Section 3.2

QUALITY ASSURANCE AND QUALITY CONTROL OF FIELD CONSTRUCTION OPERATIONS

3.2.1 Purpose

The purpose of this section is to explain the Quality Assurance (QA) and Quality Control (QC) ~~with regard to the duties and responsibilities~~ process for~~of construction inspectors that monitor a Contractor's~~ construction operations~~ in the field~~. ~~In addition, t~~This section also addresses the ~~QA/QC~~ procedures that construction inspectors ~~must~~ use ~~in order~~ to ~~satisfactorily~~ perform their duties as the ~~Florida Department of Transportation's (~~Department~~)~~'s ~~first line QA/QC~~ representatives in the field.~~ These procedures cover inspector training, preparation and performance, which if followed, should result in a complete and accurate QA/QC process.~~

3.2.2 Authority

Section 334.048, Florida Statutes~~, (F.S.)~~

~~3.2.3 Reference~~

~~3.2.3.0 Contract Documents~~

~~The following documents are referenced within this document and all are part of the construction contract between the Contractor and the Department:~~

~~(1) Special Provisions,~~
~~(2) Technical Special Provisions,~~
~~(3) Plans,~~
~~(4) Design Standards,~~
~~(5) Developmental Specifications,~~
~~(6) Supplemental Provisions,~~
~~(7) Standard Specifications,~~
~~(8) Storm Water Pollution Prevention Plan,~~
~~(9) Permits,~~
~~(10) Supplemental Agreements and Change Orders,~~
~~(11) Design-Build Design Criteria~~

(12) Design-Build Firm's Project Proposal

3.2.3.23 Procedures, Manuals and Guidelines

The following procedures, guidelines and training manuals provide guidance for QC inspections and where available online, their website addresses are listed.

(1) Construction Project Administration Manual (CPAM)
[http://www.dot.state.fl.us/construction/manuals/cpam/CPAM70000000/cpamman.htm]

(2) Basis of Estimates Handbook (Metric and English)
[http://www.dot.state.fl.us/estimates/BOE/07BOEonline.htm]

(3) Computation Methods for Design, Construction, and Final Estimates
[http://www.dot.state.fl.us/construction/manuals/finalest/newcompbook/Handbook_menu.htm]

(4) Preparation and Documentation Manual
[http://www.dot.state.fl.us/construction/manuals/finalest/p&d/P&D%20manual.htm]

(5) Review and Administration Manual
[http://www.dot.state.fl.us/construction/manuals/finalest/review%20&%20admin/chapters/aduit%20&%20admin.htm]

(6) Manual on Uniform Traffic Control Devices (MUTCD) and FDOT MOT Training
MUTCD - [http://mutcd.fhwa.dot.gov/pdfs/2003r1/pdf-index.htm]
FDOT MOT Training - [http://www.dot.state.fl.us/rddesign/MOT/MOT.htm]

(7) Design Standards including Typical MOT details
[http://www.dot.state.fl.us/rddesign/DesignStandards/Standards.htm]

(8) Florida Test Methods at the State Materials Office Website
[http://www.dot.state.fl.us/statematerialsoffice/administration/resources/library/publications/fstm/disclaimer.htm]

(9) Materials Manual (Produced by the FDOT State Materials Office)
[http://www.dot.state.fl.us/statematerialsoffice/administration/resources/library/publications/materialsmanual/index.htm]

~~(10) Statewide Inspection Guidelists [http://www.dot.state.fl.us/construction/CONSTADM/guidelist/guideindex.htm]~~

~~(11) Florida Stormwater, Erosion, and Sedimentation Control Inspections Manual [http://www.dep.state.fl.us/water/nonpoint/ero_man.htm]~~

~~(12) OSHA – Safety and Health Regulations for Construction (Part 1926) [http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10593]~~

~~(13) FDOT Construction Self-Study Training Manuals, Tutorials and Other Construction Training Manuals and Publications Online [http://www.dot.state.fl.us/construction/training/training.htm]~~

~~(14) Construction Qualification and Training Manual (CTQM) [http://www.dot.state.fl.us/construction/manuals/ctqm/700000001_CTAQM.htm]~~

~~3.2.5~~7~~3~~.2.3 Definitions

~~The following definitions are for use with this procedure:~~

~~**Contract Documents:** All the documents that constitute the contract between the Department and the Contractor for construction of a project and which are listed in ***Section 3.2.3.1*** of this procedure.~~

Contractor Quality Control ~~(CQC)~~: A contract requirement ~~of the contract documents~~ that makes the Contractor responsible for ~~for gathering~~ material sampling and testing~~es; for acceptance testing of those samples;~~, ~~for performing quality control~~ inspection of the work~~;~~, and ~~for generating and~~ maintaining associated ~~all mandatory~~ records ~~associated with these responsibilities~~.

