I-84 Construction Oversight and Audit Services

Task 1 – Industry Evaluation

Connecticut Department of Transportation

July 10, 2007

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I. Introduction

The primary mission under this task was to identify, gather and evaluate industry standards and practices for public highway construction, inspection and construction oversight. In order to perform this task, we created a baseline of the industry practices and policies by reviewing and examining the standard policies, practices and procedures of several organizations, state transportation authorities and departments. We examined how these organizations are structured, their roles and responsibilities and their use of consultants in the overall delivery of the final end product. Additionally, we reviewed these organizations' standard contractual policies and procedures to determine how they conduct major highway projects. The Connecticut Department of Transportation provided Hill with copies of the electronic files and documents for the I-84 Project. These project documents and other documents were used in this evaluation and the computer directory is provided in Appendix No. 1 for review.

We observed that highway construction, inspection and oversight is managed under similar guidelines and practices throughout the various states that we identified and evaluated.

II. Industry Overview and Basis for Selection

We reviewed available documentation from the Federal Highway Administration ("FHWA"), the American Association of State Highway and Transportation Office ("AASHTO"), the Transportation Research Board ("TRB") and the Construction Management Association of America ("CMAA").

These organizations and associations are known throughout the engineering and construction industry for providing guidelines, standard procedures and protocols for design, construction and advancements in the industry. The CMAA is better known in the 'vertical' or building construction for industry practices and standards.

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After researching the above organizations and associations, we began to investigate and research other states' departments of transportation or highway authorities. During this initial task, we searched for states of comparable size, with similar budgetary constraints, organizations, and technologies. Proximity to Connecticut also was a search criteria. From this analysis, we selected three states of similar size, urban and rural complexities, budget size, and potential advancements in standards and policies. We also selected the three states based upon our in-depth knowledge of their policies and procedures. The three states selected were (1) Pennsylvania, (2) New Jersey, and (3) Maryland.

The Commonwealth of Pennsylvania Department of Transportation ("PennDOT") was selected due to its urban and rural surroundings, such as having large cities with a majority of small town or suburban environments. Additionally, PennDOT was selected for our knowledge of its policies, its technological advancement, such as its Engineering and Construction Management System ("ECMS"), and its detailed standard specifications.

The New Jersey Department of Transportation ("NJDOT") was selected due to its similar size, close proximity to Connecticut and because it is a suburb of large metropolitan areas (New York City and Philadelphia), the size of its budget, and our knowledge of its policies and standard specifications.

The Maryland State Highway Authority ("MSHA") was selected based upon its size, its demographics, which are similar to Connecticut and New Jersey, and our knowledge of its standard specifications.

The following table summarizes some basic statistics of ConnDOT and the other departments of transportation. This information includes the responsible total miles of roadway, other authorities' roadways, the number of bridges and their fiscal year capital

program budgets. The capital program budget includes the costs of maintenance, rehabilitation and new construction.

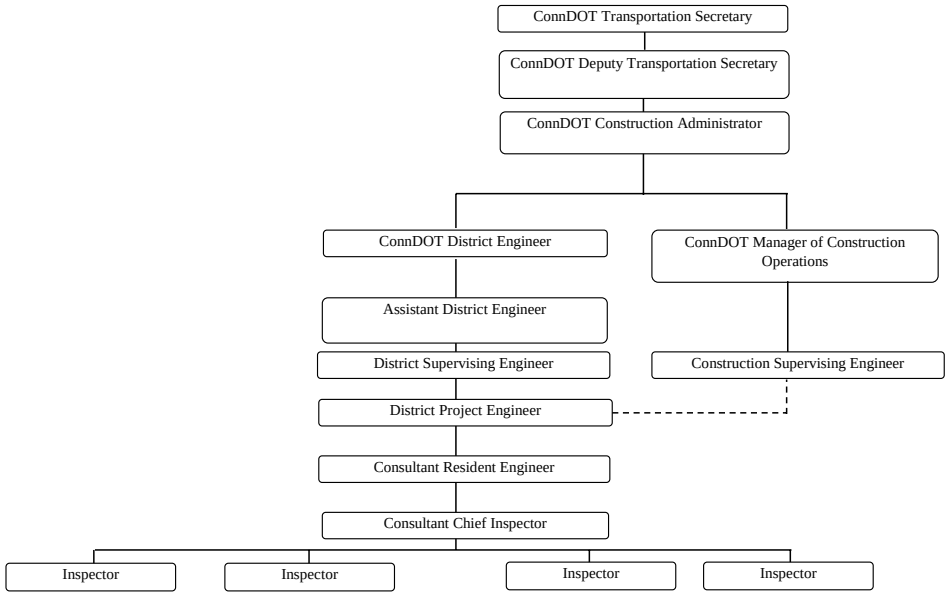
Table No.1 - Summary Comparison of Connecticut and Other DOTs

Item	Connecticut	Pennsylvania	New Jersey	Maryland
Total Miles of Roadway (miles)	4,079	>41,000	13,487	>16,000
Other Roads and Authorities (miles)	17,115	67,615	30,027	N/A
Bridges	4,187	25,000	2,346	2,500
Capital Program (DOT Only)	$775,517,311 (FY 2005)	$ 1,300,000,000 (FY 2004)	$ 1,293,000,000 (FY 2005)	$ 1,698,000,000 (FY 2005)

III. Construction Organization and Personnel

This section of the report discusses the general roles and responsibilities within the studied organizations, their oversight of active construction projects, and their use of consultants to perform specific roles during construction.

Figure No. 1: Connecticut Department of Transportation Construction Organization



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A. General Organization

From a review of the three DOTs and AASHTO, we have concluded that the individual organizations are similar in structure and nature. Working from the bottom of the organization chart, each department has an inspection staff that is overseen by a Chief Inspector. The Chief Inspector reports to the Project Resident Engineer. The Resident Engineer reports directly to an Assistant Regional or District Construction Engineer, who is responsible for oversight of multiple Resident Engineers. The Assistant reports to a Regional or District Engineer, who oversees multiple Assistant District Engineers. This District Engineer reports directly to the Chief Engineer or Director, who reports to a Deputy Commissioner, Administrator or Secretary. This Deputy reports directly to the Secretary, Administrator or Commissioner of the Department of Transportation. Some of the organizations include intermediate positions between the District and Headquarters. For example, NJDOT has a position in its organization between the Director of Construction and the Deputy Commissioner, which is the Assistant Commissioner of Capital Program Management. This position oversees the engineering and construction aspects of the department.

1. The American Association of State Highway Transportation Officials (AASHTO)

a. Department Organization

AASTHO, in its construction manual, defines the purpose and selective individuals' roles within a department organization as follows:

> *The Department is organized for the purpose of planning, designing, constructing, and maintaining an adequate system of safe highways capable of meeting the traffic needs of the State.*
>
> *It is organized under the overall supervision of a Chief Administrative Officer who is assisted by various Divisions, each under a responsible administrator. The Division of Construction is charged with the*

responsibility for administration of contracts. It assumes responsibility at the time the contract has been awarded in accordance with procedures established by the Department. Its responsibility ceases when the project has been accepted by the Department under established policy.

The District Engineer is the operational representative of the Chief Administrative Officer in each of the various districts of the State. Among the District Engineer's assistants is one assigned to contract administration and designated as District Construction Engineer. The Division of Construction on behalf of the Chief Administrative Officer assists the District Engineer and the assistant in matters of policy, administration, and study of special problems associated with construction. Operating under the general supervision of the District Construction Engineer is the Project Engineer who is the Department's representative on the project. Personnel will be assigned to the Project Engineer to assist in the staking and inspection of the work.

b. *Project Organization*

AASTHO provides in its Construction Manual for Highway Construction, a definition of the Project Organization and selective individuals' roles for the Project as follows:

Each contract is under the direct supervision of a Project Engineer. The Project Engineer is assigned to the project prior to the award of the contract. The assignment is documented by a letter from the District Engineer to the Project Engineer. The Contractor is notified by letter of the name and address of the Project Engineer assigned to the project. The Project Engineer is responsible for assuring the project is constructed in accordance with the plans, specifications and special provisions, and control of inspection, and proper documentation. The personnel assigned to assist the Project Engineer will have varying levels of training and experience.

The Project Engineer will be responsible for the proper assignment of these personnel. As the Department's representative, the Project Engineer will have frequent personal contacts with the Contractor, property owners, municipal officers, utility representatives, and the travelling public. The conduct of these associations must be of a character to reflect credit on the Project Engineer and the Department.

Further discussion of these contacts will be developed later in this manual.

2. Pennsylvania Department of Transportation

PennDOT is divided into eleven Engineering Districts, each headed by a District Executive. The District Executive is assisted in the engineering operation of their District by the following staff:

- Assistant District Executive - Planning & Pre-Design
- Assistant District Executive - Design
- Assistant District Executive - Operations
- Assistant District Executive - Construction
- Assistant Press Secretary - Public Relations

A figure of PennDOT's construction organization is presented in Figure No. 1, *Pennsylvania Department of Transportation Construction Organization*.

