New Jersey Turnpike Authority

New Jersey Turnpike

MANUAL

FOR

CONSTRUCTION

JUNE 1987

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PRE-CONSTRUCTION PHASE

CONSTRUCTION PHASE

PREFACE

The inspection of construction involves a great deal more than the passive overseeing of work and covers a far larger sphere than the craft of construction. It includes beyond these narrov confines, the whole art and technology of creating public vorks to the satisfaction of four poverful interests: the owner's capital, the engineer's knovledge, the contractor's earnings, and the user's need. The purpose of this manual is to meet these sometimes conflicting interests vith a uniform standard of acceptability drawn from engineering experience, the lav, common sense and good taste.

Turnpike construction will be judged to a large degree by the focus of things covered in this manual. Thus these instructions should be both read and referred to by all consulting engineers and architects and their principal employees with a full measure of determined compliance.

DEFINITIONS

ADMINISTRATION----------All management, reportorial, and clerical functions of the Engineer.

AGREEMENT----------A legal instrument between the N.J. Turnpike Authority and an Engineer.

ARCHITECT----------An architectural firm engaged by Agreement to perform work on buildings. Administratively analogous to Engineer.

CHANGE ORDER----------A written order to the Contractor, signed by the Chief Engineer, ordering a change in the work from that originally shown by the original Plans and Specifications.

CHIEF ENGINEER----------The Chief Engineer of the Turnpike Authority.

CLAIM----------A petition for reconsideration of a Contractor's invoice previously rejected by the Engineer, the General Consultant, or the Chief Engineer and following certain formalized procedures. (See text.)

CONSULTING ENGINEER------See Engineer.

CONTRACT----------The Agreement between the Authority and the Contractor for the performance of a specific project in accordance with the requirements and provisions of the Contract documents, which include the Proposal, Proposal Guaranty, Contract Agreement, Contract Bond, Standard Specifications, Supplementary Specifications, Power of Execution, Plans, Addenda (if issued), and Change Orders which may be issued, all of which documents are to be treated as one instrument as if set forth at length in the written Contract Agreement.

CONTRACTOR----------Party of the second part to the Contract acting directly or through agents or employees, and solely liable for the acceptable performance of the Project and for the payment of all debts pertaining to the Project except those specifically assumed by others.

ENGINEER----------The Chief Engineer of the New Jersey Turnpike Authority, or a duly authorized representative acting within the scope of the particular authority vested in him.

FINAL CERTIFICATE OF PAYMENT----------The last Pay Certificate prepared on a Contract and constituting the termination of the Contract.

FINAL ESTIMATE----------See Final Certificate of Payment.

GENERAL CONSULTANT-------The firm of Howard, Needles, Tammen & Bergendoff,

INSPECTION----------The art and technology of ascertaining and reporting that the work by a Contractor, Sub-contractor, or Supplier is consistent with the Contract.

JOB SITE----------The total environs of a Project.

LABORATORY----------A firm or individual designated by the Chief Engineer for the inspection and testing of the materials to be used in the Project.

LIAISON ENGINEER---------An employee of the General Consultant who serves as a communication link between the Engineer and the General Consultant on matters of policy, and general information.

LIQUIDATED DAMAGES-------Money withheld on a Monthly Certificate in accordance with the Contract due to late completion of work.

MATERIALS----------All raw or prepared materials and manufactured of fabricated products utilized in the Project.

PAY CERTIFICATE----------An invoice prepared by the Engineer on forms supplied by the Authority for work completed ;by the Contractor on any Contract. Usually prepared monthly but sometimes semi-monthly. (See text.)

PAY ESTIMATE----------See Pay Certificate.

PROJECT----------The entire work to be performed under the contract, including the furnishings and doing all things necessary and proper therefor or incidental thereto for repairing the work.

PROJECT ENGINEER---------A licensed professional engineer employed by the Engineer to supervise the Project staff and assume responsibility for its work.

RESIDENT ENGINEER--------An employee of the Engineer who reports to the Project Engineer.

RETAINAGE----------See Retained Percentage.

RETAINED PERCENTAGE------Money withheld on a Pay Certificate in accordance with the Contract.

SECTION ENGINEER---------See Engineer.

SOILS ENGINEER----------An employee of the Engineer whom tests analyses and reports on the materials to be included in the project.

SPECIAL FINAL ESTIMATE---Pay Certificate used in the event a claim is filed against the Authority. Prepared on Final Certificate form and normally releases all monies due the Contractor, except amounts in dispute.

SUBCONTRACTOR----------Any Corporation, Partnership, Firm or Individual who contracts with the Contractor to perform work at or about the construction site, for or on behalf of the Contractor; in a manner other than or in addition to furnishing materials, plant or equipment.

SUPPLIER----------Any Corporation, Partnership, Firm or Individual who contracts with the Contractor to manufacture, supply or sell materials, plant or equipment for the Project for or on behalf of the Contractor.

SURVEY----------Work performed by the Engineer to layout, measure, or verify dimensions of work within the terms of the agreement.

TESTING LABORATORY--------(See Laboratory.)

TURNPIKE----------The facility known as New Jersey Turnpike owned and operated by the Authority.

TURNPIKE AUTHORITY--------Duly appointed Commissioners of the N.J. Turnpike.

UTILITY ----------A public, privately or cooperatively owned Authority, Agency or Agencies operated by one or more persons or cooperation for public service. For purpose of this Contract Railroad shall be considered as well as Turnpike owned services. Utilities include electric, telephone, communications, traffic surveillance, sewer, water, gas and similiar facilities.

WORK ORDER----------A legal agreement between the Authority and a Utility Company to perform specified work.

FOREWARD

Use of the Manual

This Manual has been organized as a three dimensional matrix with three "Phases" focused around the process of construction, nine "Divisions" dealing with broadly related topics, and twenty four "Sections" on specific categories of information or instruction. Nearly all of the Sections have been further divided into "Parts" for clarity of presentation. The diagram on the following page shows the concept that was used, and the Table of Contents following the diagram shows the hierachy of separations. All such assemblages are artificial to some degree and highly arbitrary but necessary for editorial order and engineering emphasis.

Division One, called "Introduction", and Division Two, called "Organization", are intended for those who are new to Turnpike work and need an overview of its policies and functional arrangements.

Division Three, entitled "Pre-Construction Requirements", is intended as a check list for management of items to understand and take care of before the contractor moves onto the job site.

