Section 8.1

QUALITY ASSURANCE INSPECTION OF PRECAST PRESTRESSED CONCRETE PRODUCTS

8.1.1 PURPOSE

This procedure provides guidelines to the Florida Department of Transportation (here in after called Department) personnel and other entities that are involved in the Quality Assurance (QA) review and inspection program of the precast/prestressed concrete plants. The purpose of the procedure is to standardize the inspection and acceptance criteria of prestressed concrete products for statewide FDOT projects.

8.1.2 AUTHORITY

Sections 20.23(3)(a) and 344.048(3), Florida Statutes.

8.1.3 REFERENCES

Construction Project Administration Manual, Florida Department of Transportation Construction Office, Procedure No. 700-000-000.

Structures Design Guidelines, Florida Department of Transportation-Structures Design Office, Procedure No. 625-020-150.

Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, Precast/Prestressed Concrete Institute (PCI) Manual MNL 116.

Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

8.1.4 SCOPE

This procedure establishes the Department's requirements and activities for a QA plan for precast/prestressed concrete products. These requirements and activities pertain to the inspections, measurements and tests necessary to substantiate materials and products in conformity with contract requirements.

The Department's QA plan is designed and implemented with the objective of assuring that the Producer's Quality Control Plan (QCP) providing finished products that meet the specified quality. The QA plan comprises the Verification, Independent Verification, Independent Assurance (IA), and Prestressed Concrete Plant Qualification Review (PCPQR). Department representatives, who are directly assigned the monitoring duties of the precast products during production, perform Verification and Independent Verification inspection and testing. IA inspections and PCPQR are performed by Department representatives, who are not directly assigned to Verification inspection and testing, by other local or state agency representatives, and Federal Highway Administration (FHWA).

8.1.5 GENERAL INFORMATION

The Quality Control/Quality Assurance Program for precast/prestressed concrete products is composed of the Producer's QCP and the Department's QA Plan. The Producer's QCP shall include sampling, testing, and inspections. The Department provides QA sampling, testing, and inspection, including PCPQR.

All prestressed concrete plants, hereinafter called plants, are required to be on the current certified plant list of the Precast/Prestressed Concrete Institute (PCI) for the group(s) and category/categories of the products that they are producing. The plants are required to submit their proposed QCP for the review of the Department. The QCP shall include a copy of the plant's PCI approved ***Quality Systems Manual (QSM)*** and any additional specification or other contract document requirements that are not contained in QSM. Upon the Department's acceptance of the plant's QCP and satisfactory initial and annual plant inspections, the plants will be permitted to begin or continue the production of the certified group(s) and category/categories of the precast/prestressed concrete products for the Department projects**.**

This Section of the Materials Manual provides guidelines for the qualification process of the plants and describes the related functions and responsibilities of the personnel and entities that are involved in the implementation of the quality control and quality assurance programs. It replaces the originally published ***Manual for Quality Assurance of Prestressed Concrete Members, Procedure No. 675-010-001.***

8.1.6 PLANT QUALIFICATION PROCESS

8.1.6.1 General

The Department's plant qualification program constitutes a Department process for acceptance of prestressed concrete products, which establishes the potential for less involvement by Department inspectors at the fabrication plant. In turn, the fabricators will become substantially more responsible for the quality of their products.

8.1.6.2 Review of Plant's Proposed Quality Control Plan (QCP)

The PCI certified plants should submit their proposed QCP to the Department's District Materials Office for the District in which the plant is located. For out-of-state plants, the QCP shall be submitted to the Department's District Materials Office of the District in which the construction project is located. Upon the plant's submittal of QCP, in accordance with ***Sections 6-8, 105***, and ***450*** of the Department's ***Standard Specifications***, the District Materials Office will start the review of the proposed QCP and make necessary arrangements for the initial PCPQR in accordance with ***Section 8.1.6.3***. The District Materials Office may contact the State Materials Office for review of the proposed QCP, when there is a need of technical support from the State Materials Office. The District Materials Office will review and approve the proposed QCP. Modifications to the QCP shall be submitted for approval in the same manner.