Figure No. 2: Pennsylvania Department of Transportation Construction Organization

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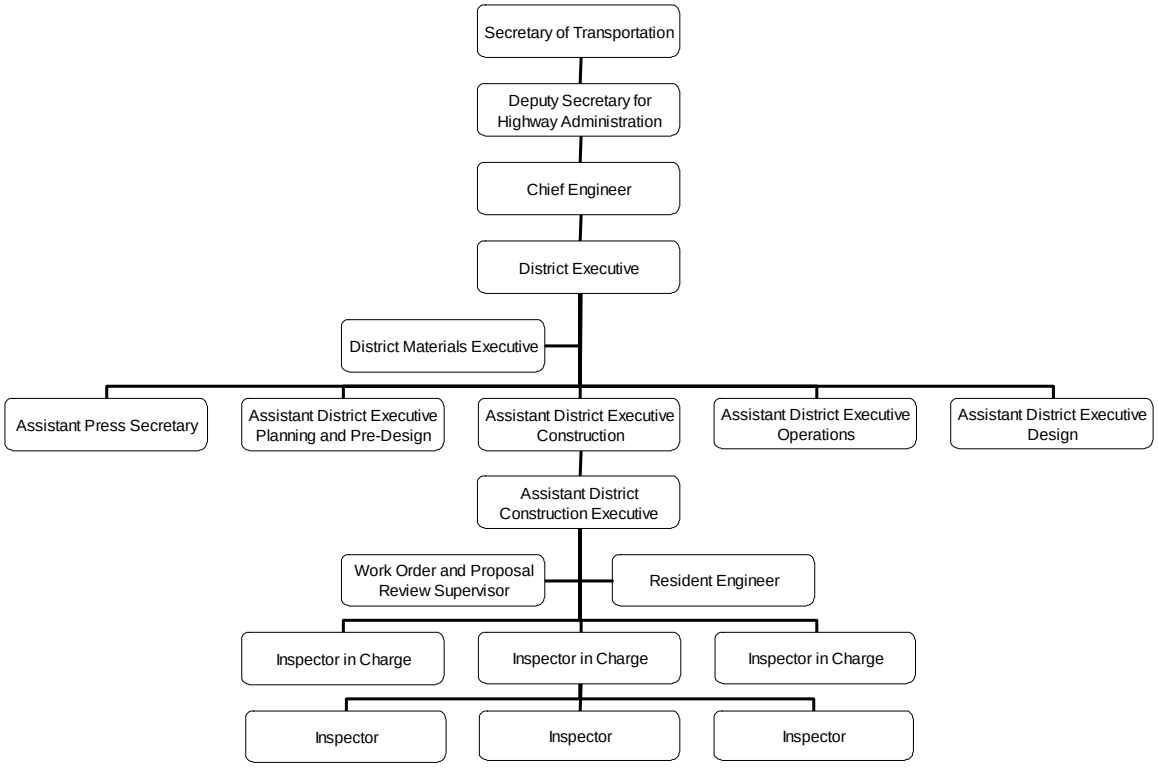


Assistant District Executive - Construction

Assistant District Executive - Construction is responsible for coordinating all activities in the District concerning contract construction work. To accomplish this, he has a staff of Assistant District Construction Executives in charge of structure control, work order and proposal reviews, project control and non-project control functions. It is his responsibility to ensure that the construction of a project meets all contract requirements. He is also responsible for conducting preconstruction meetings with the contractor and representatives of public utility companies, municipalities and other interested parties to discuss the details of the project prior to starting construction.

After a project is started, the Assistant District Executive - Construction should periodically review the job progress with the Assistant District Construction Engineer and the Inspector-in-Charge. The contractor or his representative should accompany the Assistant District Construction Engineer on this review.

The Assistant District Executive - Construction has a staff of Senior Assistant Construction Engineers who are responsible for all the construction in a specific county or counties or a specific corridor such as I-95, Route 202, or Route 309.

The Assistant District Executive - Construction will also have a "Construction Services Engineer". It is this person who is responsible for and oversees the structure control, materials, work order, and project control Units. This position is the same level as the Senior Assistant Construction Engineers.

After the project has started, the Assistant District Executive - Construction, should periodically review the job progress with the Senior Assistant Construction Engineer, the Assistant Construction Engineer, and the Resident Engineer and/or Inspector-in-Charge.

Senior Assistant Construction Engineers

The Senior Assistant Construction Engineer has charge of construction on several projects. He should be familiar with the proposals, drawings, and Specifications for these projects, and should keep in close touch with the work. If any changes in the contract are necessary, he will inform the Assistant District Engineer-Construction.

The Senior Assistant Construction Engineer should check lines and grades wherever they appear to be incorrect. He should be sure that all materials are sampled and inspected properly and that samples are forwarded to the Bureau of Materials, Testing, and Research without delay. He should instruct the Inspector-in-Charge on a project, check the details of the work with him, and review his records. He verifies the estimates upon which payments to the contractor are based. He is personally responsible for the accuracy of all quantities submitted by him on current or semi-final estimates. The Senior Assistant Construction Engineer is responsible for the preparation of work orders on projects under his control.

Inspector-in-Charge

Some projects may have a Resident Engineer or an Inspector-in-Charge or both. If both, the Inspector-in-Charge reports to the Resident Engineer. Typically, the Inspector-in Charge will be a Consultant employee along with majority of the inspectors. The following applies to either the Inspector-in-Charge or the Resident Engineer position:

> *The Inspector-in-Charge of a project is responsible for all inspection work on a project, including inspection work necessary at job plants producing concrete. He informs the Inspectors under him what to do and how to do the work. He should check to verify that they are on the job and are carrying out his instructions. He should review their reports and verify their accuracy. He satisfies himself that all materials are sampled and tested properly, and that the samples taken in the field are promptly forwarded to the Bureau of Materials, Testing and Research for testing.*
>
> *The Inspector-in-Charge has the responsibility of explaining to a property owner how the project will affect his property. He should not discuss damages or indicate what settlement the property owner will receive. Such information is given by the District Right-of-Way Administrator. The Inspector-in-Charge should notify the contractor not to trespass or do any work on private property unless he has permission in writing from the property owner. If the Inspector-in-Charge finds that a structure or slope will extend beyond the right-of-way limit, he should report the fact to the Assistant District Construction Engineer before construction is started. He should also report any condition that will require more work or material than indicated in the contract.*
>
> *When a detour is needed, the Inspector-in-Charge should file a report at least two weeks in advance with the District Engineer after being notified by the contractor. He checks to verify that the contractor complies with Bulletin No. 43 and the Traffic Control Plan and has enough flagmen to protect the work and properly direct traffic.*
>
> *When the Inspector-in-Charge is notified that special cost records are to be kept on work done by a public utility company, he determines the extent of this work and keeps the records. The cost records for this work, unless it is done by a railroad company, are kept in accordance with the Force Account Method. The Inspector-in-Charge should work with the contractor and a representative of the public utility company to insure that*

utility relocations are accomplished without delaying the project. The Inspector-in-Charge reports directly to the Assistant District Construction Engineer in charge of project control.

Inspectors

Inspectors shall be on the job or at the plant whenever work is being done. The Inspector verifies that all materials used meet the requirements of the Specifications and Special Provisions of the contract. He determines that the completed work is exactly as required by the drawings, Specifications, and changes authorized by the Chief Highway Engineer, and assures himself that all testing is performed in accordance with the Field Test Manual.

If the work does not conform to the contract, the Inspector should try to have the defect corrected as soon as possible. He should be firm in requiring the contractor to do work in accordance with the contract at all times. If he has difficulties in getting the contractor to comply, he should report the incident at once to the Inspector-in-Charge.

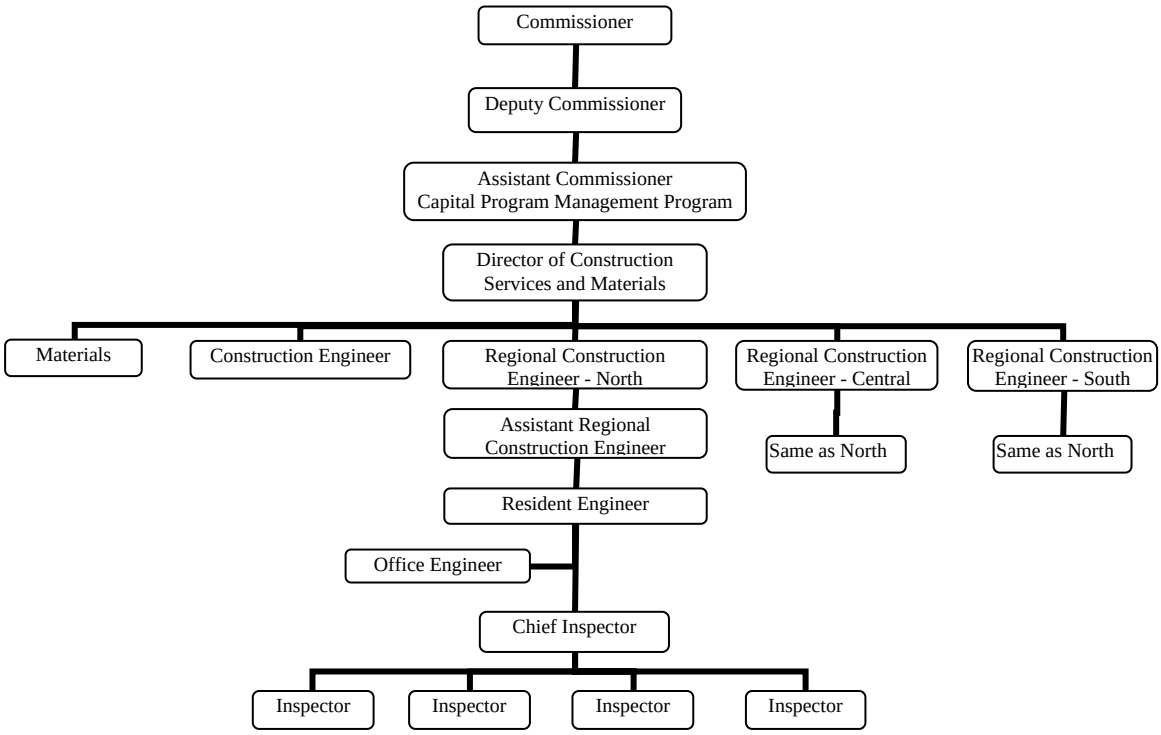
3. New Jersey Department of Transportation

The State is divided into three geographical regions. Each region has a Regional Construction Supervisor and administrative staff to coordinate construction activities in that region. The Resident Engineers, within each region, report to Assistant Regional Construction Engineer assigned by the Regional Construction Supervisor.