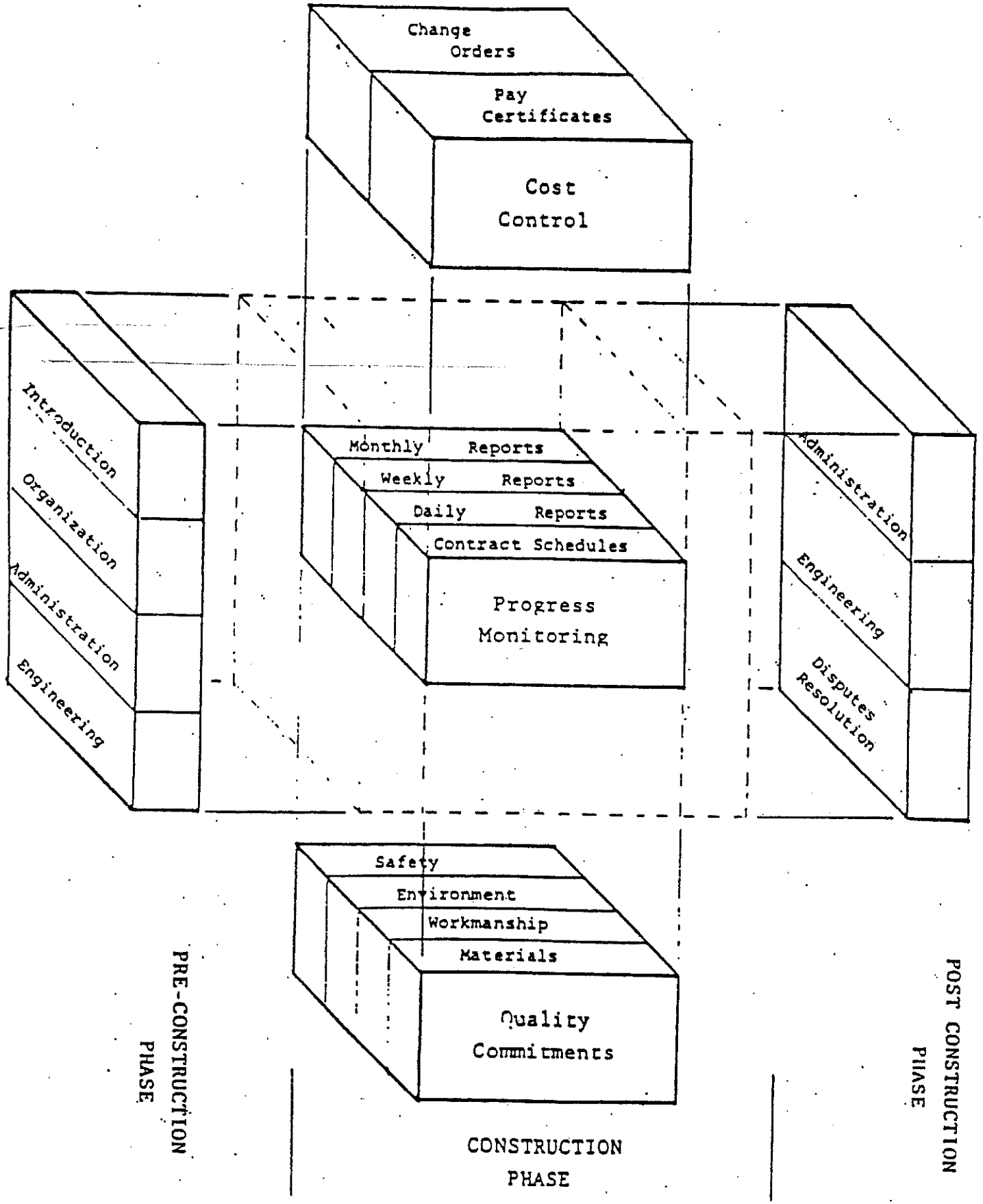
Division Four, on "Cost Control", and Division Five, on "Progress Monitoring", are intended as a hand-book of procedures for meeting the reporting requirements of the Authority and the obligations of the construction contracts.

Division Six, on "Quality Committments", is a discussion of some of the considerations that are needed in order to create a project of lasting benefit.

Divisions Seven, Eight, and Nine, dealing with "Final Engineering", "Final Administration", and "Disputes Resolution" respectively, are matters one would expect to deal with after the physical construction is finished.

An index is provided in the back of the book to help find specific topics or instructions.

"EXPLODED-VIEW" DIAGRAM OF CONTENTS



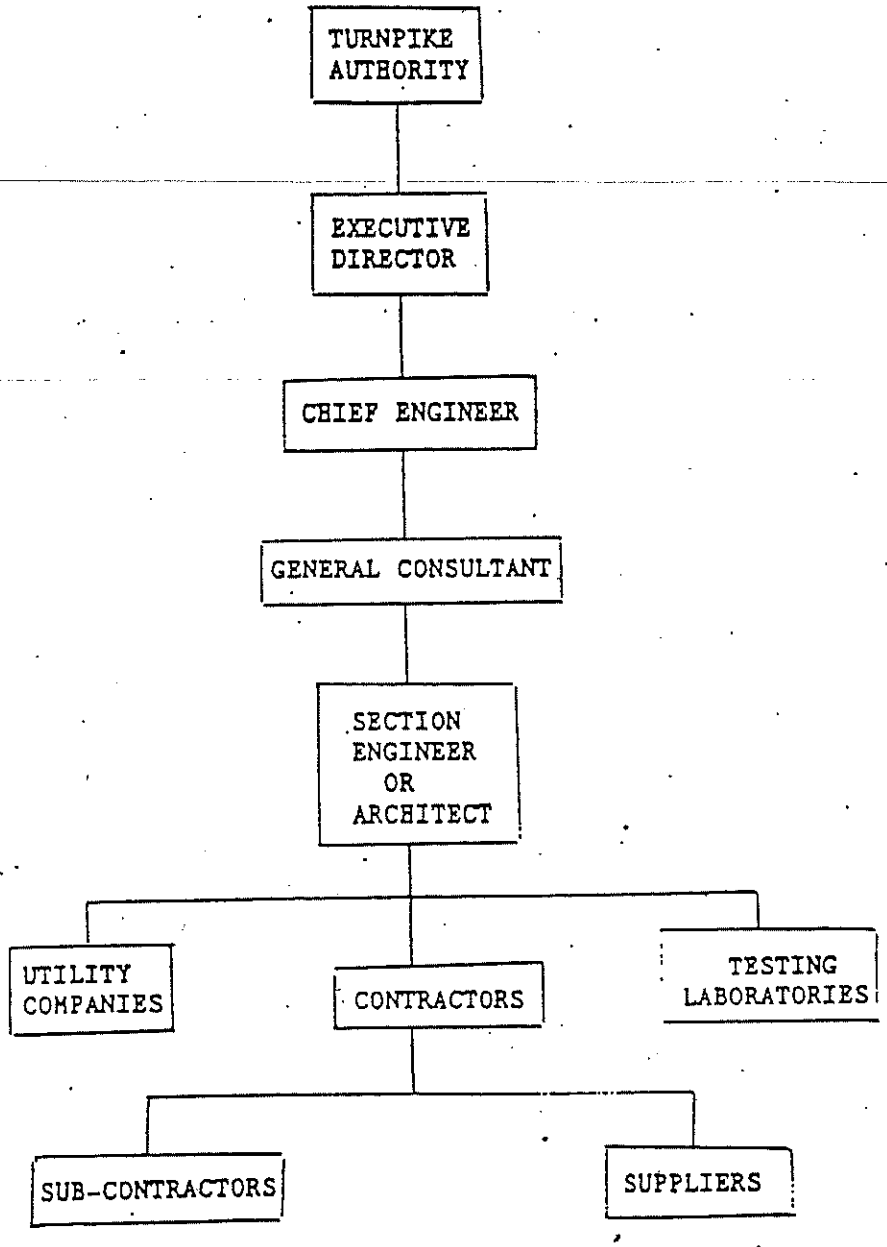
Division Two

ORGANIZATION

All of the individuals and agencies participating in Turnpike construction contracts must have knowledge of their relationship to each other so that they will understand the extent of their responsibilities and the limits of their authority.