The proposed QCP should include the following documentation:

(A) The documents showing that the plant has an onsite:

(1) Production Manager

(2) Specialty Engineer on staff or as a retainer

(3) PCI certified Level III Quality Control Manager (QCM) who has completed ***Section 450*** specification examination.

(4) *Adequate number of PCI certified Level II inspectors, who have successfully completed ***Section 450*** specification examination and are responsible for routine inspections and documentation of all phases of construction.

(B) A copy of the PCI approved QSM.

A copy of the plant's proposed repair methods, unless the plant prefers to

submit the proposed repair method for each individual deficiency separately during the construction.

*Department qualified inspectors are exempt from the above requirements until the time of expiration of their current certificates.

8.1.6.3 Prestessed Concrete Plant Qualification Review (PCPQR)

The District Materials Office will form a Prestressed Concrete Plant Qualification Review Team (PCPQRT) and make necessary arrangements to perform the plant's initial qualification review. PCPQRT may be comprised of the District and State Prestressed Concrete Engineers, District Concrete Engineers, PCI level III certified Quality Control inspector (or Department Certified Prestressed Concrete Inspector), representatives of the State and District Construction and Structures Offices, and representative(s) of the FHWA. The PCPQRT will closely and thoroughly review the plant's design, fabrication process, Quality Control (QC) testing, inspection, and documentation to ensure that they meet the Department's established standards. The initial PCPQR may include the review of the plant's records, forming, reinforcing steel placement, concrete placement operations, tensioning and detensioning of the prestressing strands, storage, and shipment of the products. The PCPQR includes the initial and at least an annual plant qualification reviews.

During the PCPQR, the plant shall produce the two most recent PCI audit reports, if applicable. The plant shall provide documentation that all deficiencies found during the recent PCI inspections have been corrected or action has been taken to correct the problem(s).

Upon the Department's satisfactory review of the proposed QCP, in compliance with ***Section 5.6*** of the Materials Manual, and satisfactory initial plant inspection, the District Materials Office will approve the proposed QCP and include the plant on the list of Department Qualified Precast/Prestressed Concrete Plants.

8.1.6.4 Maintenance of Plant Qualification

The prestressed concrete plant shall submit in writing any changes to the fabrication methods, and/or changes to the QCP, including QSM. Upon receipt of the request, the Department may initiate a plant review.

8.1.1.1 Plants that are on the Department's qualified precast/prestressed concrete plant list will be subject to the PCPQR process (complete or partial) at any

time. The PCPQRT will perform at least an annual review of the plants that are producing for the Department projects. Upon completion of the inspections, the PCPQRT will advise the plant regarding the results of the review and the plant's qualification status.

8.1.6.5 Loss of Plant Qualification

The District Materials Office may withdraw the plant from the list of qualified plants based on the recommendation of PCPQRT or District Prestressed Concrete Engineer, indicating the plant's noncompliance with the established standards, or any of the following conditions:

(A) Loss of PCI certification.

(B) Inability to fabricate products that consistently meet specification requirements.

(C) Lack of maintenance of required records and improper documentation.

(D) Failure to maintain an approved quality control program.

(E) Failure to satisfactorily resolve deficiencies identified by PCPQRT as described in ***Section 8.1.6.4***.

During the time a plant is not on the Department's list of qualified precast/prestressed concrete plants list, due to loss of PCI certification or disapproved QCP, prestressed concrete products will be accepted when the plant is under an increased level of verification inspections as determined by the Department. A fabrication plant will have three months to regain its qualification status. If, after three months, the plant has not met all requirements of qualifications, prestressed concrete products that are fabricated at the plant will not be accepted until the plant has met all requirements for re-qualification.