Guidelist: A list of major contract document requirements that inspectors are expected to verify without fail. A guidelist is not ~~intended to be~~ a comprehensive list of all contract document requirements ~~since the contract documents and Department procedures contain many other requirements that are not major~~. ~~To view the guidelists online, go to the website address in item 10, ***Section 3.2.3.2*** of this procedure.~~

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Quality Assurance: The process for monitoring the Contractor's level of compliance with, and the effectiveness of the Quality Control Plan ~~as well as evaluating the effectiveness of the Plan~~.

~~**Quality Control:** The process of monitoring and documenting the Contractor's operations and performance as well as evaluating the acceptability of the Contractor's product and performance. Product acceptability is established by determining if the product complies with the Contract Documents. Performance is determined according to ***CPAM Section 13.1***. In performing the monitoring process, an inspector is often in the position of affecting the Contractor's progress since in some instances construction should not proceed until the inspector is sure that the Contractor complies with the contract documents. It is because of this authority vested in the inspector that the process is referred to as Quality Control since the inspector can be in control of the Contractor's quality and progress.~~

Quality Control Plan (QCP): A written plan developed by the Contractor and approved by the Department that details the qualified ~~policies~~personnel, methods and ~~procedures~~ materials that the Contractor intends to use to ensure that the ~~level of quality required by~~ work complies with the contract documents ~~is achieved~~.

~~3.2.58~~3.2.4 General

The Contract Documents set forth the requirements of the Contractor Quality Control ~~(CQC)~~ program ~~which requires Contractors to be responsible for materials sampling, testing and inspection~~. ~~CQC is not; however, required for all materials and inspection activities, some examples of which are nonstructural concrete and foundation inspection.~~ Since the Contractor Quality Control specification requires the Contractor to be responsible for the Quality Control inspection of applicable materials, ~~the~~ Construction Engineering and Inspection (CEI) personnel ~~responsible for inspection, whether consultant or Department employees,~~ do not have this responsibility as a primary function. Instead, CEI personnel~~inspectors~~ have the primary function of ~~performing QA which requires~~ monitoring the Contractor's level of compliance with the Quality Control Plan and~~(QCP) as well as~~ evaluating the effectiveness of the Plan. In-person Quality Assurance inspections of work in progress~~, similar to those performed during QC inspections,~~ are also required~~;~~. ~~however, t~~These inspections should be selected on an as needed basis and are typically at a ~~much~~ less frequent interval than ~~are routine~~ Quality Control inspections.

Quality Control inspections of ~~If m~~materials or inspection activities ~~are~~ not covered by Contractor Quality Control specification ~~then the primary function of~~must be performed

3.2.~~5~~6 Quality Assurance

3.2.~~5~~6.1 General

~~The inspector~~ CEI personnel must determine how well the Contactor is following the Quality Control Plan and the effectiveness of the Plan. ~~and i~~If ~~it~~the QCP is not being followed, this must be brought to the attention of ~~the appropriate Contractor manager such as~~ the Quality Control Manager~~,~~ ~~as well as~~ and the CEI Project Administrator (PA). Depending on the degree of noncompliance with the QCP, the PA will either approve the immediate adjustment of a minor QC lapse, ~~but still allow work to continue,~~ or the PA will suspend work on the applicable part of the QCP until the Contractor revises it and receives re-approval from the PA. If the Contractor is following the QCP but the result is unacceptable quality then the inspector must ~~immediately bring this to the attention of~~ notify the PA so ~~that~~ the QCP can be revised ~~to be more effective~~. The inspector should always document instances of noncompliance with the QCP as well as instances where the QCP was followed but was not effective. This documentation must be kept in the Daily Work Report or Daily Report of Construction. These instances should also be discussed at work progress meetings and the PA should ~~hold the Contractor accountable for QCP violations by reflecting them~~ note QCP violations and failures in the Contractor's Past Performance Report.