It is through the Resident Engineer that the State administers a specific construction contract. Each Resident Engineer is assigned engineers and inspectors to supervise the on-site fulfilment by the contractor of all items of work required by the Plans and Specifications.

A figure of NJDOT's construction organization is presented in Figure No. 2, New Jersey *Department of Transportation Construction Organization.*

Figure No. 3: New Jersey Department of Transportation Construction Organization



Engineer (*represented by the positions above Resident Engineer*)

The Engineer is defined in the DOT construction contracts. In the organization, the position above the Resident Engineer may be the "Engineer," depending upon their authorities, as defined in internal DOT procedures. The following was cited from the NJDOT Standard Specifications:

> *The Engineer has the authority to suspend the Work wholly or in part pursuant to the Specifications and/or to suspend partial payments due to the failure of the Contractor to correct conditions unsafe for the workers or the general public, for failure to carry out provisions of the Contract, or for failure to carry out orders. The Engineer will decide all questions that may arise as to the quality and acceptability of the Work and as to the rate of progress of the Work, all questions that may arise as to the interpretation of the Contract Documents, all questions as to the*

acceptable fulfilment of the Contract on the part of the Contractor, and all questions as to compensation. All questions as to the interpretation of the Contract Documents shall be submitted to the Resident Engineer in writing.

The Engineer may also suspend the Work wholly or in part for such periods as deemed necessary due to unsuitable weather, for conditions considered unsuitable for the prosecution of the Work, or for any other condition or reason deemed to be in the public interest.

Resident Engineer

As the direct representative of the Engineer, the Resident Engineer has immediate charge of the engineering details of the Project. The Resident Engineer is responsible for the administration of the Contract and its responsibility includes the authority to reject defective material and to suspend any or all of the Work according to Contract.

Inspector

Inspectors employed by the Department are authorized to inspect all Work. Such inspection may extend to all or any part of the Work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to alter or waive the provisions of the Contract. The inspector is not authorized to issue instructions contrary to the Contract Documents or to act as foreman for the Contractor; however, the inspector has the authority to reject Work subject to confirmation by the Resident Engineer.

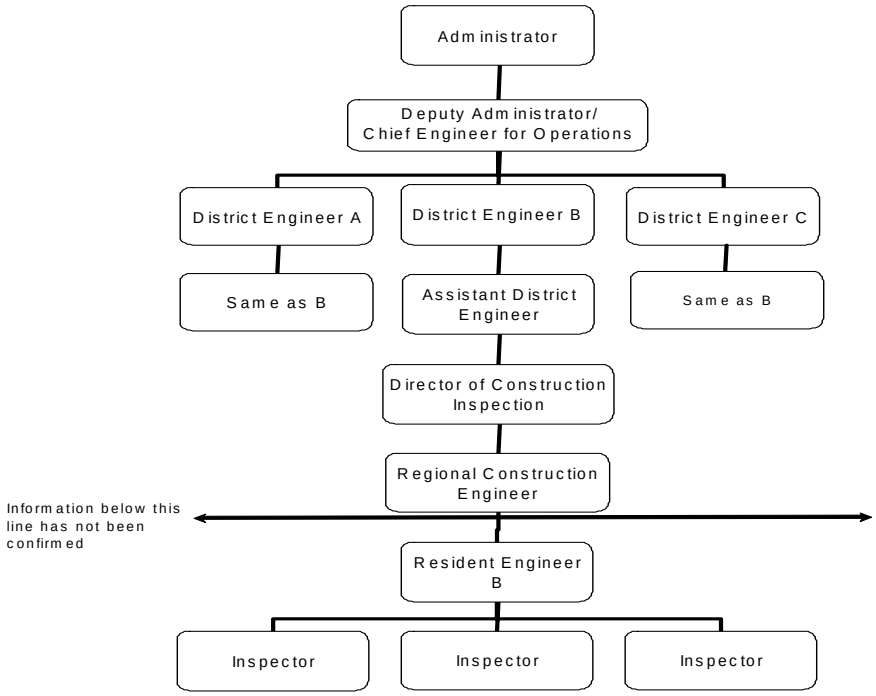
4. Maryland State Highway Authority

MSHA is divided into seven districts, each headed by a District Engineer. The District Engineer is assisted in the construction operations within the District by the Assistant District Engineer - Construction. The Office of Construction is composed of five major teams to support MSHA's Construction Program and provides the oversight of the individual Districts. The five divisions include the Director's Office, Construction Inspection Division, Utilities Team, Contracts Award Team and Contract Payment Team. The Construction Inspection Division is supplemented by consultants.

MSHA does not provide a specific outline of roles and responsibilities, as does PennDOT and NJDOT. However, it does provide individual roles and authorities in its Construction Manual under the Authority and Responsibilities section of its manual for the Project Engineer and the Inspector. The following presented below spells out the individual authority.

A figure of MSHA's construction organization is presented in Figure No. 3, *Maryland State Highway Authority Construction Organization.*

Figure No. 4: Maryland State Highway Authority Construction Organization



Project Engineers and Inspectors

MSHA's Construction Manual Category 1 describes the roles, responsibilities and the authority of the Project Engineer and Inspector. The following describes how MSHA, in its manual, delegates these responsibilities:

> *For clarification, the stated responsibilities and authorities apply to both Inspectors and Project Engineers. Any issues not easily resolved at the Inspector level should be immediately elevated to the Project Engineer who will either resolve or further elevate them to the District level.*
>
> *The Inspector is responsible for protecting the Owner against defects and deficiencies in the work. When, in the judgment of the Inspector, the plans and specifications are not being properly followed and he/she has been unable to obtain compliance by the Contractor, the District should be notified so that appropriate action can be taken. Inspection must be performed during the progress of the work; inspection after completion defeats the purpose of providing quality control and assurance on the job, as many potential deficiencies must be detected during construction. Otherwise, they may be permanently covered. The result could be a latent defect, which might contribute to a structural failure or other disaster.*
>
> *The Inspector, as project representative, should not direct, supervise, or assume control over the means, methods, techniques, sequences, or procedures of construction except as specifically called for in the project specifications. Instead, the Inspector should exercise authority on behalf of the Owner so that the project is constructed in accordance with the requirements of the Contract Documents.*
>
> *Construction administration and quality control by the Contractor or quality assurance by the Owner should include continuous on-site inspection throughout construction by one or more competent, technically qualified, and experienced Inspectors. If there are several Inspectors on the project, subordinate Inspectors will be under the direct supervision of the Project Engineer. All communications with the District or designer should be through the Project Engineer. Inspectors are responsible for seeing that all details of the design drawings, shop drawings, reinforcement drawings, and similar documents that have been approved by the Engineer are constructed in strict accordance with their respective requirements. In addition, each Inspector must see that all requirements*

of the Specifications have been met and that all workmanship and construction practices equal or exceed the standards called for in the Contract Documents. Neither the Project Engineer nor the Inspector has authority to change plans or Specifications, or to make their own interpretations, even though they may be qualified with both design and construction experience. If any question on interpretation arises, or if there is a disagreement with the Contractor on a technical matter, or if there appears to be any possibility of error or deviation from good construction practice that the Inspector notices, it should be brought to the attention of the Project Engineer and District Office immediately.

B. Construction Oversight and Management

All three of the DOTs use a combination of in-house staff (DOT employees) and consultants during their Projects. It is typical for the DOTs to perform the construction oversight and the DOT to augment its staff for construction management services.

The oversight of a project consists of individual(s) performing supervision, quality assurance and generally observing that the work being performed by the contractor and its inspection and management staff complies with standard policies and procedures. These tasks are performed by the Resident Engineer or Project Engineer, who are usually direct DOT employees.

The construction management of a project is typically the day-to-day administration of the construction contract and inspection of the contractor's work performed. The construction management of the project is completed by either in-house or consultant staff, or a combination of both.

Some DOT projects are completed with all in-house staff but, more typically, the DOT's staff is augmented with a consultant. The process for determining the need for supplementing in-house staff with consultants is not clear in the documentation we reviewed. It appears the larger and more complex projects require the departments to supplement their staff with consultants.

The consultant staff usually provides Chief Inspector and Inspectors. Some larger projects require the consultant to provide an Office Engineer or Administrative Assistant to perform specific contract administrative duties.

There have been special occasions where the department has contracted a consultant to provide the complete staff from Resident Engineer (Project Engineer) through Inspectors, and this individual reports directly to either the District or Headquarter representatives, such as a Bureau Chief and/or the Commissioner's Office. This practice is used for either a complex project for which the department does not have sufficient staff or is used as a complete staff replacement for troubled projects. The use of a consultant for the entire construction oversight and management is seldom used.