Division Two of this manual describes the function of each of the principal agencies involved and also includes job discriptions of some of the key positions.

CONTROL ORGANIZATION
FOR
INSPECTION OF CONSTRUCTION
NEW JERSEY TURNPIKE



Division Two
Organization

SECTION I
The Turnpike Authority

Turnpike Authority

The direct and principal authority and responsibility for Turnpike affairs rests with the five Commissioners. The officers' titles are Chairman, Vice-Chairman and Treasurer. Each is appointed by the Governor and serves without pay, and each has an equal vote in commission meetings.

To be considered official all actions of the Authority and all expenditures must be formally approved at commission meetings. Commission meetings are normally held in New Brunswick on the third Tuesday of the month, and all actions are reported in the official minutes.

In order for an item to be considered at a commission meeting, it must first be listed in a prepared agenda. The time for receiving items into the agenda is closed one week before the meeting. Such deadlines are very important to the engineer or architect in determining lead time for awarding contracts, reducing retainage, final acceptance of contracts and the like. An additional week must be alloved for reviev by the General Consultant and the Senior Engineer.

Specifically for construction, the Commissioners approve budgets, bids, contract awards, type III change orders, final payments to contractors, reduction in retainage and final acceptance of the work. Minutes of commission meetings do not become official until 10 working days minimum have passed after the date of the meeting in order to give the Governor an opportunity to veto the minutes if necessary.

In addition the Commissioners are constantly informed through their staff as to the progress and cost of all work and take an active interest in maintaining good public relations. It is a vital part of the engineer's task to provide a steady flov of information to the Commissioners through periodic reports to the Turnpike staff and the General Consultant.

The organization of the Turnpike Authority also includes a full- time resident secretary who reports directly to the Commissioners. The secretary certifies all commission actions and arranges for all Turnpike activities of the Commissioners.

The Turnpike Authority retains a General Counsel who attends all commission meetings, generally advises the Commissioners on all legal matters, and directly controls all legal actions.

The day-to-day activities of the Turnpike are supervised by an Executive Director who is chief-of-staff and controls all operations in behalf of the Authority. The Director also approves all items to be included in the agenda for commission meetings. This includes all items that would be of interest to the engineers.

The Executive Director's involvement with the activities of the engineer will usually be exercised through the General Consultant. However, the Chief Engineer may from time to time attend meetings of and issue directives to the engineers. Such directives carry the full weight of the Turnpike Authority.

The Turnpike staff is divided into a series of departments according to the type of work performed. Each department head is responsible for the activities of that department and reports to the Executive Director. The engineer will normally be involved only through the engineering department. Following is a brief description of the engineering department and the other departments.

Engineering Department. The engineering department is responsible for approving the design and construction of all Turnpike facilities and for making recommendations for projects to the Authority through the Executive Director. The Chief Engineer is in overall charge of the department, which is divided into four functions -- design, construction, specifications and contract records.

The Chief Engineer attends all commission meetings and carries out all policy directives of the Executive Director. That office takes direct and official interest in all activities of the engineer. Thus the Chief Engineer is the highest official with whom the engineers will most often come in contact.

The Senior Engineer functions as the principal advisor of the Chief Engineer on professional matters of policy and judgement and normally acts in the Chief Engineer's behalf when the latter is absent. The Senior Engineer has broad review powers and directs the activity of the Turnpike Project Engineers.

The Supervising Engineer, or Project Engineer, reviews and recommends for approval to the Chief Engineer plans prepared by the engineers.

The Construction Engineer supervises all construction on the Turnpike and reports all findings to the Senior Engineer and/or Chief Engineer. The Construction Engineer attends all pre-construction conferences, makes periodic visits to all job sites, reviews all change orders and monthly estimates, and attends all final inspections.

The Construction Engineer maintains a staff to assist in the duties of that office. This staff is normally divided into the two parallel categories of building construction and highway construction with an Assistant Construction Engineer at the head of each category. They are responsible for overseeing the field work performed by others. An office staff is also maintained to approve shop drawings and the like and to keep an eye on routine administrative detail such as sub-contractors approval, informing other department heads of construction procedures that may affect their interests, and in general maintaining a clearinghouse for Turnpike construction policy.

The Specification Engineer is responsible for revieving all specifications prepared by the engineer. In addition, an active file of contemporary product developments is maintained along with specifications for their use.

The Contract Plans and Records Supervisor is also within the engineering department. That office maintains a complete file of all contract plans and specifications. In addition, an account of all bid prices from all bidders on all contracts is kept. The Supervisor also maintains a flow chart showing the current status of all change orders and pay estimates. In addition a file of all sub-contract approvals and the value of all sub-contracted work is kept up to date by that office.

An organization chart of the Turnpike Engineering Department is shown on the following page.

Other Departments. The operations department is responsible for maintaining a safe flow of traffic along the Turnpike at all times. Thus this department approves the design of all signing, lighting, traffic lane stripes and the like.

The department also has a close interest in temporary lane closings. They establish standards for the design and location of all appurtanences involved in lane closings such as signs, cones, and flashing lights.

The traffic engineering department also inspects the finished construction with regard to safety features. So in many phases of construction, the engineer will come in close contact with the traffic engineering department.

The legal department is staffed by a group of attorneys. In construction matters they become particularly involved at the beginning and end of each contract.

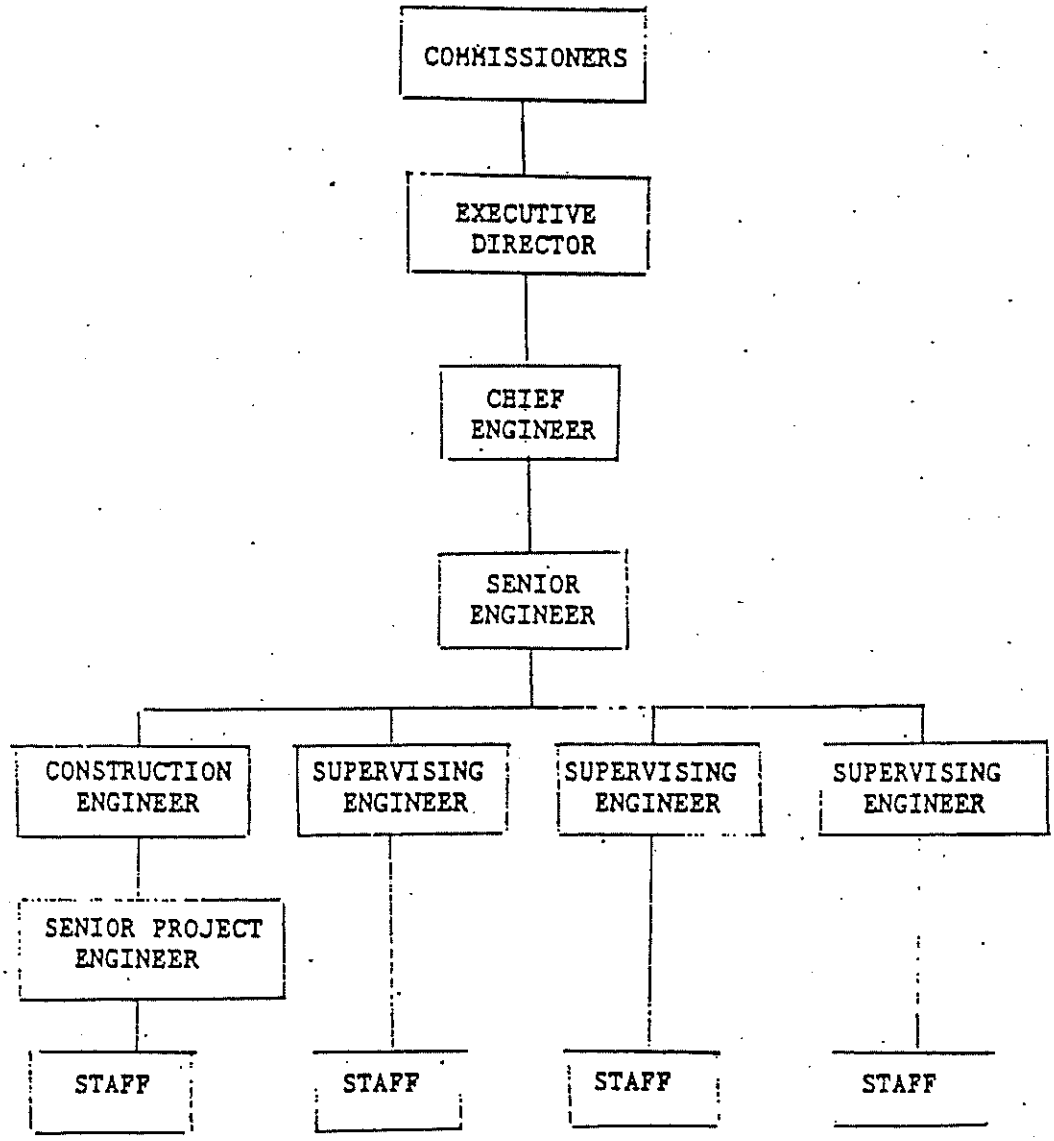
A member of the legal department will attend all bid openings. They review all contracts, contract bonds, sub-contracts, and certificates of insurance.