3.2.~~5~~6.2 Performing Quality Assurance

~~**(A) Resident Level Responsibilities**~~

~~In order to be fully prepared t~~To perform effective Quality Assurance, ~~the inspector~~ CEI personnel must become ~~completely~~ familiar with the provisions and procedures ~~of~~in the approved QCP. ~~The inspector~~ CEI personnel must verify that the individuals ~~that are~~ identified in the QCP as ~~being~~ responsible for ~~performing~~ Quality Control fulfill this responsibility ~~actually do perform Quality Control~~ and that their efforts minimize Quality Control lapses ~~by workers~~. If their efforts are not effective then this should be discussed with the Quality Control Manager and PA so that improvements~~d procedures~~ are ~~established and~~ implemented in a timely manner. ~~In order t~~To determine if there are Quality Control lapses during construction operations, inspectors must perform in-person inspections on an as needed basis. ~~Since the inspector is not expected to be~~

~~present at all times but instead shows up at locations and times that are judged likely to~~ Quality Control and ~~what~~ which operations have not. Operations that have not had should be visited more often.

3.2.~~7~~6 Quality Control

3.2.~~7~~6.1 General

It is a construction inspector's responsibility to ensure ~~that construction is being performed according to~~ compliance with the contract documents through direct observation of construction operations ~~that are underway~~, ~~by~~ examination of completed construction, ~~by~~ sampling and testing of materials, and ~~by~~ review of ~~written and electronic~~ records to verify compliance with instructions for those records. It is also the inspector's ~~job~~responsibility to produce the required performance ~~written~~ record~~s to substantiate the acceptability of the Contractor's work and performance evaluation~~. ~~An inspector's ability to accomplish~~ Performance of these responsibilities ~~depends~~ requires ~~on receiving proper~~ training, ~~on thoroughly~~ prepar~~ationing for inspections~~, ~~on focused~~ observation of field operations and ~~on conscientious~~ record keeping.

3.2.~~7~~6.2 Training Requirements

~~**(A) Resident Level Responsibilities**~~

Prior to performing an inspection, an inspector should have completed training ~~directly~~ related to the construction operation to be inspected. ~~In order for an inspector to be properly trained, c~~Classroom or self-~~ study courses must be completed taken and passed~~ prior to being in direct charge of an inspection ~~assignment~~. The inspection of certain construction operations requires ~~that the inspector have a~~ formal ~~qualification or~~ certification, such as ~~is required for~~ pile driving and drill shaft inspection. ~~In addition to formal course work, i~~Inspectors should ~~also~~ receive ~~comprehensive~~ field training sessions from a lead inspector, PA~~project administrator~~ or other qualified instructor. The inspector should be able to ~~fully~~ observe a complete construction operation and its related inspection activities~~,~~ prior to being assigned to inspect that ~~type of construction~~ operation. ~~Field training received from a qualified instructor should include a complete explanation of how the Contractor conducts the operation being inspected, including~~

3.2.~~7~~6.3 Preparation for Inspection

~~Performing a high quality inspection requires thorough and complete preparation before any field activities begin.~~
~~Performing the following tasks will insure that preparation is done thoroughly.~~

(1) Document Review

~~(A) Resident Level Responsibilities~~

~~Every project comes with a set of documents that tells the Contractor what the Department expects with regard to construction requirements, how the quality of the finished product will be evaluated, and how payment will be made. These documents are called **Contract Documents** and it is the inspector's job to verify that the Contractor performs the work according to the Contract Documents. Therefore, it is of the utmost importance that a~~An i~~I~~nspector~~s~~ must ~~be thoroughly~~ familiar with ~~what is specified in~~ the contract documents. This requires ~~reading and rereading~~ studying and annotating the contract documents~~, and taking notes~~ until a full understanding is achieved. ~~This study process should include taking notes that can be referred to in the field when needed.~~

~~At least t~~The following contract documents and other~~s documents~~ may require review~~:. Other documents may also require review depending on the specific project requirements.~~

(1) Specifications (~~including s~~Standard specifications, ~~supplemental,~~ special provisions and technical special provisions);

(2) Plans and plan notes;

(3) Design standards;

(4) Contractor Quality Control Plans and~~,~~ ~~Pile and Drilled Shaft~~ Foundation Installation Plans~~, etc.;~~

(5) Material design mixes;

~~(6) Computation book;~~

(~~7~~6) Job guide schedule for materials;

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(~~8~~7) Material sampling procedure~~s publications~~;

(~~9~~8) Quality Control Guidelists;

(~~10~~9) Safety ~~m~~Manuals; and

(11~~0~~) Basis of Estimates Manual.

