.

Scenario No. 2—If work must begin immediately, such as an immediate need under the Emergency Watershed Protection program, an undefinitized letter contract may be used. This allows the government to give the contractor a binding commitment when there is not sufficient time to negotiate a firm, fixed price. Due to the immediate nature of the work, detailed designs are not available, so the work is defined in general terms. The scope of work will only extend to the immediate repairs necessary to protect lives and property. For example, a contract for removing and disposing of debris from a stream may only list items to be removed and describe the work limits and method of disposal. To verify work performed while a contract is undefinitized, each piece of equipment with operator must be tracked for the time the equipment

is diligently performing work within the scope of the contract. The QA inspector is required to:

- keep accurate records of equipment hours for payment documentation
- judge when equipment is diligently performing work within the contract scope, as opposed to being idle or doing something outside of the contract scope
- decide when desired results are accomplished in certain areas

Note: Although contract type has a bearing on the QA inspector's role, contract type has no bearing on the QA inspector's responsibility with respect to safety and accident prevention. Work should not begin until the QA inspector can document the contractor has conducted a safety meeting and all aspects of the safety program are in place. Construction safety responsibilities should always be at the top of the QA inspector's tasks list. Chapter 4 of this handbook, Construction Safety and Health, covers safety in detail.

(a) Quality assurance plan

For larger or more complex work and/or work of a high-hazard class, a high level of QA is required and the duties of the QA inspector must be well defined in a written quality assurance plan (QAP). The QAP will identify all individuals that will perform various QA tasks and outline the frequency and timing of inspection and testing. The QAP identifies items of work that require continuous inspection and those items that can be inspected after the fact and, thus, only requiring intermittent or periodic inspection. The QAP should identify key milestones for a project when additional QA and/or the design engineer (NRCS or architectural engineering firm (A&E)) visits are required or recommended. The QAP should also identify when a geologist will be needed, if applicable.

The QAP defines QA duties including:

- items requiring inspection and testing
- timing and frequency of inspection and testing
- skills needed by QA inspectors
- names and qualifications of team members

- estimated number of staff hours required for individual QA team members
- equipment and facilities needed
- statement of team member availability

For smaller, less complex work and/or work of a low hazard class, it is likely that a detailed QAP would not be needed to ensure the designated quality is attained. If a written QAP is not required, it is incumbent upon the QA inspector to understand when specific items of work should be inspected and schedule accordingly. The QA inspector should discuss this with the designer (usually the field engineer) as needed to understand the required frequency of inspection, and testing necessary to ensure the designated quality is attained. As a minimum, a checklist should be provided to the owner that lists specific parts or stages of construction that require QA inspection. The checklist should include the necessary lead times for each item. The owner should then notify the QA inspector in advance (based on the lead times provided) of the need for inspection of these items.

(b) Quality assurance inspector

The QA inspector is the owner's onsite representative that performs or oversees the CQC to protect the owner's interest. The QA inspector is an NRCS employee or an employee of a firm contracted by the NRCS to perform QA inspection services on Federal contracts. A QA inspector on a CLO or other contract type may be either an NRCS employee, employee of a local sponsor, or employee of an architect-engineering firm. The QA inspector should oversee or perform the following activities:

- observe conditions of safety and health on the construction site
- observe construction methods and procedures
- coordinate with CQC personnel and review CQC activities
- coordinate with COR/GR to enlist additional QA personnel, the design engineer, or geologist, as applicable
- conduct QA testing to evaluate CQC activities
- document daily project activities

- maintain as-built drawings
- maintain any other measures to verify and document compliance with contractual and regulatory obligations and accepted industry standards

The QA inspector's main duty is to provide construction oversight during the installation of a project. To do this, the QA inspector must:

- understand Occupational Safety and Health Administration (OSHA) and other applicable safety regulations
- understand his or her role in the project implementation process per the QAP
- understand the basics of construction contracting
- understand how to read and interpret drawings and specifications
- know the various practices required to construct any given project
- possess the experience, knowledge, and technical and interpersonal skills and abilities necessary to provide QA inspection

In dealing with the contractor, the QA inspector should act professionally and be fair and friendly, but firm. The QA inspector must display knowledge, experience, integrity, ability, and the use of good judgment. The inspector should be cautious and avoid dictating methods of construction to the contractor, unless such methods are clearly spelled out in the contract. Additionally, the QA inspector should be careful not to discuss items directly with the contractor's crafts people or with subcontractors. Any controversies with the contractor should be settled promptly.

