

I-84 Construction Oversight and Audit Services

Task 2 – Connecticut Evaluation and Comparison

Connecticut Department of Transportation

July 10, 2007

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I. Introduction

Task Two's primary goals were to identify standards, policies and procedures specifically used by the Connecticut Department of Transportation ("ConnDOT") during the construction of a project, and to compare these standards and processes with other departments of transportation. Additionally, this review included the comparison of ConnDOT's 1998 Construction Manual to the updated 2006 manual.

In order to develop a baseline document to evaluate and compare ConnDOT's standards, policies and procedures, we gathered and researched reference documents available to Department Staff, Consultants and the Contractor. From this research and review/comparison of the 1998 to 2006 manual, we developed a matrix of the policies and procedures used by these groups. This matrix is attached as Appendix 1.1.

To compare ConnDOT to others, we developed similar matrices of standards, policies and procedures of other entities. As described in our Task One report, we selected other departments of transportation of similar size, urban and rural complexities, budgets, potential advancements in standards and policies, and our knowledge of these states' procedures and policies. Specifically, we selected departments of transportation in Pennsylvania, New Jersey and Maryland. Additionally, we reviewed the construction manual of the American Association of State Highway Transportation Officials (AASHTO), and compared it to Connecticut's. The comparison of ConnDOT and PennDOT is attached as Appendix 1.2. The comparison of ConnDOT to NJDOT is attached as Appendix 1.3. The comparison of ConnDOT to MSHA is attached as Appendix 1.4. The comparison of ConnDOT to AASHTO is attached as Appendix 1.5.

In summary, our review of the industry-standard policies and practices of ConnDOT and the other states, indicated that highway construction, inspection and oversight in general is managed under similar guidelines and practices. It should be

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noted that ConnDOT has incorporated revisions and new sections in its Construction Manual, and it is our understanding through interviews with ConnDOT that the Construction Manual will continue to be updated annually.

From our review of the ConnDOT Construction Manual and comparison of ConnDOT manual to other DOTs and AASHTO, we recommend that ConnDOT consider the following:

- Include an introduction and statement of purpose in the Manual;
- State in the introduction that this manual shall be used only as a reference and guide to the policies and procedures of the Department and shall not be a substitute for contract documents;
- Include procedures for external emails;
- Include an organization chart and/or description of the Department's organization;
- Describe the roles and responsibilities of individuals, from the District Engineer through the Inspectors;
- Include other items on the Daily Work Report;
- In the Project Meeting section, provide samples of agendas for various types of meetings;
- Describe the importance of inspection and the Inspector;
- Discuss the importance of teamwork;
- Introduce and describe the Office Engineer position;
- Discuss the importance of the Daily Dairy, kept by individuals on the project;
- Consider requiring the standard use of project controls software.

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Our review and evaluation of ConnDOT's Standard Specifications showed that they include various contractual requirements in 'Project Special Provisions' that other DOTs have standardized. Special Provisions are typically defined as applicable revisions to the Standard Specifications for an individual project. By standardizing some of the provisions in the contract, variances between projects may be eliminated and standard policies, procedures and reviews may be developed and implemented. We would recommend these modifications and/or additions be generated in a partnering workshop with the Department, Design Consultant, Inspection Consultant, Contractor and the State Attorney General.

This section of the report describes and provides examples of contract provision sections from other DOTs. These include:

- Ligated Damages
- Lane Occupancy Charges
- Termination for Convenience
- Progress Schedules
- Audit
- Dispute and Claims
- Time Extension Request
- Contractor's Expense During Delays
- Quality Control
- Health and Safety Plans
- Subcontracting
- Estimated and Final Payment and
- Contract Changes

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II. Construction Manual Evaluation

A. Introduction

A construction manual is typically used as a guide and reference for the field staff of the department, including consultants. The manual describes the general responsibilities and authorities of the construction personnel. It provides the personnel with information and direction for the performance of their respective duties. The main focus of the manual is to bring standardization to the inspection and administration of the construction contracts throughout the department. Through the standardization process, the departments may obtain a consistent and uniform work product. The manual should be presented as reference only, and should not amend the contract documents.

B. Evaluation Construction Manual

In general, ConnDOT's Construction Manual is similar in topic and detail as compared to other DOTs. It should be noted that ConnDOT has made substantial modifications from its 1998 to 2006 versions, and it is our understanding that the manual will be revised annually.