~~Review of guidelists, which are lists of the major requirements that inspectors must verify without fail, is particularly important since they increase the inspector's awareness of what contract document sections apply to the construction operation for which preparation is being performed. At the end of each guidelist requirement a notation indicates in what section of a publication, such as the construction specification or ***CPAM***, the user can find detailed information about the requirement.~~

~~(2) Records Preparation~~

~~(A) Resident Level Responsibilities~~

~~Inspectors are required to record a variety of construction related information. This information is usually entered onto preprinted forms or into computer based records; however, some of the information is recorded in project specific hard copy field books or logs that must be fully prepared by the inspector before any information is entered. Most of the logs have to do with tracking the quantities of materials that are used in the project but other logs keep track of pile driving data, survey data, etc. These logs and records usually have a standard format that must be used. For guidance about proper accuracy, see the ***Basis of Estimates Handbook*** which lists each pay item in the Contract Estimating System (CES). For the ddocumentation requirements and forms for final measurements and the scope of for these records, see the ***Preparation and Documentation Manual, Topic Number 700-050-010CPAM Section 5.11 Final Estimates Documents***.~~

(~~3~~2) Planning

~~(A) Resident Level Responsibilities~~

~~The Contractor's construction operations can often be very complicated and are usually critical in terms of how much time activities take. When things go wrong or when planning is inadequate, it disrupts the progress of construction and can lead to project~~

~~delays and claims by the Contractor. In order to reduce the likelihood of inadequate o~~Operations Meeting, should be held ~~take place~~ between ~~the~~ CEI staff~~Department, the~~ Subcontractors ~~before the Contractor~~ prior to the initial performance of~~s~~ any major construction activity ~~or operation for the first time~~. During this meeting, the Project Administrator should clearly establish lines of communication between project staff members, identify those in authority, ~~assign various responsibilities~~ and ~~develop~~ discuss ~~problem~~ issue escalation procedures.

~~Where practical, a~~As many ~~Department,~~ CEI ~~Consultant~~ and Contractor personnel ~~as possible~~ who will be ~~directly~~ involved in the activity as possible should attend the meeting. At the meeting, applicable specifications, plans and guidelists should be available for review ~~with the Contractor~~. ~~A copy of the guidelists should be given out at, or before, the meeting so the Contractor has a written document for future reference and to facilitate an item-by-item review of the guidelists with the Contractor. At the meeting, the a~~Applicable specifications should be reviewed ~~with the Contractor~~ and a "What If" discussion should take place ~~with~~ regarding ~~to~~ the Contractor's plans ~~if something~~ to deal with unexpected issues ~~happens~~ during the ~~construction~~ operation. All inspectors who will be inspecting the ~~anticipated~~ operation should ~~try to~~ attend the Pre-operations Meeting~~;~~. ~~however, i~~If they are unable to attend ~~then~~ they should discuss the operation ~~thoroughly~~ with the Project Administrator and the Lead Inspector prior to ~~its start~~the operation. ~~Pre-operations meetings should always be conducted as described above for major construction operations; however, every effort should be made to have pre-operations meetings for minor construction operations as well. For minor operations, the meetings can be shorter, more informal and can involve fewer participants.~~

~~(4) Equipment Preparation~~

~~(A) Resident Level Responsibilities~~

~~Inspectors must use a variety of devices and equipment in order to be able to do proper and accurate inspections. To make sure that all necessary equipment will be available during an inspection, an equipment checklist can be used prior to the start of each different type of construction operation, since the equipment required will vary with the type of operation. Verify that equipment calibrations are up to date.~~

3.2.~~7~~6.4 Performance of Field Inspections

(1) Field Reference Documents

~~**(A) Resident Level Responsibilities**~~

Specifications for Road and Bridge Construction, ***Design Standards***, all applicable guidelists, plans sheets, ~~contract documents, and~~ sampling and testing ~~guides and~~ logs~~.~~ ~~In addition, c~~Complete sets of these documents must be available ~~for inspector~~