The legal department also reviews all final pay estimates through the engineering department, and no contract may be terminated without their approval.

NEW JERSEY TURNPIKE AUTHORITY

Engineering Department

ORGANIZATION CHART



The legal staff is also available for consultation through the engineering department if legal matters involving the various engineers or contractors are ever brought into question. They take a particular interest in contract claims.

The legal department, of course, handles all law suits that may arise out of the course of construction; and it is expected that all engineers will put their personnel and records at the disposal of that department in cooperation with the Authority on such suits.

The Turnpike Comptroller has broad fiduciary povers in all areas of Turnpike finance and money flov. The Comptroller advises the Commissioners on the beneficial use of cash holdings, works closely with the Executive Director in budgetary matters, and consults with the staff on questions of security and money- handling. However, it is in the capacity as head of the accounting department that the Comptroller will become known to the various engineers.

The accounting department sees to it that all contracts, engineering agreements, testing services and the like are properly budgeted, funded and approved by the Commissioners. In addition, it oversees the disbursement of all cash and warrants all payments. Thus all engineering fees, nonthly pay estimates, contract change orders, testing laboratory charges, and purchase orders must be prepared to stand the scrutiny of that department. Standard forms are available from the Turnpike for all such transactions, and instructions in their use and preparation, as outlined in Section VI of this manual, must be scrupulously followed.

The Comptroller reserves the right to audit the charges on any Turnpike billing, including engineering fees, contractor's charges and whatever. So careful and definitive records must be maintained by all parties at all times on all contract work.

The Turnpike Authority supports a large, permanent maintenance department capable and qualified to perform a full range of construction, repair and operational functions. This department is headed by a Director of Maintenance who is aided by a professional staff in overseeing work which, in many respects, is similar to the work supervised by the engineers. The maintenance department is divided into a building section and a highway section. The highway section is further divided into a Northern Division and Southern Division. It is the Highway Division Managers with whom the engineer will most frequently come in contact.

The toll collection department performs an obvious function. In all work in and around both old and new toll plazas their approval, exercised through the Chief Engineer, is essential.

The toll audit department performs a record keeping function for the toll collection, traffic, and accounting departments and is involved with the activities of the engineer in matters of ticket security.

The public information department generally informs the Turnpike employees (through a house organ) and the public (through press releases) of activities of interest to those groups.

The New Jersey State Police - Troop D is both separate from and related to the operations of the Turnpike. They are separate in that all troopers and officers are an integral part of the State-wide police force. They are related in that their facilities are controlled by the Turnpike Authority. They are responsible for maintaining law and order throughout the Turnpike system and are not, by any means, limited to traffic control; although that is, of course, their principal function. A number of troopers are assigned to construction duties coordinated through the operations department.

Consulting engineers have neither more nor less than the rights and privileges of all citizens and patrons with regard to motor vehicle operations on the Turnpike.

Normally, the State Police will exercise their interest in construction operations through the traffic engineering department. However, in emergencies, their police powers are the same as elsewhere in the State.

The one exception is that those to whom Turnpike passes are issued may use grade separated U-turns while working on Turnpike business.

SECTION II
GENERAL CONSULTANT

A General Consulting Engineer is required by bond resolution. The firm of Howard, Needles, Tammen & Bergendoff has been appointed to that capacity. Their function as General Consultant is twofold.

Primarily the General Consultant serves to advise the Commissioners on all engineering matters much as the General Counsel serves on legal matters. A representative of the General Consultant attends all Commission meetings and approves all capital expenditures. In all such matters the General Consultant works in close harmony with the Trustees, the Executive Director and the Chief Engineer.

Secondly, the General Consultant is a project coordinator functioning as an extension of the Chief Engineer's staff. It is in this capacity that the consulting engineers will mainly have contact with the General Consultant.

To perform their function as project coordinator, the General Consultant must endorse and approve all contract awards, all change orders, and all final pay certificates. To inform themselves, and hence the Commissioners, they are authorized to exercise control and approval of all activities of the engineers or architects. Thus they maintain a professional liaison staff to oversee all design and construction work throughout the Turnpike. Therefore all engineers and architects must report directly, regularly, and formally to the General Consultant, normally through the liaison staff. An organization chart for the General Consultant is shown at the end of this section.

In particular, and with regard to construction, the General Consultant will attend all bid openings, review all construction schedules, receive progress reports, and copies of all job related correspondence, make periodic visits to the job site, review material approvals and methods of construction, sign all invoices, change orders, and certificates of payments to contractors, review the approval of all sub-contractors, attend job meetings, evaluate inspection personnel and procedures, review testing reports, attend final inspections, certify contract completions, and perform such other broad or detailed work as may serve to fulfill their responsibility for thoroughly appraising the Turnpike Authority of the scope, status, and quality of all aspects of engineering work.

The General Consultant will <u>not</u> correspond or intercede in any way directly with the contractors, sub-contractors, or suppliers on any project but will act only through the consulting engineers or architects.

Liaison Engineers from the General Consultant's Staff will be assigned for each section to be constructed.

The Liaison Engineer will be the prime contact for all Section Engineers on all matters pertaining to the administration and construction activities as well as any design coordination required.

Responsibility for utility installations, relocations, and coordination with contractors rests with individual Section Engineers however any problems that could result in delays to the project should be brought to the attention of the Utility Coordinator who will, as a central contact with various utilities, attempt to expedite resolution of problems and designate priorities.