The QA inspector assigned to a contract is appointed in writing by the CO on federally awarded contracts, or by the government representative (GR) or State administrative officer on nonfederally awarded contracts. The appointment letter will list QA inspector responsibilities for providing QA inspection on the job. The QA inspector should be authorized by the appointment letter to stop contractor operations for significant safety violations. The appointment letter will state that the CO is the only individual that can alter the contract. The QA inspector is not authorized

to revoke, alter, substitute, enlarge, relax, or release any requirements of the contract, including specifications, drawings, or safety provisions. Only the CO has the authority to make final acceptance of the work; the QA inspector must not indicate final acceptance of any part of the completed work. In most contracts, final acceptance only occurs at the end of the project. Note that the QA inspector's role is different than the contracting officer's representative (COR) or GR, although the same individual may fulfill both roles.

Appendix A provides a checklist (Quality Assurance Inspection Checklist) that covers the specific duties of a QA inspector.

(c) Inspection and testing

QA inspection begins before the contractor first arrives onsite. There are several items that must be in place before construction of the works of improvement can begin. The QA inspector must document that these items are in place prior to beginning work:

- The contractor must receive the notice-to-proceed, signed by the CO.
- There must be an approved safety officer and safety plan.
- A safety meeting must be conducted prior to beginning work.
- At least one person from each foreman's crew must hold a current first-aid card.
- A hard hat sign must be prominently displayed at all construction site entrances.
- A National Pollution Discharge Elimination System (NPDES) permit notice poster must typically be prominently displayed at all construction site entrances.
- The Stormwater Pollution Prevention Plan (SWPPP) must be implemented and other NPDES requirements addressed.
- Several items such as Equal Employment Opportunity (EEO) posters and emergency contact information must be posted on the contractor's bulletin board.
- Sanitation facilities must be operational.

- Cultural resources and items of historical significance must be identified and protected.
- Utilities and existing works must be identified and protected. Utility owners must be notified whenever there are utilities in the area that may be affected by the construction activity.

Inspection and testing performed by the owner (or the owner's onsite representative) are for the sole benefit of the owner and do not relieve the contractor of responsibility for CQC. The QA inspector must guard against performing CQC and must allow the CQC the opportunity to identify and correct noncompliant work before requesting removal or correction. The CQC should be given the opportunity to independently identify and initiate correction of noncompliant work. In the event that the CQC fails to identify and correct noncompliant work, the QA inspector should then address with the contractor both the deficient work, plus the failure by the CQC.

Furthermore, the QA inspector must avoid directing the contractor's work. Any direction, including better ways to accomplish work can be considered an unauthorized commitment. A contractor could claim that direction by a QA inspector entitles the contractor to compensation. This could result either in a claim or ratification of a change. Unauthorized commitments should be avoided as they may result in reprimands or, in extreme cases, liability for the QA inspector.

(d) Enforcing the terms and conditions of the contract

Work must be accomplished in strict accordance with the terms and conditions of the contract. Properly enforcing the terms and conditions of the contract is an important part of the QA inspector's job and is not considered directing the contractor's work.

The QA inspector should thoroughly understand contract requirements and construction performance and techniques. This understanding and knowledge should be the result of both training and job experience. This background will allow the QA inspector to properly enforce the terms and conditions of the contract.

The QA inspector must be thoroughly familiar with the specific contract to which they are assigned, includ-

ing the drawings and specifications, all revisions, changes, and any amendments or modifications to the contract. The QA inspector must maintain an up-to-date field copy of the contract by marking any changes to the contract such as changes to the bid schedule, drawings, and specifications. Changes to drawings or specifications should be part of a contract modification. If the design engineer issues new drawing sheets or specification pages as part of the contract modification, the new pages must be inserted into the drawings or specifications and the old page lined out. If new pages are not issued, the QA inspector must note the changes on their field copy, including the number of the amendment or modification. In addition, the QA inspector must be thoroughly familiar with pertinent NRCS policies, safety regulations, State and local regulations, and applicable industry standards. For ready reference, when applicable, links to these may also be noted on the inspector's field copy of the contract.