C. Consultant Evaluation/Selection Processes

ConnDOT utilizes a relatively subjective evaluation process to measure the qualifications of their consultant bids. For the Maguire contract, four ConnDOT representatives evaluated Maguire and fifteen competing bidders using a form with seven rating elements on a scale of one to twenty. The seven rating elements included:

1. Staff Size and Qualifications (includes Sub-consultant where applicable) – 20%
2. Construction Inspection Experience with Primary Highway & Bridge Construction – 20%
3. Familiarity with ConnDOT Construction Policy & Procedure – 15%
4. Knowledge of Corridor Construction – 10%
5. Environmental Protection Expertise Including Noise Monitoring, Air & Water Pollution Control and Hazard Waste Monitoring – 10%
6. Maintenance and Protection of Traffic for urban area including Staging of Construction – 15%
7. General Assessment – Certifications (NETTCP, CCT – Concrete, HMA – Asphalt) – 10%

The evaluators marked their ratings on the above requirements onto the form and the totals from the four evaluators were added together. Maguire ranked third highest out of the sixteen bidders. The top eight out of sixteen ranked bidders were invited to provide presentations/interviews to the selection panel. After the conclusion of the ranking and interview process, Maguire was selected to perform the work for ConnDOT. This process could be slanted by personal viewpoints. An evaluator may show preference to one firm over another in both the ranking and interview process. An example is Berger Lehman, who was ranked highest out of the 15 bidders by one evaluator with a score of 18.5, and near the bottom by another evaluator with a score of 7.55.

1. NJDOT Consultant Evaluation

NJDOT utilizes a more objective approach to evaluating consultant bids. An example of an NJDOT Request for Proposal ("RFP") for a Construction Inspection project utilizes an evaluation form with ten sections (out of 13 possible on the form) from which the bidders were evaluated. The 13 sections are standard consultant selection sections used by NJDOT for consultant design and construction services. The first four sections are the mandatory requirements and are judged on a pass/fail basis. Section 1A establishes mandatory qualifications for experience and certifications for the Project Manager, and Section 1B establishes mandatory qualifications for experience and certifications for Key Staff. Section 2 is for Certified Firm Utilization (Note: State Goal is 25 percent Small Business Enterprise Utilization). Section 3 is for Additional Resources Required for the Project (Primavera Project Planner and Claim Digger Software, if applicable). Section 4 is for certification by principal of the firm certifying the above statements, and is presented below as an example:

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Section 4 **TEAM COMMITMENT/ CERTIFICATION**	**INSTRUCTIONS: SIGN AND DATE**
I certify on the behalf of _____ (the firm), that the staff proposed in this Technical Proposal will be used in the performance of this project, and will be available for assignment to this project as of the anticipated start date. I also certify all projects utilizing same team "Project Manager and Key Staff" will be completed on time. I further certify that the information set forth and statements made in the foregoing Technical Proposal are true, accurate and consistent with the records maintained by the individual, partnership or corporation submitting this Technical Proposal and will be available for the completion of this project. I also certify, to the best of my knowledge, that the firm and its employees have not had access to any confidential information of the New Jersey Department of Transportation, which was not made available to all firms. **SIGNATURE, PRINCIPAL OF FIRM** **DATE**	

2. Summary of NJDOT Consultant Evaluation

If the bidder passed sections one through four, the NJDOT bidder was evaluated on the remaining sections on a 'maximum score' basis. Sections 6 and 7 (Section 5 is not required for construction services) were evaluated based on the experience of the Consultant's Project Manager and its performance on similar projects. These two sections account for 1/8 of the maximum score. Subjectivity was essentially removed from the scoring in this section, as the bidder was awarded points for the Project Manager's years of experience in addition to the years claimed in Section 1A. Sections 8 thru 10 account for half of the maximum score, and are comprised of Section 8 for an Organization Chart, Section 9 for Team Leader Qualifications and Section 10 for Experience. These sections contain little or no subjectivity in scoring, since points are given for the qualifications, for the number of certifications by the key staff, and for the number of years of experience of the identified staff. Section 12, entitled Key Issues and Critical Problems, accounts for 3/8 of the score. This section requires the bidder to provide a project approach narrative defining potential problems posed by the key issues provided, and a potential solution to each potential problem. The section also requires all individual project team members' names, related experience and the projects in which the experience was earned.

3. MSHA Consultant Evaluation

MSHA does not pre-qualify firms or maintain a bidders list. Architectural/ Engineering projects with services contracts in excess of $200,000 are agreed to on a competitive technical/negotiated price basis, allowing for price negotiation with the firm with the highest technical proposal. The Office of Consultant Services advertises all Transportation Professional Services Selection Board (TPSSB) projects over $200,000 to solicit Consultant interest. The Administration's Consultant Screening Committee, through screening and evaluation of candidate firms, develops a reduced candidate list from which technical and price proposals are requested.

The MSHA standard State Highway Administration "Request for Proposal" manual details how consultants should bid and how they are evaluated. Section X of the MSHA Request for Proposal manual establishes the selection procedures for consultants.

X. Selection Review Procedures

A. Technical Proposals

The Highway Administration will conduct an in-depth review of all Technical Proposals received from the firms on the Reduced Candidate List for a particular project. Each consultant's Technical Proposal will be reviewed by the Highway Administration's appropriate and knowledgeable Division(s) with respect to work proposed, the consultant's methodology for accomplishing the scope of services, proposed Key Staff and support personnel, and man hour percentage distribution proposed and verification of a firm's comprehension of the scope of services.

The major factors/criteria to be used in evaluating Technical Proposals will be:

- *Scope of Services*
- *Work Plan*
- *Key Staff*
- *Time Distribution*
- *Computer/CADD*

- *Concept of Project*
- *Consistency with Expression of Interest*
- *Financial Responsibility*
- *Measure of Protection for State against Errors and*
- *Omissions*

Other criteria may be added dependent on the nature and complexity of a specific project. The consultants will be advised of any major criteria that are added at the time of the Pre-Proposal Conference. After the Highway Administration rates the Technical Proposals, same will be ranked and the consultants shall be advised accordingly.

B. Price Proposals

At the direction of the State Highway Administrator, the Highway Administration may initiate contract and price negotiations with the highest technically ranked firm. In those cases where the Highway Administration desires to award two (2) or more identical contracts, negotiations may be conducted simultaneously with two (2) or more of the firms which have submitted the highest rated Technical Proposals.

4. Summary of MSHA Consultant Evaluation

MSHA consultant evaluation procedures include a number of valuable items not apparent in the processes of ConnDOT or NJDOT. MSHA utilizes a 'man-hour percentage distribution proposed' as a key item required in the evaluation of contractors. This provides the oversight team with the manpower and staffing plan of the consultant. Additionally, MSHA evaluates the contractors on 'Financial Responsibility' and 'Measure of Protection for State against Errors and Omissions.' These items may provide the State with financial protections against project impacts including design errors, delays, or cost overruns.

After our review of the other DOTs, we would suggest that ConnDOT review its consultant selection process and revise it to mirror NJDOT's in its impartial grading system and MSHA's 'Financial Responsibility' and 'Measure of Protection for State against Errors and Omissions' provisions.

D. Consultant Qualifications

Certifications offer an impartial basis for evaluating the skills of a potential consultant's workforce. ConnDOT includes requirements for consultant certifications in its Construction Engineering and Inspection Information Pamphlet for Consultants. ConnDOT may achieve increased competence of its consultant and internal workforce by enhancing its certification requirements. The current inspection certification requirements are generally flexible and allow for substitutes that may not establish a good basis for the required skills.

All ConnDOT consultant inspectors, with the exception of entry-level inspectors, are required to obtain a Level II certification from The National Institute for Certification in Engineering Technologies (NICET), according to the ConnDOT Construction Engineering and Inspection Information Pamphlet. A NICET Highway Construction Certification establishes that an inspector has a fundamental knowledge of inspection. A NICET Level I certification is for entry level inspectors, Level II is for inspectors to perform customary tasks under supervision, Level III is for inspectors who work with standards, plans, specifications, and instructions under little or no supervision, and Level IV is for inspectors who work without help and supervise other inspectors.

The ConnDOT Construction Engineering and Inspection Information Pamphlet for Consultants states that a NICET certification may be substituted with a bachelor's degree in civil engineering, construction technologies, or another related field:

> *The Consulting Engineer shall provide sufficient staff experienced in highway, vertical, or rail construction practices and procedures to perform construction engineering and inspection services as directed by the State's* ***Project*** *Engineer.* ***ALL*** *inspection personnel, with the exception of entry level inspectors, employed by the Consulting Engineer, shall be certified by the National Institute of Certification of Engineering Technicians (NICET) at Level II or above or possess a Bachelor of Science Degree in Civil Engineering, Construction Technologies, or other*

related fields approved by the Department. Entry-level inspectors who do not have a BS Degree must apply for NICET as soon as eligible.

**Note: Regarding the NICET Certification requirement, the Department may at its option conditionally accept an individual who does not have a NICET Certification proving that person applies immediately for the required NICET Level and the Consulting Engineer obtains written authorization from the Office of Construction.*

These requirements may, however, be waived with written authorization from the Office of Construction. The Information Pamphlet includes inspector job descriptions for a Chief Inspector/Resident Engineer, Chief Inspector (for Projects under $2.5 million), Assistant Chief Inspector, Senior Inspector/Office Engineer, Inspectors, and Entry Level Inspector. The job description for the Chief Inspector/Resident Engineer states the following with regards to certifications:

Possession of a current Connecticut Professional Engineer's License, Engineer-in-Training Certification or NICET Level IV Certification in Transportation/Highway Construction is required.