The following portion of the report presents our evaluation, observations and findings regarding the evaluation of ConnDOT's manuals, and comparison of ConnDOT to other entities. The observations and findings are presented in three issue categories: key, moderate and minor. We recommend that the Department consider addressing the identified key issues within a reasonable timeframe and incorporating the moderate and minor issues prior to the release of the annually updated manual.

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1. Major Issues

a. Introduction to the Manual

The ConnDOT 1998 manual included an introduction, and briefly described its purpose in administering the construction project. The introduction also provided information on the roles and responsibilities of individuals. This introduction was removed in the 2006 manual update. When we reviewed the other DOTs, it was standard protocol for each manual to include an introduction, which included an explanation of its purpose and intended use. We recommend an introduction to the ConnDOT manual be reinstated. The following are examples of introductions to the three other manuals we reviewed:

PennDOT

This Construction Manual is to be used as a guide and a reference for the Inspector in the field. The Inspector should familiarize himself with the requirements of the Specifications, Form 408 and Form 409. In no way is this Construction Manual intended to be a substitute for the Specifications and should not be considered as such by those who use this Manual.

The Inspector has the proposal, drawings, Specifications, and Special Provisions, which dictate the work to be performed on the project. This Manual should assist the Inspector in performing his duties by providing him with what is considered good construction practices on the different phases of the project. The contractor may have a better method than those outlined herein, but he must obtain the same end result.

NJDOT

This Construction Manual was developed to provide a guidance and information for construction personnel in the performance of their assigned duties. Its purpose is to effect standardization in the inspection and administration of construction contracts throughout the State. Standardization is beneficial to the State in ensuring a consistently high-quality performance and to the Contractor in providing uniformity in the control of construction in all areas of the State.

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In its completed form, the Manual will establish procedures and give information for road and bridge construction relative to the responsibilities and authority of State construction personnel, specifications, plans, related mathematics, material control, construction methods, documentation, office work and as-built quantities. It will not modify, supersede, or in any way replace the provisions of the plans and specifications.

MSHA

The Construction manual has been prepared as a guide for standardization of construction practices state-wide and should be utilized toward that objective.

The Construction Inspection Divisions encourages and requests that they be advised when errors or alternate construction methods are found. Approved revisions will be issued as the need arises. Each recipient of the manual is responsible for keeping the contents up to date.

a. Used in conjunction with Standard Specifications

ConnDOT's 1998 manual included a statement regarding the use of the manual in conjunction with the Standard Specifications located in chapter one, *Construction Organization*. The clause in the manual states:

*This manual, **in conjunction with the Standard Specifications for Roads, Bridges and Incidental Construction**, outlines the organization, **policies and procedures of the Department in administering construction contracts from their execution to completion**, and serves to clarify and unify construction procedures and practices.*

From reviewing the other DOTs, we would recommend this statement be removed when an introduction is reinstated in the manual. As described above, these manuals are for guidance and reference purposes of standardizing construction inspection, oversight and management. The manual should not be used to modify the contract documents or contract provisions.

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b. Project Email Procedure

As technology advances, email has become a resource used by all parties, internally and externally, in the transmittal of documents and other information. Email has become a useful tool for instant information-sharing. However, this information-sharing often can become casual correspondence, which may lead to confusion or conflicting directives or responses to information requests.

Another issue with emails is that they have become part of the project record, yet are not filed in their respective correspondence files. This may lead to counter-directives, an incomplete document record and misinformed decisions. From our review and research, there are no standard procedures or protocols for email developed by any of the DOTs, including ConnDOT. At this time, we have not been able to find any internal policies and procedures established by the DOTs; however, we were informed by ConnDOT staff that internal email policies do exist.

We recommend that ConnDOT investigate the possibility of incorporating into its manual an external email procedure or policy with regard to direct communications with its consultants and contractors. This policy should, at the very minimum, include procedures for formal directives and correspondence.

2. Moderate Issues

a. Organization

ConnDOT's 1998 manual included a brief description of the Department's Organization and Personnel. This section was removed in the 2006 manual. We recommend this section of the 1998 portion of the manual be reinstated, since it provides both internal departmental staff and consultants with valuable insight to the organizational structure. Other DOTs include a brief introduction to their respective organizations, similar to the 1998 manual.