The American Society of Testing Materials International (ASTM), American Association of State Highway and Transportation Officials (AASHTO), American Water Works Association (AWWA), and any other standard referenced in the specifications are considered a part of the specifications even though the full text of the standard may not be printed in the specifications. These standards are referred to as "reference standards" and carry the same weight and effect as if their full text were included in the contract. The QA inspector should obtain an applicable version of all reference specifications and have them readily available for reference whenever he or she is on QA inspection duty. Unless the contract was modified to include a more recent version, the version that was current at the time of contract award is the applicable version.

The up-to-date field copy of the contract including applicable reference standards must be readily available to the QA inspector at all times during the performance of the work. Any questions concerning the work that cannot be ascertained from the contract should be elevated to the COR/GR.

(e) Labor standards

The area of labor requirements in Federal construction contracts is governed by numerous Federal laws, regulations, and Executive Orders. The NRCS is responsible for ensuring the full and impartial enforcement of

labor standards in the administration of construction contracts for federally awarded contracts. The sponsor (not the NRCS) is responsible for labor compliance on CLO contracts.

Requirements found in NRCS (Federal) construction contracts will contain the following: wage rates, overtime pay, weekly payment, submission of certified payrolls, posting of wage rates at the work site, and employee protection from extortion. Most of these requirements can be found in the Davis-Bacon Act, which is a part of all Federal construction contracts, unless the construction project is \$2,000 or less.¹ Various employee classifications and wage rates (bulldozer operator, motor grader operator, laborer, etc.) are included in the contract document.

The QA inspector must observe the work and check contractor payrolls to see that contractor employees are properly classified for the number of hours worked. Sometimes individual employees will perform more than one class of job during a pay period and be listed under more than one classification on the contractor's payroll. The QA inspector also must perform periodic labor interviews, interviewing various employees throughout the course of a job to provide documentation that the employee is properly identified, classified, and compensated. Additional information on Davis-Bacon compliance assistance is available at: <http://www.dol.gov/compliance/laws/comp-dbra.htm>.

Conflicts concerning labor are not to be resolved by the QA inspector. The QA inspector should document facts related to labor standards concerns and elevate those concerns to the COR.

(f) National Pollution Discharge Elimination System requirements

The U.S. Environment Protection Agency (EPA) National Pollution Discharge Elimination System (NPDES) requires that entities responsible for day-to-day operations on construction sites abide by specific rules related to pollution control. These requirements are generally summarized in the pollution control specification contained within the contract.

¹ The \$2,000 threshold requirement was applicable in 2009. Procurement thresholds are subject to change.

The QA inspector must document that NPDES responsibilities are being carried out according to the terms and conditions of the contract. For additional information, see chapter 6 of this handbook, Erosion and Pollution Control.

(g) Monitoring progress

The QA inspector must closely follow the progression of each stage of construction, be alert to existing conditions, and be able to anticipate problems. The QA inspector should never hesitate to call on the COR/GR or design engineer for assistance whenever problems are not being resolved or when work is not being completed in accordance with the drawings and specifications.

The QA inspector should be familiar with the contractor's construction schedule and be able to determine if changes will affect the contractor's progress and finish date. In some instances, the owner is responsible for conducting some of the surveys that are necessary to layout the work and collect survey data for quantity computations. The QA inspector must coordinate with owner's surveyor to avoid any owner-caused delays by not having the surveys completed according to the schedule, which then delays when the contractor can proceed. Delays in completing work items or providing information either from the government or owner may lead to valid monetary claims, performance time extensions, or both. The COR/GR and CO should be notified whenever a delay is anticipated. A contract modification should be issued for a government or owner-caused delay. The QA inspector can also use the schedule to monitor progress to see if the contractor is operating at their planned efficiency. Failure to adhere to the schedule should be immediately communicated to the COR/GR and CO. The QA inspector should more closely observe and document progress if a schedule is not being met. On larger or complex projects, a critical path method (CPM) schedule is recommended, as well as a monthly update of the schedule to be submitted with the invoice.