~~The Section Engineer's duties are outlined in section (XI) for the~~ individual projects.

The General Consultant's Traffic Coordinator will implement the necessary coordination required to avoid or minimize conflicts between section assignments and will render the priority determinations for lane closure requirements in the various sections. All roadway restrictions and construction operations affecting traffic in any fashion must be scheduled in a timely fashion with the Traffic Coordinator.

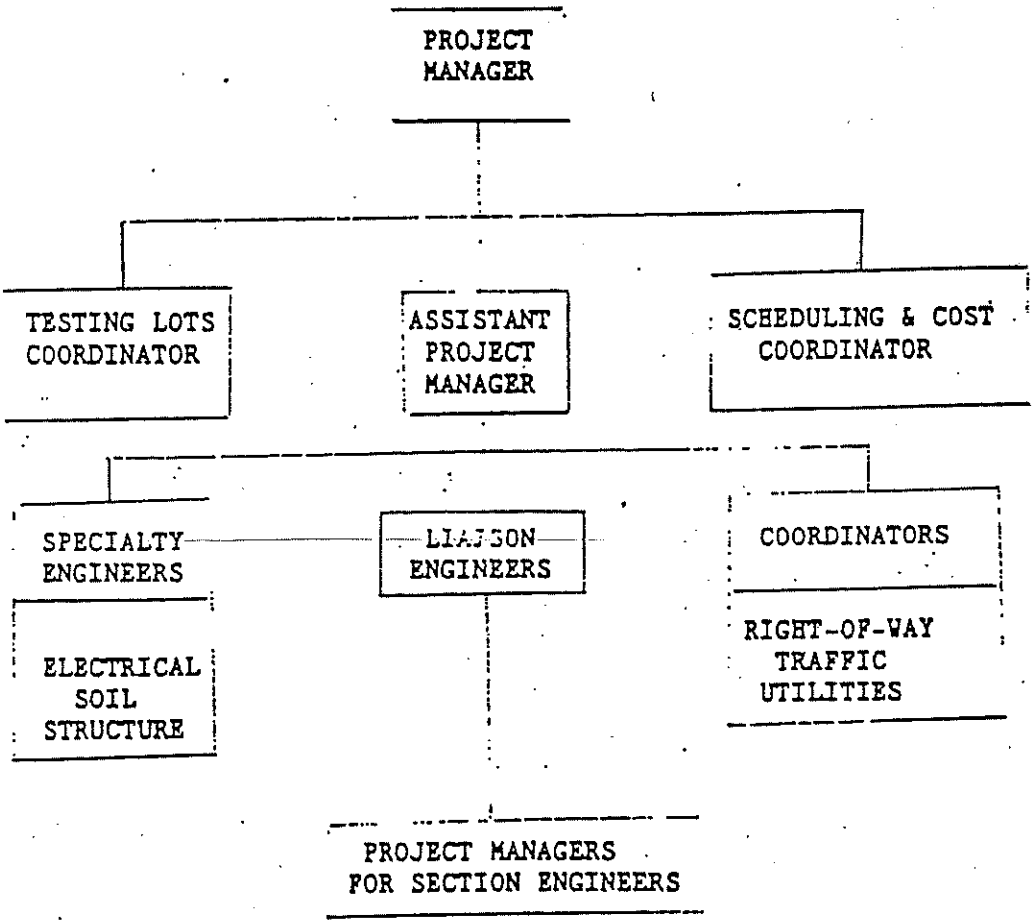
II-3

CONTROL ORGANIZATION

FOR

GENERAL CONSULTANTS

CONSTRUCTION ACTIVITY STAFF



SECTION III
SECTION ENGINEER

Definition. As previously described in this manual, the term "Engineer" or "Architect" is virtually synonymous with the term "Consulting Engineer" or "Architect" but is used in preference to the latter terms in order to avoid confusion with "General Consultant" described before.

In the usual cases the engineer will be responsible for both the design and construction within a designated section. The scope of this manual is confined solely to the construction function.

All engineers are engaged by the Authority through formal agreements and a normal client-engineer professional relationship exists between them. The engineer provides such services and assumes such responsibilities as are required by the ethics of the profession and the extent of the written agreement. The Turnpike Authority retains the rights traditional with such relationships and provides the remuneration established in the agreement. Although such rights and responsibilities are not enumerated herein, they are presumed to provide a fundamental basis for all activities discussed in this manual.

The engineer relates to the General Consultant by manner of the latter's position as an agent of the client. The engineer assumes the rights and responsibilities of the consulting engineer and the General Consultant acts only in behalf of the Turnpike Authority.

Authority of the Engineer. The performance of the work shall at all times and in all respects be subject to the inspection and approval of the engineer. The engineer shall give instructions necessary to attain strict and entire conformity with the plans and specifications. The engineer will correct apparent errors or omissions in the plans and specifications and make interpretations necessary for the proper fulfillment of the intent of the plans and specifications.

The engineer's inspection, approval, acceptance, instruction, or oversight, however, shall not relieve the contractor of responsibility for the performance of the work in accordance with the plans and specifications and shall not commit the Authority to acceptance thereof if it is subsequently found that the materials, methods of construction, or workmanship were defective or otherwise did not conform with the requirements of the plans and specifications.

Staff. To perform its duties, each engineer must provide a full-time , qualified resident staff. This staff is headed by a project engineer who has overall responsibility for the inspection of construction on the entire project.

The project engineer should be aware of the status of all contracts still in design, should have a thorough knowledge of the progress being made on all contracts under construction, and must be informed on all construction problems existing in the relevant section. The project engineer is responsible for maintaining liason between the project office and the General Consultant, the testing laboratories, the section engineer's own design office, and the field offices. It is to the project engineer that the Chief Engineer and the General Consultant will turn to gain information or to pass on instructions affecting the section.

There are certain levels of inspection coverage that the engineer or architect is bound by this agreement to provide. These are discussed in some detail in Section XIV.

Buildings. Architects are engaged by the Authority in a manner similar in almost all respects to an engineer as herein defined. They are generally retained to design and supervise the inspection of buildings but may also be engaged in certain aspects of toll plaza construction.

Office Needs. Each engineer must provide and maintain a project or section office on or near the section for the use of the project engineer and his staff. This project office, in addition to being the home base for the project engineer, should be staffed during all normal working hours in order to receive mail and telephone messages and should provide a space for job meetings. Copies of all contract plans and specifications, all records and reports, costs estimates, progress schedules, correspondence and all material relating to the entire section should be filed there.

In addition to the section office, there may be various area offices throughout the section. These will usually be field office trailers ordinarily furnished by the Authority and maintained by specific contractors. When trailers are required to be purchased by contractors for use on Turnpike projects, they are paid for by the Turnpike Authority as a contract pay item. They are located at key points designated by the engineer, generally at new interchanges, major bridges and other centers of activity.

Area offices are to be staffed by the engineer. Each area office staff should be headed by a single individual responsible for that area, usually called a resident engineer, who reports directly to the project engineer. It is usually necessary for the area office to also employ at least one full-time office employee, typically an office engineer, to maintain contact with the project office and to supervise the flow of reports. It is generally to the area office and the resident engineer that most survey personnel and inspectors will report.

For most Turnpike construction certain specialty engineers are required. If the construction involves soils or foundation considerations, the engineer is expected to have a qualified soils engineer on its field staff. Similarly, construction which affects the flow of patron traffic requires a traffic supervisor whose sole duties will be to insure that all contract requirements relating to the maintenance and protection of traffic are met.