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b. Roles and Responsibilities

ConnDOT's 1998 manual included a brief description of the Department's Office of Construction. This section was removed in the 2006 manual. We recommend this section of the 1998 portion of the manual be reinstated, since it provides both internal departmental staff and consultants with insight to the organizational structure and personnel. This section also gives a brief description of individuals' roles and responsibilities during the project, and the level of authority assigned to each individual. Other DOTs include a brief introduction to their respective organization and personnel, similar to the 1998 manual.

c. Daily Reports

As stated in our Task One report, field reporting and documentation are the most critical aspect of construction management and oversight. The inspector's daily records are the primary source of observations made contemporaneously in the field. They record the daily events and observations of the project, and are the sole basis for the measurement and payment of quantities. All written field notes, such as Daily Inspection Reports, become the permanent observations of the construction and should include pertinent information, measurements, quantities and day-to-day observations about the project and its progress. These 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, the quality of installed materials, personnel and equipment records, and identification of deficient or defect work. These records should be consistent, organized and readily available for quality checks and historical reviews.

All of the departments and AAHSTO stress the importance of the inspection reports, and all describe the basic requirements in completing them. Some departments recommend including more information than others. After the review of the individual

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department's recommended format and content, we recommend that ConnDOT consider requiring the following additional elements in its Daily Work Reports:

- Weather conditions
- General purpose of work
- Standard of Work Statement - Does the work meet the requirements specified in the Contract Documents?
- Identify Nonconforming or Deficient Items
- Track potential extra work or potentially disputed work including personnel, hours, equipment and materials
- Unusual conditions, possible change of site conditions
- Progress quantities by location

Other considerations that the DOTs and AASHTO require inspectors to include in their reports are:

- Neatness
- Legibility and clarity of observations and the use of plain simple lettering and words 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, and general clean-up, etc.
- Pride - Inspection personnel should turn in notes and documents which they can be proud of. These documents are permanent records which often others create a general impression of the Inspectors ability and accuracy by the reading of the reports.

d. Project Meetings

In our review of all the various departments' construction manuals and/or standard specifications, we were not able to find any requirements for project meetings.

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Nor did the manuals discuss project meetings and agendas. We recommend that ConnDOT incorporate into its Standard Specifications a requirement that the department and the contractor to meet on a bi-weekly basis, at a minimum, to discuss the progress of the project. Additionally, ConnDOT's construction manual should include a section on sample agendas. This section would include, for example, such topics as (1) Progress; (2) Scope of Work; (3) Schedule; (4) Budget; (5) New issues; (6) Old Issues and; (7) Potential Conflicts and Resolution.

Additionally, we recommend that ConnDOT incorporate other agendas for special meetings, as necessary, including meetings on erections, traffic stage modifications, and/or concrete pour placements. It should be noted that, during our review, the project meeting agenda was discovered in the Daily Work Report, Section Figure 1.3.1, located on Page 1-3.4.

3. Minor Issues

a. Importance of Inspector

When reviewing the NJDOT construction manual, we discovered a section that discussed the importance of the Inspector. We recommend ConnDOT consider adding a similar section into its manual.

NJDOT Construction Manual Section 107.1 Importance

In recent years, many engineers have become aware that construction inspection is one of the most important phases in the conception, design, construction and maintenance of a facility. Unless field inspection is conscientiously carried out, the completed project may well be an unknown quantity, a potential high maintenance facility, a threat to the reputation and prestige of the Department as well as a waste of public money. Some people feel that inspection is an added cost; the contractor, in many cases, feels that it is an added aggravation. In reality, proper inspection ensures that the Department is obtaining the results required in

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the Plans and Specifications; anything less would be foolhardy to accept the key man in the inspection of a construction project is the Resident Engineer. His importance to the project is equal to that of the engineer who designed it. The Resident Engineer works in close association with his subordinates, his superiors and the contractor.

b. Team Work

When reviewing NJDOT's Construction Manual, a second section was discovered that discussed the importance of Teamwork. We recommend ConnDOT consider adding a similar section into its manual.

NJDOT Construction Manual Section 107.3 *Team Work*

Team work is a necessity for proper project control. The Resident Engineer is charged with the responsibility for quality construction, but it is only by the coordinated efforts of himself and his subordinates that this can occur. Project personnel should expect the Resident Engineer to review and discuss the quality of their work as necessary.

The quality of a project primarily depends on the effectiveness of the Resident Engineer as a supervisor. The Resident Engineer should review his personnel's inspection procedures for their assigned field operations on a daily basis. Cross training in job assignments will be stressed so that an effective inspection team is developed. Every attempt should be made to assign inspection personnel to operations that best suit their abilities.

All construction personnel should anticipate the application of the rule "praise him publicly, rebuke him privately". Failure to apply this rule is the first step toward losing project control. The competence of the Inspection team will be affected by that of its least competent member.