The inclusion of the Engineer-in-Training (EIT) certification in this job description as a substitute for a NICET IV or Professional Engineer's license is questionable, as the EIT is an entry-level certification not necessarily appropriate for the Chief Inspector. The EIT certification surely does not establish a basis for the skills required for a Chief Inspector.

Additionally, the job descriptions for Chief Inspector (for Projects under $2.5 million), Assistant Chief Inspector, and Senior Inspector/Office Engineer utilize the EIT certification as a substitute for a NICET III certification:

Possession of an Engineer-in-Training Certification or NICET Level III Certification in Transportation/Highway Construction is required.

The EIT certification is not necessarily an appropriate substitute for a NICET Level III certification, as the EIT is for entry-level workers, not appropriate for the Chief Inspector, Assistant Chief Inspector, or Senior Inspector/Office Engineer. The Inspector job description does not include the EIT as a substitute for NICET II:

> *NICET Level II Certification or Bachelor's Degree in Civil or Construction Engineering Required.*

In the Inspector job description, an EIT certification may be an appropriate substitute for the NICET Level II or Bachelor's Degree in Civil or Construction Engineering. A graduate in Civil or Construction Engineering traditionally acquires the EIT certification prior to graduation or shortly thereafter. Therefore, ConnDOT should consider removing from its information pamphlet the EIT certification in the Senior Level Inspector (NICET III & IV) job description, and include it in the Inspector (NICET II) job description.

The ConnDOT contract states in its information pamphlet that its personnel must meet the minimum education, experience, training and certification requirements. Additionally, the Maguire contract requires that the inspection personnel obtain one of the six certifications listed below:

> *(2) QUALIFICATIONS OF CONTRACTING ENGINEER PERSONNEL:*
>
> *That all personnel employed by the Contracting Engineer shall meet the minimum education, experience, training and certification requirements for their applicable classification of employment as defined in the current edition of the "Information Pamphlet". In addition, all inspection personnel must possess one of the following:*
>
> 1. *Registration as a Professional Engineer in Connecticut.*
> 2. *Engineer in Training Certification*
> 3. *Bachelor of Science Degree in Civil Engineering or related field or an Associates Degree in Civil Engineering (Structural or Highway technology).*

4. *NICET Transportation Engineering Technology/Highway Construction certification (Level II or higher).*
5. *Level I enrollment in NICET Transportation Engineering Technology/Highway Construction Certification Program. Level I will be used for training purposes only.*
6. *All Inspection Staff on bridge painting projects must be certified in the NACE Intermediate Coating Inspection Level. All Resident Engineers or Chief Inspectors on bridge painting projects must be NACE certified Coating Inspectors with the appropriate years of experience.*

The Information Pamphlet establishes the minimum requirements for the Maguire contract, as the Maguire contractual language requiring one of six listed certifications is less stringent than the requirements in the Information Pamphlet.

In summary, the job descriptions in the Information Pamphlet specify appropriate inspector certification requirements, except for the EIT as a substitution for NICET Level III & IV certifications. The distribution of workers required on a project at each NICET certification level is not specified in the Information Pamphlet. The Information Pamphlet requires sufficient staff to properly inspect the contractor's staff and a staff size and qualifications approved by the District Engineer:

Section 3 Project Staffing

The Consulting Engineer shall provide sufficient staff to properly inspect the contractor's operation. The staff size and qualifications shall be approved by the District Engineer and the Consulting Engineer shall modify the size of the on-site staff as required by the contractor's operations and schedules with approval of the District Engineer…

…The Consulting Engineer shall provide a fully qualified Resident Engineer/Chief Inspector to supervise the Consulting Engineer's project organization in their administration and inspection of the work. Depending on the project size and complexity, the Resident Engineer/Chief Inspector shall have under his/her supervision an inspection staff sufficient to continuously monitor the contractor's principal operations and to perform administrative tasks associated with the construction project. On smaller projects, survey work will be performed by District personnel whenever possible. On projects which

require a substantial effort (general guide – projects greater than $10,000,000) survey services may be provided by the prime consultant or subconsultant. Also, on smaller projects, various responsibilities may be combined under one classification (i.e. Office Engineer/Inspector) to economically provide the required service…

…If at any time it is determined that the Consulting Engineer's project staff is inappropriate for the work being performed, the Project Engineer shall direct the Consulting Engineer to make appropriate adjustments to staff.

The Maguire Contract specifies that the State reserves the right to determine the size of the inspection force required:

…The State reserves the right to prequalify the Contracting Engineer's supervisory and inspection personnel, determine the size of the inspection force required, and to direct the assignment and reassignment of inspection personnel at its discretion, as deemed necessary by the State.

The contractual language above does not specify the number of NICET Level II Field Inspectors as opposed to NICET Level III Senior Field Inspectors required by the Inspection Consultant. The Inspection Consultant may utilize NICET Level II Inspectors for the largest part of the inspection work unless directed otherwise by the State. The concern is that NICET Level II Inspectors are borderline entry-level inspectors who have untested skills, whereas NICET Level III Senior Inspectors are more experienced and are certified to work with standards, plans, specifications, and instructions under little or no supervision.

There is a considerable difference in the fundamental skills established for a NICET Level II Inspector as compared to the NICET Level III Senior Inspector. Therefore, a 2:1 ratio for Field Inspectors consisting of two Senior Inspectors (NICET III level) for every one Inspector (NICET II level) should be considered as a future requirement for ConnDOT Inspection consultant contracts.

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Task One - Industry Evaluation

ConnDOT's current inspection standards generally allow for economically supplied inspection services. The increased distribution of consultant inspectors may bring additional costs to an inspection contract, as it would require a more advanced workforce and a resulting increased cost per consultant. The increased contractual costs could be recovered in the long run with the more qualified staff of consultant inspectors through a reduction in the subsequent cost of rework and claims.

The Project Manager is the key member of the Consultant's workforce that ensures the project is completed within the contractual requirements. ConnDOT requires that a Consultant's Project Manager have at least 15 years of civil or highway engineering experience. Two of those years can be substituted with a Bachelor of Science degree in Civil or Construction Engineering. The Project Manager is not, however, required to have any certifications as defined in the Project Manager's job description in the Construction Engineering and Inspection Information Pamphlet for Consultants:

> *Not less than fifteen (15) years employment in civil or highway engineering of which at least six (6) years must have been in a supervisory capacity of **complex** highway and/or bridge construction activities as required, and at least four (4) years of which will have been in field inspection activities. A Bachelor of Science Degree in Civil or Construction Engineering may be substituted for two (2) years of the general experience requirement.*
>
> *The Project Manager will be responsible for coordination between the administering unit of the Department, consulting firm, and project staff to resolve problems concerning activities related to the project. Generally, one day per month will be permitted for this purpose unless written approval is obtained from the Office of Construction. **Only** activities directly related to the project are reimbursable. Reimbursement will not be permitted for administration activities for the firm's personnel.*
>
> - *Hours negotiated for Project Manager shall be limited to a **maximum** of 8 hours per month.*

It is recommended that ConnDOT add a certification requirement for the Consultant Project Manager to ensure he or she maintains the fundamental project management credentials necessary to administer a quality project. Examples of certifications for a Project Manager are the Project Management Professional (PMP) by the Project Management Institute and the Certified Construction Manager (CCM) through the Construction Management Certification Institute.

The Project Management Institute is the leading organization in the field of project management with professionals across numerous industries including construction, engineering, information technology, and healthcare. The PMP certification is the Project Management Institute's specialized certification that establishes that a Project Manager has the fundamental skills and experience necessary to manage a project. Additionally, a PMP certification must be renewed every three years, so the project manager must maintain up-to-date project management knowledge to maintain the PMP credential.

There are more than 200,000 active PMPs, including a large number from the engineering and construction industries. Therefore, there should be an adequate supply of PMPs. The Project Management Institute more recently began to offer the Program Management Professional (PgMP) certification. This could be a substitute for the PMP, appropriate for Project Mangers who oversee multiple projects at one time.

The Construction Management Certification Institute is an independent administrative organization of the Construction Management Institute of America overseen by Construction Management professionals. The Certified Construction Manager (CCM) certification establishes that a Construction Manager has obtained the fundamental skills and experience necessary to manage a construction project. It differs from the PMP in that it is designed specifically for the construction industry. The CCM

and the PMP would both be appropriate certifications for ConnDOT consultant Project Managers.

ConnDOT should also consider adding a requirement for the consultant to include a Scheduler on large engineering and inspection projects. A Planner/Scheduler is necessary on large inspection projects to plan and coordinate activities and resources. The Scheduler ensures that work is completed on time and that adequate resources are available at times of peak construction. A minimum experience requirement should be a prerequisite for a consultant scheduler. The certifications appropriate to establish a basis of scheduling proficiency include a Primavera Certificate by Primavera, or the Planning & Scheduling Professional (PSP) certification by the Association for the Advancement of Cost Engineering.

Primavera produces Primavera Project Planner (P3) software, the standard scheduling software utilized in scheduling engineering and construction projects. Primavera offers a User Certificate program, which establishes that an individual possesses the fundamental working knowledge of Primavera scheduling software, including Primavera Project Planner (P3). A Scheduler can obtain the basic or advanced user certificate by passing the program's test offered both on the internet and at training sites.