(h) Documentation

Documentation of daily project activities is an essential part of the QA inspector's role. While verbal communication may be sufficient to interact with the

contractor on an informal basis, the documentation of communications and decisions is essential. In the case of contract modifications or claims, the QA inspector's documentation is the crucial evidence to support the NRCS or local sponsor's position. Note that in the event of claims or disputes, only the written record and photographic documentation are admissible in court.

In all cases, QA inspectors should strive for clarity and completeness of the information documented. Unclear and incomplete information can cause confusion and misunderstandings when the documentation is reviewed at a later date.

(1) Job diary

It is required that a job diary is kept on all federally contracted work and all conservation engineering practices of Job Class V–VIII. Specific job diary usage policy can be found in NEM 512. It is recommended that a job diary be kept, even if not required, if the work is complex in nature, either technically or due to the involvement of multiple entities or partners. Technical assistance notes should be used for engineering-related projects installed that are not covered by the policy listed above. (Technical assistance notes are kept in the owner's file at the field office.) If the project is complex in nature or if the NRCS cost share is significant, the use of a job diary in lieu of technical assistance notes is recommended. The term "job diary" will refer to the use of either a job diary or technical assistance notes, as appropriate. Note that if technical assistance notes are being used, the level of detail of information captured should correspond to the type and complexity of work being performed.

Job diary records often provide the principal evidence in contract disputes for consideration by the CO, contract review boards, and courts of law. The job diary documents a chronological, factual account of the work and all associated activities on a real time basis. Labor and equipment records are kept in the job diary and may be used to reconstruct contract costs for modifications and claims.

The job diary is the QA inspector's written record of what transpired on the job. Each QA inspector records in the diary the work performed on the project on a daily basis. A job diary should be started as soon as possible, but no later than the site showing. The QA inspector should have the job diary with them at all

times whenever they are onsite, so that events can be recorded as close to when they occur as possible. The QA inspector should not keep side records and fill out the job diary at a later time.

Appendix C contains examples of information to record in the job diary for the types of work being described in this handbook.

Job diary entries should include, but are not limited to, documenting the following events or items of importance:

- site showing including names, positions, and firms represented; date and time of the site showing; description of the weather, site, and soil conditions at the time of showing; and a list of questions asked and answers given or a reference to the document containing these
- preconstruction conference including names, positions, and firms represented; date and time the conference was held; and a list of items covered, questions asked and answers given or a reference to the document containing these
- applicable routine daily entries such as date, weather, work period, workforce
- instructions received from the CO, COR, and others
- instructions given to the contractor
- any change in contractor's supervisory personnel
- a description of the work being done on the site, equipment and material involved, and progress being made
- problems encountered on the project and corrective actions taken by the NRCS or the contractor
- discrepancies between CQC test results and QA test results
- conversations with the contractor, landowner, or others that are pertinent or significant to the work
- reference to any testing done, including notation of the results or action required

- notation of any surveys, stakes placed, or measurements made
- reason for, and length of, any work delays or lost time
- record of efficiency or inefficiency of the contractor
- site conditions, particularly any unexpected changes in the site (this must also be reported to the CO and COR as soon as possible)
- detailed record of any rejected work or materials
- daily equipment records (use appropriate section in front of diary)
- daily estimate of work accomplished (quantities)
- detailed records of any items that may be involved in a contract modification or claim
- detailed record of any extra work performed by the contractor
- identification of all visitors to the site and the purpose of their visit

The NRCS uses NRCS–ENG–310, a bound, hardback book, as a job diary. Along with a place to record a narrative for each day of the project, the job diary includes locations to record bid schedule information, material receipt and certification, and a log page to track daily equipment use.

The following are instructions for proper completion of a job diary:

- Use nonwater soluble ink so that pages can be easily copied and can not be erased.
- Never attempt to erase. Strike through incorrect entries and initial the struck entry.
- Fill out all lines, leaving no blanks.
- Strike through or cross out all blank space on the page below the signature.
- Keep entries factual and concise; do not include hearsay, gossip, information not related to the job or defamatory comments.
- Prepare a report for non-work days or give reason on the next report for missing days.