Inspection personnel can expect to be given authority to fulfill their area of responsibility. This authority will be absolute and personnel can expect to be held accountable. Engineers and inspectors should expect the Resident Engineer to respect the chain of command that he establishes. The Resident Engineer should expect subordinates to seek advice on

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technical matters when they have questions relative to job operations, Plans or Specifications.

It is the responsibility of all construction inspection teams to seek construction quality. Inspection personnel must actively participate, day by day, to obtain the desired quality. Anybody can read the Specifications and wait for a mistake to be made; a good inspector will make sure he is aware of problems and advise the contractor of problem areas as they occur.

c. Introduction of Office Engineer

When reviewing ConnDOT's Construction Manual, we observed that the job of Office Engineer was not described. The Office Engineer coordinates all of the office functions for the Resident Engineer. We recommend ConnDOT consider adding a section into its manual regarding the potential roles and responsibilities of this individual(s). Other DOTs use the Office Engineer to perform some of the following tasks:

- Receive and review all inspection reports
- Prepare project records
- Review status reports from Materials Department
- Maintain office plan set
- Maintain correspondence log and meetings
- Prepare project documents, such as weekly status reports, monthly estimates and change orders.

d. Importance of Diary

As stated in our Task One report, field reporting and documentation are the most critical aspects of construction management and oversight. One of the most important historical records is the Resident Engineer's diary. We recommend that ConnDOT incorporate a section regarding the importance of the diary and provide examples of daily

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entries. We recommend that the following examples of pertinent information be contained in the document:

- The date and signature of the Resident Engineer or his representative should be included immediately after each day's entry.
- The Resident Engineer's designee should make entries for the Resident Engineer in his absence.
- An entry should be made for every business day, regardless of whether the contractor is working or not. Reasons for not working or slow progress should be included.
- It should be kept as brief as possible, without forgoing necessary information, since it provides invaluable information and evidence in the event of later dispute.
- The diary should be complete and understandable to anyone unfamiliar with the project.
- It should include specific problems encountered and corrective action taken in regard to work progress, work starts, work stoppages, construction equipment, material deliveries, weather conditions, material shortages, testing, labor disputes, utilities, subcontractors, etc.
- The project diary is an official 'source' document and should be turned in with other contract records at the conclusion of the project.
- A detailed record of information that might have a bearing on any probable dispute.
- Composed of statements of fact. If an opinion is warranted, clearly state that it is an opinion.
- A record of discussions with, decisions made, and directions given to the contractor's representatives and assigned personnel.
- A record of discussions with, decisions made, and directions received from the Resident Engineer's immediate supervisor and higher authorities.
- A record of discussions with other interested parties (safety inspectors, local residents, etc.) and comments concerning the discussions.
- An explanation of how and when a project problem was resolved, together with proper cross-references. This should be done when an inspector's report includes a critical or adverse comment about a construction operation.

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- A record of any accidents or injuries on the job, and the conditions prevailing at the time.
- A source of some general information, such as the hours worked, the weather conditions, and what the contractor did.

e. Project Controls- Expedition or Prolog

As technology advances, project control programs and electronic document management systems are becoming increasingly integrated into construction projects. It is our understanding that ConnDOT is currently researching and implementing these systems and/or testing them. If and when these systems are integrated into the ConnDOT's project delivery, we recommend that the staff be trained in the computer programs, which will assist in effectively integrating the program into ConnDOT's processes. These computer programs are only beneficial when the end users understand and continuously use them.

III. Review and Comparison of Standard Specifications

A. Introduction

From our review of ConnDOT's Standard Specifications and comparison with the three other DOTs' standard specifications, we have found several contract clauses that are not included in ConnDOT's specifications. It is our understanding from verbal communications with ConnDOT that several of these clauses are included in individual Project Special Provisions. By including these special provisions for individual projects, each clause(s) is modified, which may create unintended differences among projects and conflicts within a given contract. By standardizing some clauses, procedures and processes for managing projects will be developed that will help the department's staff manage their projects. Before including or revising any clauses, we recommend that ConnDOT develop a steering committee of ConnDOT staff, contractors, engineers, construction consultants and the state Attorney General. To assist ConnDOT in

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standardizing some of these typical contract clauses, we have presented below several important standardized clauses from other DOTs as examples.

B. Ligated Damages

From our review of ConnDOT's standard specifications, we discovered that Ligated Damages is only referenced in Section 1.08.09, *Failure to Complete on Time*. ConnDOT has stated that each project has a Ligated Damages clause in the Project Special Provisions.