The following documents must be available ~~in the inspector's vehicle~~ for ~~immediate~~ reference by the inspector: ~~applicable~~ ***Standard Specifications for Road and Bridge Construction***, ***Design Standards***, all applicable guidelists, plans sheets, ~~contract documents, and~~ sampling and testing ~~guides and~~ logs~~,~~ and material design mixes ~~that apply to the construction operation being inspected~~. ~~In addition, c~~Complete sets of these documents must be available ~~for inspector reference~~ in the field office ~~or in the Resident Engineer's office if no field office exists~~.

~~(2) Performing an Inspection~~

~~(A) Resident Level Responsibilities~~

~~Just prior to the start of a construction operation, the inspector should do a thorough review of the applicable contract documents and guidelists. Any specification or guidelist requirement that is not completely clear should be discussed with the Lead Inspector or Project Engineer and the specification covering the guidelist requirement should be studied. During the actual inspection of the Contractor's work, the inspector should refer to the guidelist often and may find it helpful to have a copy on his/her person at all times. As a general rule, the guidelist shall be referred to each time the Contractor performs an operation. When the operation is checked enough times to completely determine the Contractor's level of quality control, then judgment can be applied to whether to reduce the frequency of inspection. Before any decision to reduce the frequency of checking is put into effect, the inspector should discuss this with the Lead Inspector or Project Administrator. Once the Contractor has completed an operation, all aspects of the operation that could have been done incorrectly but could not be verified by the inspector while the operation was underway should be checked, if possible.~~

(~~3~~2) Documenting the Inspection

Inspectors must record a variety of construction related information. For guidance about proper accuracy, see the ***Basis of Estimates Handbook*** which lists each pay item in the Contract Estimating System. For documentation requirements and for these records, see the ***CPAM Section 5.11 Final Estimates Documents***.

~~**(A) Resident Level Responsibilities**~~

An inspector must ~~formally~~ record ~~specific~~ details of construction activities each day for all assigned construction activities into Site Manager ~~that have been assigned to that inspector~~. ~~In order to formally record construction activities, the inspector must enter predetermined items of information into a laptop computer that the inspector uses in the field and by employing a computer program referred to as "Site Manager ".~~ The computer record that results from the inspector's ~~computer~~ input is ~~referred to as~~ the "***The Daily Work Report***". For details about Site Manager and the requirements of The ***Daily Work Report***, see ***CPAM Section 5.1***. ~~If a laptop computer is not available for inspector use then the inspector must fill out the ***Daily Report of Construction (DRC), Form No. 700-010-13*** every day including each operation and location of construction that has been assigned. It is very important for the ***DRC*** to be filled out completely and accurately. When the inspector has access to a computer but no less often than once per week, the information on the ***DRC*** form must be entered into Site Manager by the inspector and paper ***DRC's*** must be scanned and stored in the "Hummingbird" electronic document management system. In addition to the standard information that is required by the ***DRC*** and ***Daily Work Report*** (see ***CPAM Section 5.1, Project Diary***, for detailed description), t~~The information covered in the "***Contractor QC Lapses***" section that followings should be entered into the comments section of the form and into the "Remarks" section of the ***Daily Work Report*** under remarks category: QC Plan Compliance.

Contractor QC Lapses: The inspector must record lapses of the Contractor's QC. ~~For example, if the Contractor has asked for a final inspection of deck rebars shortly before deck concrete placement, and if rebars have been placed incorrectly, then this lapse should be recorded in the ***Daily Work Report*** or ***DRC***. The intent of this reporting is not only to document isolated or infrequent lapses in QC, but to report repeated patterns of inadequate or poorly managed QC. It is especially important to report QC lapses that have major significance, such as causing major delay or expense to the Contractor or resulting in a finished product that is not in compliance with the Contract Documents. The information that is provided by the inspector on the ***Daily Report of Construction*** or ***Daily Work Report***, documents that the Contractor's QC needs improvement and confirms that the Department's Quality Assurance program is effective with regard to identifying Contractor QC lapses. This information also provides vital documentation for~~ lapses are used in the computation of the Contractor's Past Performance Rating.