8.1.7 FUNCTIONS AND RESPONSIBILITIES

8.1.7.1 Prestressed Concrete Plant

The plant is responsible for the quality of the finished product and shall have a QCP acceptable to, and approved by, the Department prior to commencement of any work. The QCP shall include a management statement of dedication to quality and to the QCP.

The prestressed concrete plant shall provide facilities and qualified personnel to perform specified tests and maintain an acceptable Quality Control (QC) program in compliance with the requirements as specified herein and in ***Section 450*** of the specification, ***PCI Manual MNL–116***, and plant's approved quality control plan. The contract documents will govern when there is a discrepancy between ***MNL –116*** and the contract documents.

8.1.1.2 8.1.7.2 District Materials Office

The District Materials Office approves the proposed QCP, performs periodic QA functions, including, Verification sampling and testing, PCPQR, IA, and IV sampling and testing. The District Materials Office is responsible for providing the QA function at all precast/prestressed concrete plants that are located within the District. The QA review of plants located out of state shall be the responsibility of the District Materials Office of the District in which the project is located. District Materials Offices providing the QA function may perform the QA program by their own personnel, consultant personnel under contract, or by other District Materials Office personnel through mutual agreement between Districts. Quality Assurance inspectors shall monitor the Producer's operations by performing PCPQR, Verification, and IA inspections. The PCPQRT will perform at least an annual review of the plants to ensure that the quality and acceptability of the precast/prestressed concrete products are in accordance with the requirements of the contract documents. The Verification of the concrete tests and inspections are performed in accordance with ***Section 346*** specification. Verification testing and inspection of reinforcing steel, welded wire fabric, and prestressing strands are performed by sampling at least from two LOTs per year and tested at the State Materials Office. The Verifications of other prestressed concrete related materials are done by review of the manufacturer's records that are maintained in the plant's QC files.

The detailed functions of the Verification inspectors, Resolution inspectors, Independent Assurance inspectors, and Independent Verification inspectors are described in ***Sections 8.1.7.2.1 – 8.1.7.2.4***.

8.1.7.2.1 Verification Inspections

The Department or its representative will monitor the plant's QC operations to assure conformity with the contract plans and specifications. The Department will perform inspection and testing of materials and of the precast/prestressed concrete products to the extent considered necessary to verify the effectiveness of the Producer's QCP and to assure acceptability of the finished members. Department inspectors will not

issue instructions to the plant's representatives on how to run their operations. However, the Department's inspectors will question or advise the plant's representatives against continuation of any operation or sequence of operations observed, which may result in unsatisfactory compliance with contract plan or specification requirements.

The Department will perform the required concrete Verification inspection and testing at the specified frequency, as described in Section 346 Specification, to compare the results of the Verification tests with the QC test results. When there is favorable comparison, the Verification test results are used for acceptance and for payment. If there is not a favorable comparison the Department and the plant will proceed to the Resolution inspection and testing.

The District Material Engineer shall assure that only qualified inspectors are assigned to each plant producing precast/prestressed concrete products. For the prestressed concrete related Verification inspection and testing, as a minimum, the District Materials Office shall assign Verification inspectors that are certified PCI Level II inspector and have satisfactorily completed 450 specification examination. The duties of the Verification inspectors, at the prestressed concrete plants, are described in ***Sections 8.1.7.2.1.1 – 8.1.7.2.1.7***.

8.1.7.2.1.1 Material Verification Review

(a) The Verification inspector shall perform a weekly review of the plant's records for materials received at the plant and/or incorporated into the fabrication of precast prestressed concrete products, including the certified physical property reports. The inspector shall assure that the records are adequate to verify that all materials meet the requirements of the contract documents.

(b) Weekly, the inspector shall check the handling and storage for each of the materials to assure compliance with the specifications. Steel materials shall be visually inspected for condition

(c) For miscellaneous materials, the inspector shall assure that the plant has used the Qualified Products List (QPL) and applicable material certifications to verify compliance with contract document requirements.