PennDOT and NJDOT use two different methods for standardizing this clause. PennDOT includes varying damages based on the contract value, while NJDOT's standard specification reference its Project Special Provisions for a value of damages that is calculated based upon individual project constraints. Both of these clauses are presented in Exhibit Nos. 1 and 2, respectively, as examples and for ConnDOT's further review. Some other significant observations include:

- PennDOT provides a table for the Ligated Damages per day, and the value of the Ligated Damages is based upon the Contract Amount.
- PennDOT includes a Work Zone Ligated Damage. This is a charge for failure to comply with the Maintenance and Protection of Traffic requirements or other traffic control requirements.
- NJDOT states that the Ligated Damages value is presented in the Special Provisions of the contract, since each project has different variables. However, the contractor is referenced through the standard specifications to the Special Provisions for the specific value.
- NJDOT includes a Lane Occupancy Charge in its standard specifications. This contractual charge is for the failure to open a lane or lanes of travel in accordance with the lane closure limits and the permitted time period allowed by contract. This charge is deducted from the monthly estimate when appropriate.

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B. Termination for Convenience

From our review of the ConnDOT's Standard Specification, we found that the specification include only a Termination for Cause in its contract under Section 1.08.10, *Annulment of Contract*. We recommend that ConnDOT consider including a Termination for Convenience clause in its Standard Specifications. We have presented NJDOT, PennDOT and MSHA Termination Clauses in Exhibit Nos. 3, 4 and 5 for ConnDOT's further review. Some other significant observations include:

- NJDOT prescribes the payment for items of work, which were completed or in process, at the time of the termination notice.
- NJDOT states its right to audit any costs to determine the validity and amount of each item for which the Contractor seeks compensation.
- PennDOT provides the reasons for which it has the right to terminate for convenience.
- PennDOT does not allow for a claim for lost profits or damages of any kind for the termination for convenience.
- MSHA specification provides the Contractor with specific procedures after the termination.

C. Project Schedule

An effective time management system is necessary for a project to be effective in managing people, materials equipment and money. Proper scheduling and planning are necessary to manage a project and achieve completion within budget and time. Project scheduling is one tool in this management, however, poorly developed and poorly maintained schedules are of no value. To assist in setting procedures and policies, some of the DOTs are including more stringent scheduling requirements in their standard procedures. Exhibit Nos. 6 and 7 provide the requirements of NJDOT and PennDOT, respectively, for developing and monitoring project schedules. Some other significant observations include:

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- NJDOT prescribes the type of schedule to be used and the standards by which the schedule should be developed.
- NJDOT states that no activity shall be greater than 20 working days without approval of the State.
- NJDOT describes the method of payment for this lump sum item.
- PennDOT requires a Project Control Meeting be held as needed or directed to discuss the progress of the project.
- PennDOT requires a written report to be provided with the schedule update. This report should include the progress of activities, impacts, a two-week look-ahead, and other related schedule data.

D. Audit

NJDOT includes in its Standard Specification the right to audit the contractor's records regarding disputes. We recommend that ConnDOT incorporate a similar standard contract section in its Standard Specification. This NJDOT standard specification is included in Exhibit No. 8. The section includes the following:

- NJDOT requires the ability to audit a contractor's records when a claim is filed to validate its request for compensation.
- The audit may be performed by the State or by an auditor under contract with the DOT.
- The list of documents that should be available is provided in Exhibit No. 8.

E. Dispute and Claims

From our review of ConnDOT Standard Specification, we discovered that Dispute and Claims Resolution is only referenced in Section 1.08.08, *Extension of Time*. There are no standard contractual procedures identified in the ConnDOT Standard Specifications.

From a review of the PennDOT and NJDOT specifications, we have found two different methods for standardizing the dispute and claims resolution clause. Both of

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these clauses are presented in Exhibit Nos. 9 and 10 for ConnDOT's further consideration and review. Some other significant observations include:

- PennDOT prescribes a compensable delay.
- PennDOT prescribes items of damages that cannot be included in any delay claim against the Department.
- NJDOT stipulates the administrative process for the resolution of the dispute in sequential order.
- NJDOT provides the procedure and requests the contractor to provide specific information regarding the dispute for the administrative process and review.
- NJDOT specifies the time constraints in submitting the claim and the time to prepare and submit the written decision within each step of the process.
- NJDOT includes a secondary resolution path if the dispute exceeds \$250,000 or is mutually agreed upon by both parties.