Construction of roadway lighting facilities also presents a special staffing consideration. A Qualified electrical inspector must have a broad view of the complete project and understand all the phases of electrical construction work.

On the following page is a chart showing the suggested organization of the engineer's field staff.

Contract Communications. Engineers are expected to maintain continuous communications with all of the contractors under their control. This is generally handled by written correspondence, telephone calls, and job meetings.

All requests from contractors for approvals, job information, and contract interpretation must be directed to the engineer. Neither the Authority nor the General Consultant will receive any communications from contractors but will refer all matters to the engineer.

All letters from contractors received by the engineer should be stamped "Received - (Name of Firm) - (Office Location) - (Date and Time)." All correspondence should be answered at once, if only to acknowledge receipt. One copy of all letters sent by the engineer to the contractor is to be forwarded to the General Consultant.

The project engineer and each resident engineer should keep a job diary. Highlights of all job conversations and telephone calls should be entered daily in the diary.

Engineers should assign someone to record the minutes of all job meetings. Memoranda to file should then be prepared listing the date, time, place, and persons attending each meeting along with a brief account of all problems discussed and conclusions reached. Copies of such memoranda are forwarded to the General Consultant.

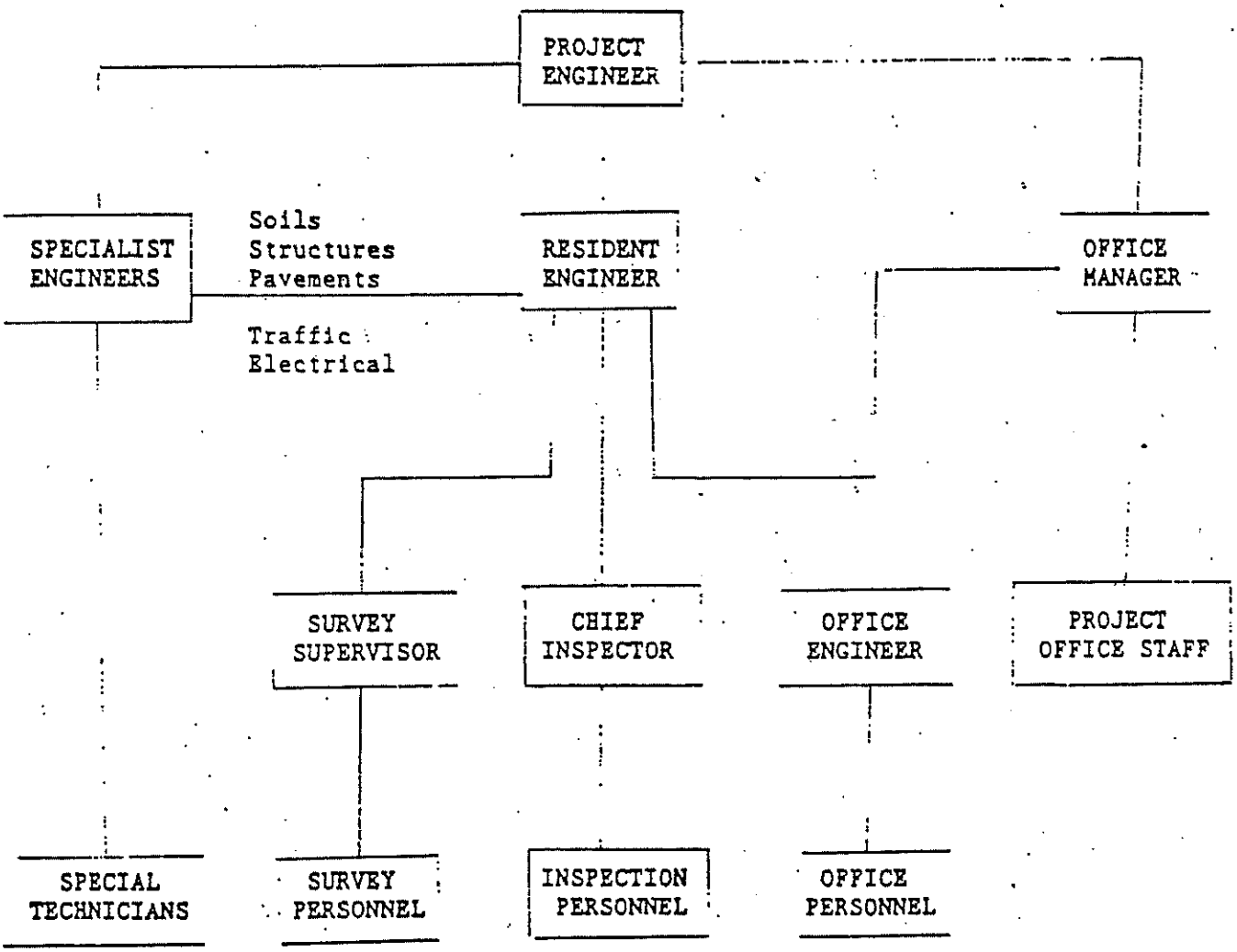
III-4

SUGGESTED ORGANIZATION

FOR

CONSULTING ENGINEER'S

FIELD STAFF



SECTION IV
THE CONTRACTING SYSTEM

Contractors. Contractors are employed by the Authority to perform all of the construction work. They are generally selected by public invitation and competitive bidding. They are bound by legal agreement to perform the work in the manner prescribed, within the time specified, and for the prices set forth in the bid proposal.

All contractors are under the direction of the Chief Engineer. However, the performance of his work shall at all times and in all respects be subject to the inspection and approval of the engineer. The engineer as a third party may not rescind, alter, or enlarge the contract. Such rights rest only with the Chief Engineer.

Contractors are paid for their work by the Turnpike on a regular monthly basis by virtue of certificates of payment prepared and certified by the engineer. If the value of the work completed exceeds $100,000.00 in a two-week period, a semi-monthly or interim certificate may be processed for payment, if required by the contactor.

Sub-Contractor. Sub-contractors are generally construction specialists who contract with the contractor to perform work at or about the construction site. The total amount of any contract work that can be sublet shall never exceed fifty (50) percent of the total amount of the contract, unless a specialty item is provided for in the contract except in the case of a Joint Venture. Each party to a Joint Venture shall perform, with his own organization work amounting to not less than thirty percent (30%) of the total amount of the contract.

Sub-contractors are never assigned by the Turnpike Authority, but the Authority does require that all contractors submit proposed sub-contractors for approval. However, any consent of the Authority for the subletting of any of the work under the contract in no way relieves the contractor from his full obligations under the contract. Engineers should avoid dealing directly with sub-contractors but should always work through the prime contractor -- especially with regard to approval of shop dravings, and progress payments.

Suppliers. Suppliers and materials are all purchased by the contractor and sub-contractors. The engineer approves, but never selects, the supplier. A sample form to be used by the engineer for approval of suppliers is found on the following page. Materials furnished are also subject to the engineer's approval as described in Section XII.

J.S. Sliderule & Associates
Consulting Engineers
678 Blank Ave., New Brunswick, N.J. 08903

Materials Supplier Approval

Sunburst Electric Company, Inc.
123 Sunshine Lane
Newark, New Jersey 07114

Re: New Jersey Trunpike - 1990 Widening
Section 4A - Contract W-2742
Materials Supplier

Gentlemen:

In reply to your request we hereby approve the company listed below as a supplier of materials for Contract W-2742.