(d) The Department's inspector shall bring all deficiencies in material acceptance to the attention of the plant's QCM.

8.1.7.2.1.2 Sampling and Testing

(a) General

Verification sampling and testing shall be performed in accordance with the schedule specified in Section 450 specification and summarized herein. Independent Verification samples may be obtained at the discretion of the inspector. The Department's District Materials Office's testing laboratory, State Materials Office's testing laboratory or any other District Materials Office's contracted laboratory meeting the requirements of ***Section 6-9***, may be used for materials testing.

(b) Schedule

1. Reinforcing steel and welded wire fabric

Each LOT of the reinforcing steel and welded wire fabric is accepted based on manufacturer's certified mill analysis and the Department's Verification samples. A LOT is a single vehicle load of the reinforcing steel or welded wire fabric of the same grade and manufacturer that is delivered to the plant. The Verification inspector shall take samples from at least two LOTs per year. From each of the two randomly selected LOTs of reinforcing steel and welded wire fabric, three samples shall be taken per year. Each sample of reinforcing steel shall be seven feet long. Each sample of welded wire fabric shall cover at least an area of four intersections of transverse and longitudinal bars. The transverse wires of the welded wire fabric shall extend approximately six inches to both sides of the welded joints.

One of the samples from each LOT shall be sent to State Materials Office for testing and the remaining samples, properly identified and tagged, shall be stored for future testing in the event of failure of the first sample. If the first sample fails to meet the specified requirements, the second sample shall be tested. If both samples fail to meet specified requirements, the LOT of material shall be rejected and replaced with material

meeting the requirements. If one sample fails and one sample meets the specified requirements, the third sample shall be tested to confirm material acceptability. If third sample fails to meet specified requirements, the LOT of material shall be rejected and replaced with material meeting the requirements.

Each LOT of material that does not conform to the requirements of the contract documents shall be rejected.

2. Prestressing Steel

Each LOT of the prestressing steel is accepted based on manufacturer's certified mill analysis and the Department's Verification samples from at least two LOTs per year. The Verification inspector shall randomly select the LOTs and take three five-foot long samples of prestressing strands from each of the two randomly selected LOTs.

One sample of each LOT shall be tested and the remaining samples, properly identified and tagged, shall be stored for future testing in the event of loss or failure of the first sample to meet minimum requirements. If the first sample fails to meet the requirements specified, the second sample shall be tested. If both samples fail to meet specified requirements, the LOT of material shall be rejected and replaced with material meeting the requirements. If one sample fails and one sample meets the specified requirements, the third sample may be tested to confirm material acceptability. If third sample fails to meet specified requirements, the LOT of material shall be rejected and replaced with material meeting the requirements.

Each LOT of material that does not conform to the requirements of the contract documents shall be rejected.

3. Concrete

Concrete shall be sampled and tested in accordance with Section 346 specification, except as modified in ***Section 450*** specification. For the prestressed concrete compressive strength tests, the use of 4" x 8" test cylinders is allowed. For the use of 4" x 8" cylinders, the Verification inspector shall verify that approved mix design include the test data of both 6" x 12" and 4" x 8" cylinders. For the purpose of comparison, the

Verification inspector shall use the same size cylinder used by the QC inspector.

4. Miscellaneous Materials

The Department shall check the plant's basis for acceptance of miscellaneous materials.

8.1.7.2.1.3 Inspection

(a) General

The Verification inspector shall review and become familiar with prestressed concrete related sections of the Materials Manual, the approved plans, and/or shop drawings, and specifications. The Department's inspector shall perform random review of the plant's fabrication methods, procedures, workmanship, and QC inspections. Verification inspections shall include the random review and visual inspections of all other major phases of work such as formwork, reinforcing steel, stressing, curing, detensioning, dimensional checks, handling, storage, and shipping. The Verification inspector shall document the inspections as part of the project's records and shall advise the plant against any observed manufacturing operations, which may result in unsatisfactory contract plans or specification requirements. The Verification inspector shall assist PCPQRT during their initial or annual reviews of the plant qualifications.