The Association for the Advancement of Cost Engineering (AACEI) is an organization that promotes excellence in the planning and management of costs and schedules. AACEI has long offered certification programs in Cost Engineering, and recently began offering the Planning & Scheduling Professional (PSP) certification. The PSP is differs from a Primavera Certificate in that it establishes proficiency in planning and scheduling independent of the software maker. An advantage of the PSP certification is that it demonstrates that a consultant is an expert-level scheduler. A disadvantage is

that there is a limited supply of PSPs, since the certification program has been offered for less than five years.

ConnDOT requires consultants on limited-access expressway projects to have at least one person certified as a Traffic Control Supervisor (TCS) under the American Traffic Safety Services Association (ATSSA). The ATSSA is an organization whose members supply a large amount of the safety products and services for the country's roadways. ConnDOT should consider requiring more than one person be certified as a Traffic Control Supervisor, as one person may not be present on site at all times.

Additional consultant certifications that are required by ConnDOT generally meet the requirements necessary for the prescribed position. ConnDOT requires Certified Concrete Technicians (CCT) and HMA Paving Technicians (HMAPT) offered by New England Transportation Technician Certification Program (NETTCP) for concrete and HMA Field Testers. Comparable programs are offered by the American Concrete Institute (ACI) including the Concrete Transportation Construction Inspector Certification. ConnDOT requires consultant NACE (Corrosion) certifications for bridge painting projects. Similar programs are offered by The Society for Protective Coatings including the Protective Coatings Specialist Certification (PCS).

In summary, ConnDOT may attain increased competence in its workforce by enhancing its certification requirements. The evaluation of engineering and inspection consultants can be a subjective process. Certification requirements provide a more objective basis to assess the skills of a consultant's workforce and increase the probability of receiving high-quality engineering and inspection services.

IV. Contract/Construction Administration

A. Introduction

This section presents the three DOTs processes and procedures under the contract administrative phase of the project and includes field reporting and documentation, payments to the contractor, and quality assurance/quality control. This section also discusses the general roles and responsibilities within the individual organizations (DOT representatives or contractor) in performing each of these processes during construction.

B. Field Reporting and Documentation

Field reporting and documentation are the most critical aspects of construction management and oversight. The daily dairies and inspectors' daily records are the first and sole source of observations made contemporaneously in the field, and record the daily events and observations of the project. All written field notes, such as Daily Reports, become the permanent records of the construction and should include pertinent information, measurements, quantities and day-to-day observations of the project. These written records become the historic data for monthly payments, assist in the later resolution of disputes and are historic observations of project conditions and progress. These observations include, but are not limited to, the type of work being inspected, quality of installed materials, personnel and equipment records and identification of deficient or defect work product. These records should be consistent, organized and readily available for quality checks and historical reviews.

AASHTO and the three DOTs all stress the importance of the inspection work reports and describe the basic requirements in completing these daily reports, such as the following:

- Weather conditions
- Directives or orders presented to the contractor
- Important discussions with contractor or its representatives

- Report visitors and special inspections (e.g. material testing)
- Hours of work
- Work completed by contractor during the operation
- General purpose of work
- Track potential extra work or potentially disputed work including personnel, hours, equipment and materials.
- Unusual conditions, possible change of site conditions
- Progress quantities and location by station
- Neatness
- Legibility and clarity of observations and the use of plain simple lettering to avoid confusion.
- Completeness - show all pertinent calculations, measurements, observations;
- Honesty - record exactly what was done at the time rather than depending on memory at a later time.
- Remarks - Inspection personnel should also include remarks they feel are appropriate for the item and conditions encountered such as specific problems, unacceptable work, safety, general clean-up, etc.

The DOTs and AASHTO recommend that the Project Engineer and/or the Resident Engineer keep a bound daily dairy for each project. This dairy should not be a duplication of the inspector's daily work reports; entries should include only general information about the daily operations and daily events. This dairy should include conversations, directives and orders given to the contractor. The record should be factual without opinion, unless an opinion is warranted for clarification and decisions for the resolutions of project issue(s).

C. Payment Process

In order to determine the standard policies and procedures for partial and final payment processes, we reviewed the standard specifications for the three DOTs. It should be noted that AASHTO does not provide a procedure and/or policy in its Construction Manual for the partial and/or final payment process. From the review of

these DOTs we were able to determine standard procedures and processes for payment. These findings and observations are presented below:

- Each DOT measures the actual installed quantities and basis its monthly or partial payments based upon the inspectors measured quantities.
- The contractor does not review or certify these quantities, which the monthly or partial payments are based upon.
- The Contractor is responsible to certify that all subcontractors and suppliers are paid, however this certification is not submitted to the construction field office or the Bureau of Construction for verification.
- Payment to the Contractor for an item may be withheld if, in the judgment of the Engineer, the work is not in accordance with the contract documents. The Engineer may also take a credit in preceding months, if deficient work is later identified.
- The DOT will submit final quantities to the contractor for its review and acceptance prior to the final payment. The contractor has the right to dispute quantities presented by the DOT. The contractor typically has a window or period of time to dispute these final calculated quantities.
- There is no specific certification required by the DOT for the contractor to submit which states that its work was in conformance with the contract documents and/or completed with good workmanlike character and within recognized industry standards.

From the review of other DOTs, it appears that the policies and procedures for the payment of work installed during the construction of a project appear to be similar, if not identical. The following are PennDOT, NJDOT and MSHA standard policies and procedures for payment from each of their respective standard specifications.

1. PennDOT Payment Procedures

PennDOT's Standard Specifications outline the process and procedures for payments to the contractor for work performed. The following presents PennDOT's Standard Specifications for the monthly and final payment processes:

Standard Specification 110.05 Current Estimate Payments

Current estimate payments will be processed based upon assessments made by the Department as work is satisfactorily completed. Processing of estimate payments will begin on the first estimate date established following the Notice to Proceed Date or indicated in the special provisions. No estimate payments will be processed before the Notice to Proceed Date. Current estimate payments exceeding $1,000 will be processed by the Department at semimonthly intervals, or more frequently, as work progresses. Current estimate payments amounting to less than $1,000 may be processed monthly. (Emphasis added)

Final payments amounting to between -$10 and +$10 will be disregarded. Partial payments do not bind the Department to the acceptance of any material furnished or work performed. Within 7 calendar days of the receipt of current estimate and final payments from the Department, pay all subcontractors their earned share of the payments, including all retainage, provided the terms and conditions of the applicable subcontract or purchase agreement have been reasonably met. (Emphasis added)

Standard Specification 110.08 Final Inspection, Acceptance, and Final Payment— (c) Final Settlement Certificate Computations.

The Representative will compute the entire amount of each contract work item performed and its contract value. The Representative will notify the Contractor of the amount for each item, including additions to and deductions from the contract quantity for each item of work, all other legal and equitable additions and deductions to be made, amounts previously paid, and the net amount of the final settlement certificate computations. The Representative will request written acceptance of, or exception to, these final settlement certificate computations within 10 days of the notification. Failure to follow the following procedures will waive the right to file a claim. (Emphasis added)

1. Within 10 days from the date the final settlement certificate computations or revised computations are submitted, notify the Representative, in writing, of acceptance or exceptions.

1.a If accepted, or upon failure to accept or take exception within the specified time, the Chief Engineer, Highway Administration will certify to the Secretary, in the final settlement certificate, the entire amount of each work item performed, its contract value, all legal and equitable additions and deductions, and the amounts previously paid. The Secretary will

certify to the State Treasurer the amount due in final payment and contract settlement. Under these circumstances, all claims are considered waived by the Contractor.

The Department will forward a copy of the final settlement certificate, setting forth the final settlement date. Copies will also be forwarded to the surety and other appropriate interested agencies. The date the Secretary notifies the Contractor of the final settlement certificate computations, or revised computations, will be the date of contract completion.

1.b If not acceptable, notify the District Executive, in writing, of all exceptions. The District Executive will give notification of the acceptance or rejection of the exceptions. The Contractor or surety has the right to appeal, within 10 days of the rejection, to the Director, BOCM. Notification will then be sent, in writing, from the Director, BOCM stating that the claim has been approved or rejected. Where the claim does not involve any disputes specified in Section 105.01, the "date that the claim accrued," for purposes of filing claims before the Board of Claims, will be the date notification in writing is sent from the District Executive, of the rejection of the claim. In the event of an appeal within 10 days, as provided, the date will be the first notification following the claim rejection by the Director, BOCM.

2. During final settlement certificate computations, if the Department determines that the net total amount to be received is actually a negative amount, then prompt reimbursement to the Department for the total amount overpaid is required. In the event of failure to reimburse the Department, the Secretary will take legal measures to secure the amount due. The Department may, in addition, remove the Contractor from its list of approved pre-qualified contractors, according to regulations. (Emphasis added)

2. NJDOT Payment Procedures

NJDOT's Standard Specifications outline the processes and procedures for payments to the contractor for work performed. The following presents NJDOT's standard specifications for the monthly and final payment processes:

Standard Specification 109.05 Partial Payments.