Wire Conductor Company
1000 Voltage Blvd.
Edison, New Jersey 08817

The materials to be supplied are:

Approximate Quantity	Description
5000 LF	#2 A.W.G. Conductor
3000 LF	#6 A.W.G. Conductor

It is understood that you are fully acquainted with the provisions of the Contract Specifications pertaining to materials supplied to the contract and with Section 105 of the Standard Specifications entitled "Control of Materials."

It is further understood that the approved supplier will submit certifications for the materials supplied indicating conformance with the appropriate specifications.

Very truly yours,

J. S. Sliderule Associates

By: /s/ Charles J. Smith

Project Engineer

CJS
cc: General Consultants

SECTION V
THE CONSTRUCTION SYSTEM

Testing Laboratories. The testing laboratory is an independent agency designated by the Chief Engineer for the inspection and testing of the materials to be used in the project for set unit fees established in advance.

The testing laboratory is directed by, and reports to, the engineer. The type, range and number of tests taken is generally at the discretion of the engineer.

The testing laboratory has no authority to accept or reject materials but is responsible to make accurate tests and objective reports in accordance with the standards and specifications provided by the engineer and may recommend acceptance or rejection to the engineer.

The testing laboratory is reimbursed by invoicing the Turnpike Authority on forms provided by the Authority. These invoices are checked and approved by the engineer and recommended for payment through the General Consultant. Payment is then made directly by the Authority to the laboratory.

Utility Companies. The relocation of utilities is an important factor in Turnpike construction and engineers should maintain a close association with the utility owners concerned and effect coordination in scheduling the work to be performed.

A utility order is required for any relocation or modification, temporary or permanent, of an existing utility caused by Turnpike construction. The utility order is prepared by the engineer in accordance with the procedures established and discussed in detail on subsequent pages of this manual.

Local Municipalities. When Turnpike construction passes through or near a township, borough or town, there is usually an impact on the residents of the community. Local officials are besieged with complaints or requests from the residents concerning among other things the noise, dust, dirt, encroachment on their property and the like. The officials in turn write or contact the Turnpike Authority, the General Consultant or the engineer to help resolve these problems.

The engineer should maintain favorable relations with all persons in the community and be available to resolve any problems of this nature that may arise. A word to the contractor about where trucks are parked, the speed that vehicles are driven through local streets, or perhaps ordering a water truck to keep the dust down -- such efforts will often go a long way to developing cooperation with neighboring residents.

Engineers are often requested by the Authority to attend meetings with town officials to discuss problems affecting the municipality because of the present construction. The engineer can and often will reach agreements with town officials whereby an entire community can be satisfied by establishing certain detours for traffic or installing safety walks for school children near construction sites. It may also become necessary to establish temporary street lighting in some areas or install temporary traffic lights in others. All such agreements should be coordinated with the Authority through the General Consultants.

Other Agencies. From time to time in the course of the project the engineer may be called upon to deal with other agencies who have no direct connection with the Turnpike Authority. Some of these agencies are:

US Coast Guard
US Army Corps of Engineers
New Jersey State Department of Labor and Industries
New Jersey Department of Transportation
Underwriter's Laboratories
The Department of Environmental Protection (both Federal and State)
New Jersey Department of Community Affairs
Occupational Safety and Health Administration

Engineers are expected to cooperate with all such agencies. However, where juristrictional issues are questioned the matter should be referred at once to the General Consultants.

Division Three

PRE-CONSTRUCTION REQUIREMENTS

Prior to the time that any of the contractors begin work, there are certain engineering and adminstrative responsibilities that fall upon the consulting engineer. Division Three of the Manual sets forth some of these requirements and offers a check list for the pre-construction conference.

OUTLINE OF DUTIES

FOR

CONSULTING ENGINEER

Cost Control	Quality Control	Progress Control	General
Review budgets, construction estimates, and engineering costs. Check bid prices.	Review plans and specifications. Stake-out job. Instruct testing labs.	Post target dates. Study construction sequence. Approve progress schedule.	Organize staff. Set up office. Conduct precon-stuction confer-ence. Review subs. Check contractor's insurance
Check lines and estimates. Record contrac-tors labor and equipment. Prepare change Orders Recommend approv-al of testing lab. invoices & U.O. invoices. Prepare daily quantity reports.	Prepare reports: grades. Approve material suppliers. Approve construc-tion methods. Approve shop dravings. (bi-weekly) Inspect workmanship.	Write and file daily job reports, contract progress, (daily) area progress (weekly) section progress	Prepare pay correspondence. Maintain daily diary. Conduct and record job meet ing. Coordinate traffic Protection.
Record final quantities. Prepare final pay Certificate.	Conduct final inspection.		Prepare as-built plans. Prepare Engineer's Certification Review contract claims.

SECTION VI

ENGINEERING RESPONSIBILITIES

Planning Ahead

During the pre-construction phase for all contracts, the engineer or architect should become familiar with the contract plans and specifications. It is a good idea at this time to make a list of early needed items, such as site fencing, office trailers, and shop drawings for long lead time items.

On the Turnpike, control surveys are provided by the engineer - usually during design - and the layout of physical features is performed by the contractor. It is essential for the engineer to verify that a sufficient number of control points have survived to let the contract surveys begin.

Require the contractor to submit in writing a list of the proposed material suppliers for the contract. This list is revieved by the engineer for approval and a copy is forwarded to the General Consultant. (See page 17 for sample form to be used for approval of materials supplier by the engineer.) Arrangements should be made to have the material tested by an authorized testing laboratory for compliance with the specifications. The name of the laboratory to be used will be provided by the general consultant.

Review the contractor's progress schedule. On most contracts it will be required that the contractor submit the schedule within a specified period of time per Subsection 107.04 of the Specifications. A thorough review of this schedule by the Section Engineer and the General Consultant is essential. A detailed study should include coordination with other contractors as well as the completion date specified in the project.

It is crucial to maintain an up-to-date report on the status of right-of-way acquisitions together with specific estimates of anticipated dates for securing unacquired property. This information is available from the general consultants. Also it is vital to maintain an up-to-date status report for utility removals and relocations. Establish separate records for each utility order to be performed.

Obtain from the contractor a cost breakdown for all contracts bid on lump sum basis. This procedure enables the engineer or architect to establish a completion percentage at any given period of construction.

SECTION VII

ADMINISTRATIVE RESPONSIBILITIES

Getting Started

During the pre-construction phase for all contracts, the engineer or architect should:

1. Note and file the award date of all contracts.

2. Provide the addresses and phone numbers of the section field office and trailers as soon as possible to the General Consultant and the Authority.

3. Following the award of the contract, take immediate steps to arrange for a pre-construction conference through the General Consultant. Be prepared to recommend alternate dates for the conference to accomodate the several parties.

4. Notify the contractor in writing of the pre-construction conference date, place, and time.

5. See that the contractor is supplied with Notification of Intent to Subcontract forms at the pre-construction conference and has a knowledge of how the form is to be prepared.

6. Reviev the Notification of Intent to Subcontract forms when submitted by the contractor. Be certain that the limits of the Automobile Liability Insurance are correct.