F. Time Extensions Request

ConnDOT has a Standard Specification for the Request of Time Extension, Section 1.08.08. From our comparison, some DOTs have added to the clause, and included additional procedures, conditions and standard requirements in their Standard Specifications. We recommend that ConnDOT incorporate similar additions into its standard specifications. We have provided two examples of such additions in Exhibit Nos. 11 and 12 for ConnDOT's review and consideration. Some other significant observations include:

- PennDOT provides specific reasons for a time extension or time reduction.
- NJDOT provides the reasons for a time extension or reduction of contract time.
- NJDOT provides the criteria the Contractor must meet for a time extension or reduction.
- NJDOT provides a table for extreme weather conditions for which a time extension would be granted. This table is presented in Exhibit No. 12.

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G. Contractor's Expense During Delays

NJDOT includes in its Standard Specification clauses regarding payment of contractor's expense during delays. We recommend that ConnDOT incorporate a similar contract section in its Standard Specification. NJDOT's standard specification, 109.04 *Payment for Contractor's Expense During Delays* is presented in Exhibit No. 13 as an example. Some other significant observations include:

- NJDOT describes the items for which it will compensate a contractor for during a delay period, such as labor, bond, insurance, tax, equipment, miscellaneous, and profit.
- NJDOT requires supporting documentation for the itemized statements of the costs.

H. Quality Control and Quality Assurance

Most of the DOTs 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 off-site facility, such as a precast concrete manufacturer. The DOTs 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.

PennDOT's Standard Specification 106.03 requires that the Contractor 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. The plan should include sampling and testing frequencies and corrective action measures. Exhibit No. 14 is PennDOT's standard specification regarding the contractor's submission of a Quality Control Plan. This plan defines the roles and responsibilities of the individual parties through during the placement or installation of materials. The Contractor is responsible for the Quality Control of the materials, while

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the DOT is responsible, through the Field Inspection Staff and Material Staff, for ensuring that the materials meet the contract documents or other standards.

I. Health and Safety Plans

From our review and comparison of the ConnDOT Standard Specifications, we found that the specifications do not include a clause for the submittal of a Health and Safety Plan (“HASp”). We would recommend that ConnDOT consider the inclusion of this type of clause in its Standard Specification. We have presented the following clause from NJDOT in Exhibit No., 15 for further review, research and consideration. The clause includes:

- NJDOT provides a prescriptive list of items that should be included in this plan.
- The Contractor is solely responsible for creating, implementing and monitoring the Program.

J. Subcontracting Clause

We found that ConnDOT’s Standard Specification included a clause for subcontracting of the work, including includes procedures and policies. However, the other DOTs’ Standard Specifications contain other requirements beyond the ConnDOT requirements. We would recommend that ConnDOT consider the revising its Standard Specifications to include these various other requirements. We have provided these standard specifications from other DOTs in Exhibit Nos. 16, 17 and 18. Some other significant observations include:

- PennDOT specifies that each subcontractor must be prequalified for the type of work undertaken and not exceeding its assigned maximum capacity rating.
- NJDOT includes a clause that the Contractor is responsible for all work of the subcontractors.

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- NJDOT allows a reduction of the contract percentage of work performed by the Contractor if a specialty item is specified in the contract. The standard allowable percentage of work is a least 50 percent of the total Contract Price.
- NJDOT specifies that, if the subcontracted work exceeds \$1,000,000, subcontracting will be permitted only to subcontractors who have been pre-approved by the DOT. Additionally, if a subcontractor's aggregate value of work with the DOT is more than \$1,000,000, then the subcontractor must be prequalified with the DOT for that type of work. Landscape and electrical contractors must be prequalified regardless of the value of the work.
- MSHA requires that the Contractor provide a list of all subcontracts, along with their value.
- MSHA requires the Contractor to receive its approval to use specific subcontractors. The contractor cannot substitute a subcontractor, unless the subcontractor has been approved in writing.

K. Payment

From the review of other DOTs and the comparison of their procedures and policies, 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. However, the other DOTs, prior to the issuance of the final payment, require the contractor to certify the as-built quantities. The PennDOT, NJDOT and MSHA standard policies and procedures regarding payment are provided in Exhibit Nos. 19, 20 and 21. Some significant observations include:

- Payments made to the contractor are based upon quantities and assessments of the DOT and/or its representatives.
- The release of partial payment does not mean that the DOTs have accepted any material furnished or work performed.
- PennDOT, NJDOT and MSHA require the contractor to review and certify the as-built quantities prior to the release of the final payment.
- Some of the DOTs require the contractor to certify that all prior payments to subcontractors and suppliers have been made in accordance with the terms and conditions of the contract.