(b) Depth of Inspection

The Department's Verification inspection shall be of sufficient depth to assure that the plant's QCM and inspectors are performing the required inspections in compliance with the requirements of the QCP. The Verification inspector shall perform random spot checks to ensure that the observed precast/prestressed concrete products are being fabricated in compliance with the requirements of the contract documents. A more in-depth review of some phases of work may be necessary at the discretion of the inspector.

(c) Finished Member

The Verification inspector shall perform spot checks of the products to detect any defects such as cracks, spalls, chips, and honeycombs, which may require repair before shipping. Periodically, the Verification

inspector shall verify the measurement records for sweep and camber. The Department's inspector shall perform random inspection of the finished products for dimensional and alignment tolerances, handling, storage, and shipping.

(d) Quality Control Documents

The Verification inspector shall perform weekly reviews of the QC reports and check of the plant's documentation for products prior to their shipment. The Verification inspector shall visually inspect randomly selected products after the plant has completed all work prior to shipment to ensure that proper certification statement is included with each shipment. In the absence of the shop drawings, the Verification inspector shall verify that a framing plan, tensioning and elongation calculations, and detensioning schedules are available.

8.1.7.2.1.4 Non-complying Prestressed Concrete Products

(a) General

The Verification inspector will be involved in the verification of the deficient prestressed concrete products, depending on the magnitude of the deficiency and the disposition of the products as described herein and in ***Sections 450-12 through 450-14***.

(b) Cosmetic and Minor Deficiencies

The plant's QCM shall examine and determine the magnitude of the deficiency. When a QCM inspection report indicates that the deficiency belongs to the category of cosmetic or minor deficiency, the plant may repair the deficiency in accordance with ***Section 450-13*** of the specification or an alternate method that has been approved as part of the approved QCP. The repair shall be performed under the observation of the QCM or under the observation of personnel working under the direct supervision of the QCM. The plant's QC personnel shall document the type of deficiency and its repair method. The Verification inspector may perform the spot checks of the type of deficiencies, their repair methods prior to and after the repair, and proper documentation.

(c) Major Deficiencies

When the QCM determines that the type of deficiency belongs to the category of a major deficiency, the plant shall notify the Verification inspector. Based on the magnitude of the deficiency the QCM may propose one of the following procedures for the repair and disposition of the deficient products:

1. Review By Verification Inspector

When the deficiency does not require engineering evaluation, the QCM proposes the repair method in accordance with the approved repair method that has been included as part of the approved QCP. The Verification inspector shall examine the type of deficiency and sign the proposed repair method. The signature of the Verification inspector indicates that the deficiency has been examined and the information in the proposed repair method has been verified. The plant may proceed with the repair method under the observation and satisfaction of the QCM or under the observation of the personnel working under the direct supervision of the QCM.

2. Engineering Evaluation

The plant may propose the repair method in accordance with ***Section 450-14.2***, when the QCM determines that the deficiency requires engineering evaluation. The Verification inspector shall examine the deficiency and review the proposed repair method. After verification of the information in the proposed repair form, the inspector shall sign the repair proposal indicating that the described deficiency has been verified. The plant will submit the proposal in accordance with ***Section 10.2*** of ***Topic No. 700-000-000***, ***Construction Project Administration Manual (CPAM)***. The plant performs the repair after the approval of the proposed repair method.

The Verification inspector shall make sure that the repair is performed under the observation of QCM or under the observation of personnel working under direct supervision of the QCM. The Verification inspector may observe the plant's repair of non-complying members to assure it conforms with the approved repair method meeting the requirements of ***Section 450-14.2***.