- Make narrative entries complete and legible.
- Sign at the end of each entry covering a day or work shift.
- Use ruled pages in the back of the book for continuation of the narrative; cross reference, sign, and date each continuation narrative.
- Provide greater detail for activities related to modifications, changes or potential disputes.

The job diary is an official record and is subject to disclosure to the public under the Freedom of Information Act. As a record that must be disclosed, the NRCS is authorized to provide all information contained in the job diary to any individual that properly requests it. The job diary may be viewed by the public (including the contractor) and copied in the presence of NRCS personnel. However, in no case should physical control of the diary be relinquished to non-NRCS personnel. Include notations of who copied information from the job diary and when, if that occurs.

(2) Photographic documentation

Using photos to record work is an efficient and informative means of documentation. Photos can provide evidence of work items that cannot be easily described or interpreted from written documentation. Photographs are also used as support for modifications to the contract, to support the NRCS's or owners' position during a claim, to train employees, and to publicize NRCS work.

Consider photographing any of the following:

- the undisturbed site prior to beginning of construction
- the ingress/egress road before, during, and after construction
- any existing structures (fences, gates, stream crossings) before, during, and after construction
- water conditions
- rock in excavations, especially whenever the excavation is classified as "common excavation"
- poor construction practices
- good construction practices

- inefficient operation
- unacceptable work
- dewatering efforts
- damage to the work
- differing site conditions
- violations of safety or sanitary requirements
- erosion and sediment control best management practices (BMPs) before and after storm events
- equipment condition
- the completed project

Digital photography is preferred because it is easily stored, can be pasted directly into reports, and can be transmitted electronically.

Cameras, when possible, should be set to automatically imprint the date and time on the photo. A log should be kept of photos, which includes the following information:

- time and date
- project name
- location on the project
- vantage point from which each photo was taken and direction in which photo was taken
- name or initials of the photographer
- photo caption

When possible, the images should contain a means for gauging the scale of the subject matter. A pen, hard hat, survey rod, or person can be included in the photo for this purpose.

Video photography should be used when a record of an entire process is needed or when sound effects would add to the inspection record. This is useful when recording activities such as a heavy crane lift or loading of a test pile to failure. Videos should be recorded digitally, or converted to a digital format so that they can be easily shared with others and become a permanent record.

(3) As-built plans

The NRCS policy on as-built plans is found in NEM Part 512, Subpart F, As-Built Drawings.

As-built plans are the amended “as-designed” drawings revised to show the project as the contractor built and constructed it. The final as-built plans include modifications to the drawings and specifications made during construction, field changes such as elevation and length variances within tolerances, shop drawings, and contractor designs. The QA inspector normally is responsible for maintaining the as-built records. For large and/or more complex projects, the contractor may also be required to maintain a set of as-built plans.

The QA inspector should maintain a complete set of full-size construction drawings and specifications at the jobsite to track changes, additions, or deletions from the original design during construction. Rules for completing as-built plans and items that should be changed, added, or deleted include:

- Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built plans. Cross out such words and phrases as “optimal requirement,” “or equal,” and list specifically the items installed.
- Note unusual or uncharted obstructions that are encountered in the work area during construction.
- Record all significant differences in the geologic information and amend any geologic maps and sections in the design or geological reports. Show geological conditions exposed during excavation that were not previously observed and reported. Document actual conditions encountered, with particular emphasis on those that vary significantly from information presented in the as-designed drawings. Significant differences include structural or stratigraphy discontinuities in the geologic materials (any type of soil or rock) at the site, location of solution cavities and voids, ground water conditions, and any other geologic related condition that can adversely affect the engineering performance of the structure.
- Record location, extent, thickness, and size of protection (riprap, articulating concrete

blocks) if different from as-designed location, extent, thickness, and size.

- Show structural and/or dimensional changes made in a conduit, drainage systems, cutoff trench, foundation preparation, embankment zoning, geotextile, dental concrete, outlet pipes, or any structural element.
- Note changes during construction that could affect the storage volume of a reservoir or structure. These changes could include more or less borrow material being removed from the reservoir basin, deposition of waste material within the basin, and a significant change in a structure (like a roadway) within the storage area.

The most important guideline is that the marked-up changes shown on the as-built plans shall be complete and understandable. Record changes so that as-built information is obvious (clouding). Legibility is an issue because the drawings may be scanned and reduced in size. The following information is provided to improve the quality of the as-built drawings.