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L. Changes

From our review and comparison of ConnDOT's Standard Specifications, we found that the specifications did not include a clause regarding changes in the work, and the policies and procedures surrounding such changes. We recommend that ConnDOT consider including this type of clause, and have provided the clauses from NJDOT in Exhibit No. 22 for review, research and consideration.

IV. Specific Construction Tasks

During the construction of a highway project, the individual parties have specific authorities, roles and responsibilities to perform in order to deliver a quality product on schedule and within budget. The contractor is essentially responsible for constructing the project according to the contract documents through accepted industry standards and practices. The construction oversight and management team is responsible for overseeing the contractor's performance and progress, for making payments, and for documenting the project on a contemporaneous basis.

The following sections discuss the importance and authority of inspector and the payment process during construction.

A. Inspection

The most important part of the construction oversight and management team is inspecting the contractor's work and performance, and determining if the contractor is complying with the contract documents. The most critical tool for the inspection process is accurate reporting and documenting of the contractor's work through the Daily Inspection Report (or Daily Work Report). The inspection process contains a hierarchical quality check system, which means each higher level checks the lower level work. This system can break down if there is a failure at the higher level. Our suggested

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requirements for completing a report and daily diary are described in Section 1 of this report.

The construction inspection is one of the most important phases in the conception, design, construction and maintenance of a facility. Unless the inspection is conscientiously carried out, the completed project may well be an unknown quantity, a potential high maintenance facility, and/or a waste of public money. Some people feel that inspection is an added cost and the contractor usually feels that it is an added aggravation and resents someone looking over his or her shoulder. However, good inspection ensures that the required end result is being achieved.

In general, the three DOTs and AASHTO are consistent with roles, responsibilities and authority of the inspection. They state that: (1) Inspectors are authorized to inspect all work; (2) inspection may extend to all or any part of the work, and to the preparation, fabrication, or manufacture of the materials to be used; (3) the inspectors are not authorized to alter or waive the contract; (4) the inspectors are not authorized to issue instructions contrary to the contract documents; (5) the inspector can not act as foreman for the contractor or; (6) the inspector has the authority to reject work subject to approval by the Resident Engineer or Project Engineer.

In order to document the performance and progress of the project, the Inspector must examine each part or detail of the work as constructed by the contractor. The DOT's Representative is allowed access to all parts of the work, and should be assisted by the contractor, as required, to make a complete and detailed inspection. Additionally, the Resident Engineer or Project Engineer has the ability to direct the contractor, at any time, to remove or uncover specified portions of the finished work that the Inspector had previously inspected. After the inspection, the contractor is required to restore portions of the work to the requirements of the contract documents. If the work exposed proves

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acceptable as constructed, then the cost of uncovering will be paid for as Extra Work. If the work that was exposed proves unacceptable, then the contractor should bear the cost of replacement and repairs.

After the inspectors prepare their reports, these reports are submitted for a review by the Chief Inspector, who reviews and approves each report. After the Chief Inspector's review, the daily report information is entered into a database for further processing, reporting and payment. This information then is filed according to the individual DOT filing requirements. Additionally, during construction, the Resident Engineer and/or other DOT staff perform quality control checks of the daily reports.

B. Payment

As described in Section 1 of this report, the monthly payments to the contractor are based upon field measurements and quantities reported by the DOT's Inspectors. The daily quantities are input over the estimate period and a monthly estimate is developed. The estimate quantities are reviewed by the Chief Inspector, who has the ability to make modifications to the estimate of quantities prior to releasing to the next individual for approval. The next approval beyond the Chief Inspector is an approval by the Resident Engineer. The monthly payment estimate is then forwarded to the District for final approval and payment. As described in Section 1, the contractor is not required to certify that the work was completed according to the contract documents or certify the measured quantities. The overall process of payment and its review and certification are pretty consistent throughout the DOTs.

C. Change Orders (Construction Orders) Process

A change order authorizes the contractor to perform added or extra work through its original contract with the DOT. A change order must be approved and processed prior to issuance of payment to the contractor for work performed. Time is of the essence in

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developing, reviewing and approving change orders. This section will not discuss the need for change orders in construction contracts, but will discuss the processes and procedures of approving the changes of both ConnDOT and the other DOTs.