8.1.7.2.1.5 Documentation

The Verification inspector shall maintain a diary and other documentation that reflects key inspection, sampling and testing activities performed daily. Also, the diary shall reflect key discussions relative to content and decisions with plant personnel. In addition, the Verification inspector will maintain a record of all results of Verification testing performed on material and disposition of all material samples taken for testing elsewhere.

For each component, the Verification inspector shall check that the QCM has maintained documents indicating compliance with the requirements of the QCP. The Verification inspector shall document the type of deficiencies that have caused the plant to be removed from the Department's Qualified Precast Prestressed Concrete Plant list, and maintain documents of the plant's corrective actions.

8.1.7.2.1.6 Production or Quality Control Deficiencies

The Verification inspector shall evaluate the plant's compliance with the approved QCP and contract document requirements. The Verification inspector shall document and notify the Producer's QCM, during the weekly meetings or any other times deemed necessary, of any deficiencies noted during the Verification inspections. After notifying the QCM, the inspector shall follow up on each issue to assure corrective action has been taken by the plant to resolve the deficiency in the QC operation, fabrication process, or member compliance, as appropriate. The timeliness of actions by the plant shall be documented.

In the event that the deficiencies affect the structural or functional performance of a member, or when the plant does not take timely action to satisfactorily resolve deficiencies in the QC program, fabrication process, or other items as appropriate, the Verification inspector or the District Prestressed Concrete Engineer shall notify the District Materials Engineer. The District Materials Engineer shall immediately review the file, review actions taken by the plant and, if necessary, notify the plant and Contractor in writing that the plant may be removed from the Department's Qualified Precast/Prestressed Concrete Plants list or may be placed on the list of Conditional Qualified status. The Conditional Qualification status will be for a period of time commensurate with the nature of deficiencies and corrective action required, but not to exceed six months. If a plant

does not correct noted deficiencies or remains on a Conditional Qualification status for six months, the District Materials Engineer will remove the plant from the list of Qualified plants. The plant's re-qualification status will be reinstated upon satisfactory resolution of deficiencies found by the Department.

8.1.7.2.1.7 Weekly Meetings

The Verification inspector shall attend weekly meetings that are held with the QCM and Production Personnel. During the meetings the Verification inspector shall discuss the product deficiencies that are found during the weekly inspections, and suggest improvements in the fabrication process and the QC operations.

8.1.7.2.2 Resolution Testing

In accordance with ***Section 346*** of the Department's ***Standard Specification***, the Resolution testing process of concrete is initiated by the District Materials Office to resolve the differences between the QC test data and the Department's Verification tests. If the resolution testing compares favorably with the producer's QC data, the producer's data will be accepted for the payment. If the Resolution testing compares favorably with the Department's Verification data, the Verification is used for acceptance and payment. When the resolution testing does not compare favorably with either the QC or the Verification test, the Resolution test may be used for acceptance and payment.

8.1.7.2.3 Prestressed Concrete Independent Assurance Inspection and Testing

The Concrete IA program is used to check compliance of the sampling and testing technicians and equipment. The District or State Materials Offices perform the IA procedure. The IA program tests both the QC and Verification technicians and equipment. The sampling and testing equipment may be removed when it does not meet the requirements of the specifications. If a technician fails to meet the requirements of an IA inspection, the technician may be given an opportunity to correct the deficiencies.

8.1.7.2.4 Independent Verification

The Department may perform the Independent Verification by sampling and testing any product or its material ingredients that is suspected of noncompliance with the contract documents. This is a checking function

outside of the general verification program, in which sampling and tests are performed on a random basis.

8.1.7.3 State Materials Office

The State Materials Office will provide prestressed concrete related technical support for all Districts. The technical support may be provided by performing the review of the plant's proposed QCP, plant inspection, and by review of the plant's QC/QA records or other prestressed concrete related information that may be needed by the Districts or plant personnel. When requested by the District Materials Office, a State Materials Office's representative will accompany District personnel during Independent Assurance inspections, Independent Verification, or serve as member of the initial and annual PCPQRT. The State Materials Office will maintain the list of the Department's Qualified Precast/Prestressed Concrete Plant.