Monthly estimates will be made of the approximate quantities of Work satisfactorily performed according to the Contract Documents during the preceding month. Partial payments on account of such monthly estimate will be made based on the prices bid in the Proposal or as provided by Field Order, Change Order, or Supplementary Agreement. The Contractor is also to be paid under the monthly estimates for materials delivered according to Subsection 109.06. (Emphasis added)

***Before the issuance of each monthly payment before Substantial Completion, the Contractor shall certify**, on forms provided by the Department, that:*

1. *Each subcontractor or supplier has been paid any amount due from any previous progress payment and shall be paid any amount due from the current progress payment; or*

2. *There exists a valid basis under the terms of the subcontractor's or supplier's contract to withhold payment from the subcontractor or supplier, and therefore payment is withheld.* (Emphasis added)

Additionally, whenever the certification indicates that payment has been or will be withheld from a subcontractor or supplier, the Contractor shall, according to PL 1991, c.507, provide written notice of such non-payment to the subcontractor or supplier and shall provide to the Department, and to the Bonding Company providing the Performance Bond for the Contractor, a copy of the written notice of withholding of payment required by PL 1991, c.507. The notice shall detail the reason for withholding payment and state the amount of payment withheld.

PL 1991, c.507 authorizes any subcontractor or supplier from whom payment is withheld to receive from the Contractor, in addition to any amount due, interest at a rate equal to the prime rate plus one percent if the subcontractor or supplier is not paid within ten Calendar Days after receipt by the Contractor of payment by the State for completed work that is the subject of a subcontract or a material supply agreement and if no valid basis exists for withholding payment.

This interest shall begin to accrue on the tenth Calendar Day after receipt of payment by the Contractor. In addition, if court action is taken by a subcontractor or supplier to collect payments withheld by a Contractor, the prevailing party shall recover its court costs from the party against whom judgment is rendered.

Pay Items that are on a lump sum basis will not be measured. However, payment for such items will be included in partial payments consistent with the provisions of the Subsection describing the Work under the lump sum Pay Item. Where the method of payment is not described under the Subsection describing the Work of the lump sum Pay Item, partial payment will be made based on an approximation of the proportionate value of the Work satisfactorily performed to date.

Partial payment will not be made when the monthly estimate shows the total Work and delivered materials payable since the preceding monthly estimate to be less than $1,000, unless the Contractor requests in writing that such payment be made.

From the total amounts ascertained as payable, an amount equivalent to five percent of the amount due on the first 50 percent of the total adjusted Contract price will be deducted and retained pending Substantial Completion. On the remaining 50 percent of the total adjusted Contract price, no percentage of the partial payments is withheld as retainage. Any amounts paid to the Contractor in the form of incentive payments for early Completion and positive pay adjustments will not be included in the adjusted Contract price when calculating retainage.

Such estimate or payment will not be made when, in the judgment of the Engineer, the Work is not proceeding according to the Contract Documents *or following the Commissioner giving the Contractor and surety notice of delay, neglect, or default under Subsection 108.17. (Emphasis added)*

Such estimate or payment shall not be construed to be an approval of any defective or improper Work*. The Engineer upon determining that any payment under a previous monthly estimate was improper or unwarranted for any reason may deduct the amount of such payment from the subsequent monthly estimate and partial payments made to the Contractor. (Emphasis added)*

The Department will deduct from any monthly estimate and payment and/or the final payment such amounts as are required to be deducted pursuant to provisions of the Contract Documents.

Standard Specification 109.11 Final Payment and Claims.

The Final Certificate shows the total amount payable to the Contractor, including therein an itemization of said amount segregated as to Pay Item quantities, Extra Work, and any other basis for payment, and also shows therein all deductions made or to be made for prior payments and as required pursuant to the provisions of the Contract Documents. All prior estimates and payments are subject to correction in the Final Certificate.

***Within 30 days after said Final Certificate has been issued to the Contractor, the Contractor shall either submit to the Engineer a written acceptance of the Final Certificate without exception or a written acceptance of the Final Certificate with exception or reservation**. The Contractor's failure to submit any written acceptance within said 30 days will be construed as an acceptance of the Final Certificate without exception or reservation. Final payment will be made to the Contractor in the amount set forth in the Final Certificate, and the Contract will be complete as of the date on which such payment is issued. Failure of the Contractor to accept the tendered Final Payment shall not affect completion of the Contract.* (Emphasis added)

If the Contractor submits to the Engineer its written acceptance of the Final Certificate without exception or reservation, the acceptance shall contain a release signed by the Contractor in the following form:

> *In consideration of the above payment, I hereby release the State of New Jersey, Commissioner of Transportation, the Department, their agents, officers, and employees from all claims and liability of whatsoever nature for anything done or furnished or in any manner growing out of the performance of the Work.*

Upon receipt of such written approval and release, the State will pay the entire sum due there under as provided by the New Jersey Prompt Payment Act, NJSA 52:32-32 et seq., and the Contract will be complete as of the date on which that payment is issued.

3. MSHA Payment Procedures

MSHA's Standard Specifications outline the processes and procedures for payments to the contractor for work performed. The following presents MSHA's Standard Specifications for the monthly and final payment processes:

Standard Specification GP-9.01 Scope of Payment

Payment to the Contractor will be made for the actual quantities of Contract items performed in accordance with the Plans and Specifications and if, upon completion of the construction, these actual quantities show either an increase or decrease from the quantities given in the bid schedule, the Contract unit prices will still prevail, except as provided in GP-4.04 Variations in Estimated Quantities. (Emphasis added)

The payment of any partial estimate or of any retained percentage except by and under the approved final estimate and voucher, in no way shall affect the obligation of the Contractor to repair or renew any defective parts of the construction or to be responsible for all damages due to such defects.

When requested in writing by the Contractor and approved by the procurement officer, payment allowance will be made for nonperishable material to be incorporated in the work delivered and stockpiled at the work site or other approved site. Material, for which payment has been made, wholly or partially, shall not be removed from the worksite or other approved site.

Payment to the Contractor under this section for materials on hand in no way will be construed as acceptance by the Administration of title to the material. Title shall remain with the contractor until the project has been completed and accepted in accordance with GP-5.13.

Contractor shall indicate his Federal Tax Identification or Social Security Number on the face of each invoice billed to the State.

On Contracts in excess of $25,000, the Contractor prior to receiving a progress or final payment under this Contract, shall first certify in writing that he has made payment from proceeds of prior payments, and that he will make timely payments, from the proceeds of the progress or final payment then due him, to his subcontractors and suppliers in accordance with his contractual arrangements with them and State Finance and Procurement Article, §17-106. This certification may be required by the procurement officer for Contracts of $25,000 or less. (Emphasis added)

The Contractor shall also obtain from each subcontractor a certification that it has made payment from proceeds of prior payments to any of its lower tier subcontractors, and will make timely payments to its lower tier

subcontractors and suppliers in accordance with its contractual arrangements with them. This certification is not required from subcontractors who have no lower tier subcontracts. These certifications may be required by the procurement officer for contracts of $25,000 or less. (Emphasis added)

In addition to any other remedies provided by law or this Contract, any Contractor or subcontractor of any tier who fails to make payment as required by the certification set forth in the above paragraphs within thirty (30) days from the date such payments is due shall be obligated to include with such payment interest at the rate of 10 percent per annum from the date the payment was due to the date the payment was actually made to the subcontractor or lower tier subcontractor.

Standard Specification GP-9.04 Final Acceptance and Final Payment

(a) When the Contractor has completed a Contract, and it has been accepted for maintenance in accordance with the provisions of GP-5.13, the Administration will promptly proceed:

(1) To make any necessary final surveys;

(2) ***To complete any necessary computation of quantities****; and (Emphasis added)*

(3) ***To submit to the Contractor, within 60 days after final completion and acceptance of the project by the procurement officer for maintenance, for his consideration, a tabulation of the proposed final quantities****. This tabulation shall be accompanied by a statement setting forth: (Emphasis added)*

(a) the additional work performed under change orders and/or supplemental agreements;

(b) the authorized extension of time;

© the number of days which have been charged against the Contractor as having been used to complete the Contract, and

(d) any deductions, charges or liquidated damages which have been made or imposed.

(b) ***The Contractor shall then have a period of 10 calendar days, dating from the date upon which he received the aforementioned tabulation from the Administration****, in which:* (Emphasis added)

(1) To decide whether or not he will accept final payment upon such a basis, and

(2) To notify the Administration, in writing, of his decision. The Contractor may request an additional period up to 10 calendar days in which to notify the Administration of his decision. In the event the Contractor notifies the Administration that he protests final payment on such a basis, that notification shall outline the reason(s) for said protest.

(c) Upon receipt of a notification of acceptance as provided for in paragraph (b) above, the Administration shall prepare the final estimate and final payment forms and submit them to the Contractor. These forms shall show all data noted in paragraph (a) above, together with deductions for all prior payments. The Contractor shall execute these forms and return them to the Administration within 30 calendar days from the date they are received for execution and payment. If such signed forms are not received by the Administration within the specified time, the Administration will prepare duplicate forms for execution and payment. Such action by the Administration shall be deemed to constitute acceptance and final payment.

(d) If, under the provisions of paragraph (b) above, the Contractor notifies the Administration of his protest and nonacceptance of the data submitted to him, the Administration shall pay the Contractor a semi-final estimate, or an additional semi-final estimate in the event a semi-final estimate has already been paid based upon the data noted in paragraph (a) above, with deductions for all prior payments. A retainage equal to 1 percent of the total value of the Contract shall be withheld by the Administration. The acceptance of such semi-final estimate, or additional semi-final estimate, shall not be considered as a waiver on the part of the Contractor of his right to pursue his protest and press for acceptance and final payment.