1. Change Orders Process for ConnDOT

The Chief Inspector is the primary project staff member responsible for the preparation and content of the change order. The Supervising Engineer must obtain the required approvals for change orders that involve price adjustments, differing site conditions and/or claim settlements. Additionally, the Supervising Engineer must obtain concurrence from the Principal Engineer or the Assistant District Engineer for changes in quantities, a significant quantity change, or a differing site condition. If the value is less than \$100,000, the Assistant District Engineer must obtain concurrence from the District Engineer. If the total is greater than \$100,000, than the District Engineer must obtain concurrence from the Office of Construction. Individual DOT project team members have various responsibilities and roles during the change order process. Those responsibilities are outline below:

- Project Engineer: Has the primary responsibility for reviewing the change order for accuracy, completeness and scope. The Project Engineer forwards the change order to the Supervising Engineer.
- Supervising Engineer: Has the primary responsibility for ensuring that the change order complies with DOT policy, determines the necessary approval level, meets with the Assistant District Engineer to obtain approval of draft change order and forwards the document to the District staff for initial processing. Additionally, the Supervising Engineer must authorize the processing of the change order.
- Processing by the District: The District checks funding, reviews format, ensures that required corrections are made, prepares the package with a cover letter to the Contractor, and returns the completed package to the Project Engineer for signature.
- Project Engineer: Signs the change orders and forwards them to the contractor for signature.

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- Supervising Engineer: Signs the change order after receiving it from the contractor and then forwards it to the District for processing.

2. Change Orders Process for NJDOT

The Resident Engineer, with the assistance of the Office Engineer, is responsible for the preparation and content of the change order. All change orders, no matter the value, must be signed and approved by the Resident Engineer, Resident Engineer Supervisor (ConnDOT's Supervising Engineer), Regional Construction Engineer (District Engineer) and the Capital Program Project Manager. The Capital Program Project Manager has typically seen the project through planning, design and construction and is the liaison between the FHWA and the DOT.

The DOT has a construction change order threshold, per event or change, of \$500,000 or five percent of the contract value. If a construction change request is issued and the actual or proposed value of the change exceeds this threshold, then a Construction Change Request must be submitted and the Construction Change Board will review this proposed change. Members of the Construction Change Board include four of the Capital Program Management Directors, who are the Directors of Construction Services and Materials, Design Services, Project Management and Capital Program Support. During the meeting, the Project Manger may be accompanied by the Designer (Consultant) and the Resident Engineer for technical support.

3. Change Orders Process for PennDOT

The Resident Engineer, with the assistance of the Office Engineer, is responsible for the preparation and content of the change order. All change orders, no matter the value, must be signed and approved by the Resident Engineer, Assistant District Construction Engineer (ConnDOT's Supervising Engineer) and the District Engineer. For additional work and extra work items, outside legal disputes and resolutions that are

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100 percent state-funded, the District Engineer may delegate this approval authority at his/her discretion.

The DOT has several construction change order authority thresholds:

- a. If the net change orders total value is less than \$500,000 or 15 percent of the original contract value, the District Executive may process all change orders;
- b. If the increase net total is between \$500,000 and \$1,000,000, then the Director of the Center for Program Development and Management needs to approve the change orders.
- c. If the cumulative net total of the approved work orders exceeds \$1,000,000, then the Program Management Committee approval is required.

If a construction change request is issued and the actual or proposed value of the change exceeds this threshold, then a Construction Change Request must be submitted and the Construction Change Board will review this proposed change.

4. Summary of Change Orders Process

The DOTs each conduct change order processing similarly; however there are some differences that ConnDOT should consider incorporating into its process, such as PennDOT's total cumulative net change order threshold for approvals of change orders. This process tracks change orders by a cumulative total, instead of a single change order total. NJDOT requires the Project Manager to approve the change order regardless of monetary value.

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V. Summary

In summary, we observed that highway construction, inspection and oversight, in general, are managed under similar guidelines and practices throughout the various states we analyzed. It should be noted that ConnDOT has incorporated revisions and new sections in its 2006 Construction Manual and it is our understanding, through interviews with ConnDOT, that the manual will continue to be updated annually.

Additionally, during our review and evaluation of the Standard Specifications, we discovered that ConnDOT includes varies contractual requirements through individual ‘Project Special Provisions,’ while other DOTs have standardized these contract provisions. Special Provisions are typically defined as applicable project-specific revisions to the Standard Specifications. By standardizing some of the provisions, variances between projects may be eliminated and standard policies, procedures and reviews may be developed and implemented. We recommend that these modifications and/or additions be generated in partnering workshop with the Department, the Design Consultant, the Inspection Consultant, the Contractor and the State Attorney General.