8.1.7.4 District Construction Office

When a precast/prestressed concrete product does not comply with the requirements of this section or has a major deficiency, the QCM will submit a repair proposal to the Project Engineer in accordance with ***Section 450-14*** and ***Chapter 10*** of the ***CPAM, Topic No. 700-000-000***. The Project Engineer will require a credit on any product with deficiencies that require an engineering evaluation and are attributed to the Contractor.

The Project Engineer at the project site will ensure that the plant has stamped each product, which has been delivered to project site. A signed statement by a plant representative, certifying that all products meet the requirements of the Contract Document, shall accompany each shipment of the products.

The certification shall be on the plant owner's letterhead and shall include as a minimum:

(1) Project Number

(2) Date shipped

(3) Serial Number of the product/products

(4) Certification statement, indicating that the products meet the requirements of the contract documents.

(5) Signature of a plant representative

8.1.7.5 State Construction Office

The State Construction Office will review the proposed construction related specification and project contract administration related changes.

8.1.7.6 District Structures Design Office

The District Structures Design Office will provide structures related District-wide technical support.

8.1.7.7 State Structures Design Office

The State Structures Design Office provides technical guidelines to all Districts. Any changes to the standard structural drawings require State Structures Design Office's approval.

8.1.8 REVISIONS AND ADDITIONS

This Section of the Materials Manual is updated periodically to reflect changes in specifications or needed changes in operating procedures. The State Prestressed Concrete Section of the State Materials Office prepares the update. The updates are prepared after input is received from the District and State Materials, Construction, and Structures Offices. Updates are coordinated through Organization, Forms, and Procedures for conformance with the Standard Operating System.

8.1.9 TRAINING

8.1.9.1 General

The State Prestressed Concrete Section of the State Materials Office, in conjunction with the Florida Prestressed Concrete Association (FPCA), coordinates and organizes the training and testing of private and state employed personnel who are involved in the QC or QA inspection of the precast/prestressed concrete products. The training is offered periodically at various locations. The training course covers the materials that are included in ***Section 450*** of the Department's ***Standard Specifications and PCI Quality Control Technician/Inspector Level I and II Training Manual***. Application processing, testing, and Qualifications are done through industry FPCA.

The QC inspectors, technicians, and managers may make direct arrangements with the Precast/Prestressed Concrete Institute (PCI) to attend their training classes for ***Levels I, II, and III Quality Control Personnel Certification*** or take PCI's self-study courses for Levels I and II and take the required PCI certification examinations.

8.1.9.2 Qualifications of Plant's Quality Control Personnel

The QCM shall have at least 5 years of related experience, a current ***PCI Level III Quality Control Personnel Certification***, and a certificate of completion of ***Section 450*** of the Department's Standard Specification examination. Quality Control inspector/technician shall have a ***PCI Level II*** certification and a certificate of completion of the review of ***Section 450*** of the Department's Standard Specification examination. The District Materials Engineer may reduce the 5-year experience requirement for the plant's proposed QCM with a Professional Engineering license or with a Civil Engineering college degree. The Department Qualified inspectors are exempt from ***PCI Level II and III*** and from completion of the review of the ***Section 450*** of the Department's ***Standard Specification*** examination until the time of expiration of their certificates.

8.1.9.3 Qualifications of Department Quality Assurance Personnel

At each precast/prestressed concrete plant the District Materials Offices will assign at least one full time PCI Level II certified Inspector who has taken and passed the *Section 450* of the Department's Standard Specification examination. The District Materials Engineer will have on staff one certified PCI Level III QC inspector. The Department Qualified Prestressed Concrete Inspectors are exempt from the above requirements until the time of expiration of their current certificates.