- Where possible, use three base colors in marking the working or field copy of the as-built drawings. Provide a legend indicating the purpose of the colors used. Traditional base colors are:
 - Deletions (red)—Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.
 - Additions (green)—Added items shall be drawn in green with green lettering in notes and leaders.
 - Special (blue)—Items requiring special information, coordination, or special detailing or detailing notes shall be in blue.
- Frequently use written explanations on as-built drawings to describe changes; do not rely totally on graphic means to convey the revision.
- Legibility of lettering and numbers shall be precise and clear.
- Clarify ambiguities concerning the nature and application of the change.
- Wherever a revision is made, make changes to related section views, details, legend, profiles,

plans and elevation views, schedules, notes and call-out designations, and mark accordingly to avoid conflicting data on all other sheets.

- When deletions are made, cross out all features, data, and captions that relate to that revision.
- When changes are required on small-scale drawings and in restricted areas, draw or sketch large-scale inserts, with references to the applicable location.
- Be sure to add and denote in the legend, any additional equipment, materials, facilities, service lines, incorporated into the work.
- When attached drawings or sketches are provided with the field copy of the as-built drawings, indicate whether:
 - The attached drawings or sketches shall be added to final as-built drawings.
 - or
 - The attached drawings or sketches shall be referenced or used to make changes or additions to the final as-built drawing.
 - or
 - The attached drawings or sketches are for reference only to provide details not required for initial design and are not intended to be included or referenced in the final as-built plans.
- Make the comments on the drawing complete without reference to letters, memorandums, or materials that are not also a part of the as-built drawings.
- The sheet index shall be updated if any sheets are added or deleted or the sheet name has been modified.
- Use check marks or similar marks to indicate items whose measurements match those on the plans.

If the final as-built plans are generated by computer aided design (CAD), the CAD drawings should clearly show both the original design and as-built information using varying line weights, colors, shading, hatching, dimensioning, notes, and separate layers as needed.

(4) Checklists

Checklists are designed to assist QA inspectors in performing inspections of NRCS projects. Checklists provide documentation that a thorough inspection was performed. Checklists are provided in appendix A. The checklists in appendix A may not address all of the duties for which an NRCS QA inspector is responsible on all sites. They should be used for guidance only as the QA inspector plans and conducts inspections and should not be relied upon as a comprehensive list of items to check. QA inspectors should also use their own knowledge and experience when determining what to examine and test during inspections.

The Quality Assurance Inspection Checklist contains QA duties and activities that QA inspectors must perform for typical construction contract work. Other checklists contained in appendix A address QA duties and activities for specific practices such as excavation, foundation preparation, earthfill, concrete.

Checklists filed with the contract documents should be identified by contract number, job name, and date and referenced in the job diary. After completion, they should be submitted or maintained by the inspector to be submitted with the job diaries to the COR/GR to be included in the contract files.

(5) Worksheets

QA inspectors are required to record measurements and calculations during sampling and testing of materials and work performed on a project. This information is used to verify the quality of the work and to document that CQC has met (or failed to meet) contract requirements. When sampling and testing the work, QA inspectors are to complete the worksheets, showing the data recorded and calculations made. The worksheets are a supplement to the information recorded in the job diary and should be referenced in the diary.

Numerous worksheets designed to assist the QA inspector are provided in appendix B along with examples of how to complete the worksheets.

645.0803 References

- American Society of Civil Engineers (ASCE). 2000. Quality in the constructed project—A guide for owners, designers, and constructors. 2nd Edition. Manuals and Reports on Engineering Practice No. 73.
- Code of Federal Regulations, Title 48, Federal Acquisition Regulations System.
- U.S. Army Corps of Engineers. 1992. Construction quality assurance representative guide. EP 415-1-261. Washington, DC.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2001. National Engineering Handbook, Construction Specification 94—Contractor Quality Control. Washington, DC.
- U.S. Environmental Protection Agency. 2002. Guidance for quality assurance project plans. EPA QA/G-5. Available at <http://www.epa.gov/quality/qs-docs/g5-final.pdf>. Accessed November 15, 2011. Washington, DC.