(e) In the event the Contractor does not accept the data submitted to him as described in paragraph (a) above and/or has outstanding a claim filed in accordance with GP-5.14, the procurement officer and the Contractor shall confer at mutually convenient times and endeavor to

reconcile all points of disagreement expeditiously. If such reconciliation is accomplished, the Administration will promptly proceed with acceptance and final payment on the reconciled basis and in accordance with the provisions of paragraph (c) above. If reconciliation is not accomplished within 30 days, the decision of the procurement officer shall be reviewed by the Administrator and appropriate legal counsel. After review by the Administrator, the decision of the procurement officer is deemed to be the final action. The procurement officer shall furnish a copy of the final decision to the Contractor by certified mail, return receipt requested. This decision may be appealed by the Contractor to the Maryland State Board of Contract Appeals. This must be done by filing a written notice of appeal to the Appeals Board within 30 days from the date of the final decision. Failure to provide timely notification to the procurement officer shall constitute a waiver by the Contractor of his right under the Disputes Clause and final payment may be made by the Administrator based on the procurement officer's recommendation.

(f) ***All prior partial estimates and payments shall be subject to correction at the time of acceptance and final payment and if the Contractor has been previously overpaid, the amount of such overpayment shall be set forth in the Final Payment forms and the Contractor hereby agrees that he will reimburse the Administration for such overpayment*** *within six months of receipt of such advice, and his surety will not be granted release from obligations under the terms of the Contract until reimbursement has been made in full.* (Emphasis added)

(g) Payment for the full apparent value of the Contract thus determined shall become due and payable to the Contractor within ninety (90) days after acceptance of the project by the procurement officer for maintenance, as hereinafter provided. As condition precedent to final payment, the Contractor shall be required to execute a general release of all claims against the Administration arising out of, or in any way connected with, this Contract.

(h) In accordance with § 7-222 of the State Finance and Procurement Article of the Annotated Code of Maryland, certification must be obtained from the Comptroller of the Treasury, and the Employment Security Administration that all State taxes have been paid prior to release of final payment on a construction Contract. The check will be

processed and mailed only after notification is received from both departments that no State tax is owed.

D. Quality Management

AASHTO defines Quality Control, Quality Assurance and Quality Control Plan as:

Quality Control

The sum total of activities performed by the seller (such as producer, manufacturer, and/or Contractor) to make sure that a product meets contract specification requirements. Within the context of highway construction this includes materials handling and construction procedures, calibration and maintenance of equipment, production process control, and any sampling testing, and inspection that is done for these purposes.

Quality Assurance

All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality. Within an organization, Quality Assurance as a management tool. In contractual situations, Quality Assurance serves to provide confidence in the supplier.

Quality Control Plan

A detailed description of the type and frequency of inspection, sampling, and testing deemed necessary to measure and control the various properties governed by Agency specifications. This document is submitted to the Agency for approval by the Contractor during the preconstruction conference.

CMAA defines Quality Control, Quality Assurance and Quality Management as:

Quality Control

The continuous review, certification, inspection and testing of project components, including persons, systems, materials, documents, techniques and workmanship to determine whether or not such components conform to the plans, specifications, applicable standards, and project requirements.

Quality Assurance

The application of planned and systematic examination or verifications which demonstrate that quality control procedures are being effectively implemented.

Regardless of the level of effort required by the Construction Manager's contract, quality management is an inherent element of the Construction Manager's basic service. Similarly, the Construction Manager should develop and implement a comprehensive Quality Management Plan as one of the first project tasks undertaken, whether the Construction Manager begins providing services during the Pre-Design Phase, after construction has begun, or anywhere in between.

Quality Management

The process of planning, organizing, implementing, monitoring and documenting of a system policies and procedures that coordinate and direct relevant project resources and activities in a manner that will achieve the desired quality.

Most of the departments assure a quality product by self-performing the sampling and testing of the materials being installed and/or constructed on the project or at an offsite facility, such a precast concrete manufacturer. The DOTs self-perform and typically specify the required lot size, or sampling size, for the amount of materials placed. However, the contractor is responsible for the control and quality of the materials, workmanship and construction procedures.

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Task One - Industry Evaluation

PennDOT's Standard Specification 106.03 requires the Contractor to prepare and submit to the Chief Inspector its Quality Control Plan prior to the start of construction activities. The Chief Inspector is responsible for reviewing this Quality Control Plan. Additionally, the plan should include sampling and testing frequencies and corrective action measures.

PennDOT Standard Specifications 106.02.a.2 requires the following for the Quality Control Plan:

> ***2. QC***
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> ***2.a*** *Maintain a QC system that provides reasonable assurance that materials, products, and completed construction, submitted for acceptance, conform to contract requirements whether self-manufactured, processed, or procured from subcontractors or vendors. When specified, submit for review, a plan of the QC system to be used. Have performed or perform the inspections and tests required to substantiate product conformance to contract requirements. Make the inspection and test results available for review throughout the contract life. Procedures will be subject to the review of the Department before the work is started. Charts and records documenting QC inspections and tests are the property of the Department. Submit a QC Plan for use in compliance with the following guidelines, as a minimum:*
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> ***2.a.1 Raw Materials.*** *List the source of material along with methods of documentation and testing performed to assure the material quality.*
>
> ***2.a.2 Production Control.*** *List lot size and samples required; include sample selection, labeling and test procedure; also include manufacturing phase.*
>
> ***2.a.3 Product Testing.*** *List type and frequency of tests to be performed, along with method of documenting and reporting test results. List test equipment and calibration procedure (frequency) required. List procedure for retesting or rejecting items failing the tests. List the disposal methods and location for test samples and rejected lots.*

2.a.4 Personnel. *List the personnel in charge of QC and define their areas of responsibility.*

2.a.5 Packaging and Shipping. *List method of identifying, storing, loading, transporting, and unloading to assure safe delivery of acceptable material and products.*

2.a.6 Documentation. *List the procedures used for documentation and certification. The QC Plan and process are subject to periodic review and inspection by the Department.*

2.b *Promptly record conforming and non-conforming inspection and test results on acceptable forms or charts. Keep these records complete and keep them available for inspection at all times during the performance of the work.*

2.c *Promptly correct any errors, equipment malfunctions, process changes, or other assignable causes which have resulted or could result in the submission of material, products, and completed construction not conforming to specification requirements.*

2.d *When required, provide or have provided and maintain measuring and testing devices necessary to ensure that material and products conform to contract requirements. In order to ensure continued accuracy, calibrate these devices at established intervals against Department standards.*

2.e *When required, make the measuring and testing equipment available to the Representative for use in determining conformance of material, products, or completed construction with contract requirements. In addition, make personnel available for the operation of such devices and for verification of the accuracy and condition of the devices. Have calibration results available at all times. The Department reserves the right to conduct periodic inspections of the measuring and testing devices to confirm both calibration and condition of operation.*

2.f *Failure to comply with the QC Plan may result in suspension of approval to provide material*

From our review of the three DOTs, it is clear that the responsibility for providing/assuring a quality product lies solely with the contractor. Further, the inspection staff must be present to document the work that is being installed. This responsibility for quality management is stated by each of the three DOTs, as presented below.

PennDOT Standard Specification - 105.05 Responsibility of Contractor

The Department is not responsible for the Contractor's satisfactory completion of the contract work as a consequence of the presence of Department representatives or inspectors and their inspection.

NJDOT Standard Specification - 105.14 Inspection of Work

The Contractor is responsible for carrying out the provisions of the Contract at all times and for control of the quality of the Work regardless of whether an authorized inspector is present or not. This obligation to perform the Work according to the Contract Documents is not relieved by the observations of the Engineer in the administration of the Contract, nor by inspections, tests, or approvals by others. Work not meeting the Contract requirements shall be made good, and unsuitable Work may be rejected, notwithstanding that such Work had been previously inspected and approved by the Department or that payment therefore has been included in a monthly estimate certificate.

MSHA- Construction Manual- Project Engineers and Inspectors

The Inspector must avoid any inspection, testing, or other activity that could be interpreted as a responsibility of the Contractor; otherwise, the Owner's position may be jeopardized in the event of a dispute or claim. This applies particularly to the Contractor's quality control program for testing and inspecting the Contractor's materials and workmanship as a part of his contractual responsibility.

It should be noted that ConnDOT, NJDOT, MSHA and/or AASHTO do not require or recommend that the contractor submit a quality assurance/control plan. It is of

the utmost importance that a deficiency or defect is identified quickly, and that the industry-recognized fix is implemented in a timely manner, since the majority of DOT work is built upon each element. The contractor's performance and workmanship are observed by inspectors and by their own internal staff. These individuals are not provided with a specific reference, aside from the contract provisions, to other industry standards, such as ACI (American Concrete Institute), or to contractor-developed quality assurance/control plans. The only true recourse for the DOTs is to direct replacement, not pay for the item or accept the material as placed with a possible reduction in the unit price item. This type of response is counterproductive and typically generates further disputes.

We would recommend that ConnDOT examine the potential of requiring, through its Standard Specifications, that the Contractor develop and provide a Quality Assurance and Control Plan.

By introducing a quality plan initiative developed in concert with the contractors and DOTs, non-conforming work can be identified and resolved in a timely manner through standardization of procedures and having pre-approved repairs that are accepted in the industry or by ConnDOT. Additionally, the specifications should mandate that the Contractor provide a representative (instead of the contractor's superintendent) for assuring that the quality of the Contract is being met.