7. Transmit the executed Notification of Intent to Subcontract form in duplicate to the General Consultant. The letter of transmittal to the General Consultant should indicate that the engineer has revieved and recommends approval of the sub-contractor.

8. Inform the appropriate testing laboratory(s) of the avarded contract, the contractor's name and address, the location of the working site, the materials to be tested, the location of the concrete plant or asphalt plant if applicable, and the proposed distribution of the testing reports by the laboratory.

9. Obtain from the contractor a list of all contractor personnel to be associated with the contract.

Execution of the Contract. The bidder to whom the contract has been awarded shall within ten (10) calendar days of receipt of Notice of Award:

1. Execute and deliver to the Senior Attorney of the Authority four (4) copies of the contract. (A sample copy is shown on page 25.

2. Furnish and deliver the Contract Bond on the standard form of the Authority bound in the contract. (A sample is shown on page 28.) The bond shall be in a sum of not less than the total amount bid for the project and shall be maintained by the contractor until the final payment is made. For further information refer to Subsection 103.02 of the Specifications.

3. Furnish satisfactory evidence of the required insurance as specified in the special provisions of the specifications.

4. If the award is to be a joint venture, furnish and deliver the Certificate of Secretary on the standard form of the Authority bound in the contract.

All of the above shall be furnished, executed and delivered before the contract will be executed and dated by the Authority.

NEW JERSEY TURNPIKE AUTHORITY

* * * * * * * * * * * * * * * * *

CONTRACT AGREEMENT

CONTRACT NO. W-999

THIS AGREEMENT made this _____ day of

in the year of our Lord, one thousand nine hundred and _____ between the New Jersey Turnpike Authority, party of the first part, sometimes hereinafter called Authority, and

party of the second part, sometimes hereinafter called Contractor.

WITNESSETH, that the said Contractor, in consideration of the payments hereinafter specified, hereby convenants and agrees to furnish and deliver all the materials, to do and perform all the work and labor required to be furnished and delivered, done and performed for, and to do and perform all things necessary or proper for, or incidental to the completion of Contract No. W-999 in strict and entire conformity with the Specifications, attached hereto, and the Plans which consist of Dravings numbered 1 to 18, bearing the general title:

NEW JERSEY TURNPIKE AUTHORITY
NEW JERSEY TURNPIKE
CONTRACT NO. W-999
REPLACEMENT OF DOORS AT VARIOUS LOCATIONS - NORTH

and under Contract Documents which are hereby made a part of this agreement as fully and with the same effect as if the same had been set forth at length in the body of this Agreement.

All work done under this Contract shall be completed within 180 days of the date of notice of Award of Contract.

If the Contractor fails to complete fully, entirely and in conformity with the provisions of the Contract, the Project and each and every part and appurtenance thereof, within the time stated above, or within such further time as may have been granted in accordance with the provisions of the Contract, then the Contractor shall and hereby agrees to pay the Authority for each and every calendar day that he is in default on time to complete the entire Project, One Hundred Dollars ($100), which said amount per calendar day is agreed upon by the parties hereto to be liquidated damages and not a penalty.

Notwithstanding any language herein to the contrary regarding liquidated damages, the Authority and the Contractor agree that in the event damages are sustained by the Authority in excess of liquidated damages, the Authority shall have the right to proceed to assess and recover said additional damages and shall not be limited to recovery of liquidated damages.

The Contractor agrees to make payment of all proper charges for labor and materials required in the aforementioned work, and defend, indemnify and save harmless the Authority, its officers, agents and servants and each and every one of them against and from all suits or costs of every kind and description including suits, costs, claims and judgements of agents, servants or employees of the Contractor and of his subcontractors, and from all damages to which the Authority or any of its officers, agents or servants may be subjected by reason of injury to the person or property of others resulting from the performance of the Project, or through the negligence of the Contractor, its agents, servants, employees and subcontractors; or through any improper or defective machinery, implements or appliances used in the Project, or through any omission on the part of the Contractor or his agents, servants, employees and subcontractors; and he shall further defend, indemnify and save harmless the Authority, its officers, agents and servants from all suits and actions of any kind or character whatsoever, which may be brought or instituted by any subcontractor, materialman or laborer who has performed work or furnished materials in or about the Project or by, or on account of, any claims or amount recovered for any infringement of patent, trademark or copyright. So much money due to the Contractor under and by virture of the Contract as shall be considered necessary by the Authority may be retained by the Authority and held until such suits, actions, claims or amounts shall have been settled, and suitable evidence to that effect furnished to the Authority.

In consideration of the premises, the Authority hereby agrees to pay, as sole compensation for the performance of the Project, payments for the actual quantity of authorized work performed, as provided in the Specifications, at the prices for the Scheduled

Items of Work in the Proposal. This contract is to be binding upon the Authority, its successor or successors, and upon the Contractor and its heirs, executors, administrators, successor or successors, and is voidable and may be terminated by the Authority, in accordance with the provisions of the Specifications, or if the provisions of the statutes relative thereto are not complied with.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement the day and year first above written.

Attest: NEW JERSEY TURNPIKE AUTHORITY

_____ _____
Secretary Executive Director

_____
Contractor

(Corporate Seal) _____ L.S.

Witness or Attest _____ L.S.

_____ _____ L.S.

NEW JERSEY TURNPIKE AUTHORITY

* * * * * * * * * * * * * * * *

CONTRACT BOND

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned

As PRINCIPAL, and
a corporation organized and existing under the laws of the State of
, and duly authorized to do business in the State of New Jersey, as Surety, are hereby held and firmly bound unto the New Jersey Turnpike Authority, hereinafter called Authority, its successor or successors, in the penal sum of

Cents ($_____) for the payment of which well and truly to be made, we hereby jointly and severally bind ourselvese, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, A.D. nineteen hundred and _____.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that whereas the above named Principal is about to enter into a contract with the Authority, its successor or successors, which said contract, known as Contract No. _____ entitled _____ is hereby made a part of this bond as if set forth herein at length.

NOW, THEREFORE, if the said Principal shall well and faithfully do and perform the things agreed by to be done and performed according to the terms of the said Contract, or any changes or modificaitons therein provided, and shall abide by all vage laws and pay all lavful claims and judgements of subcontractors, materialmen, laborers, persons, firms or corporations, for labor performed or materials, provisions, provender or other supplies, or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing of said Contract, we agreeing and assenting that this undertaking shall be for the benefit of any subcontractor, materialman, laborer, person, firm or corporation having a just claim, or judgement against the principal, as well as for the obligee herein, and shall defend,

indemnify and save harmless the Authority, its officers, agents and servants, and each and every one of them against and from all suits, costs, claims and judgements of every kind and description, and from all damages to which the Authority, or any of its officers, agents, servants may be put by reason of injury to the person or property of others resulting from the performance of said Contract or through the negligence of the Principal, its agents, servants, employees or subcontractors, or through any improper or defective machinery, implements or appliances used by the Principal in the aforesaid work or through any act or omission on the part of the said Principal, or his agents, employees or servants, and shall further defend, indemnify and save harmless the Authority, its officers, agents and servants, from all suits, actions, claims and judgements of any kine or character whatsoever, which may be brought, instituted or obtained by a subcontractor, materialman or laborer who has performed work or furnished materials in or about the work required to be done pursuant to the said Contract, or by or on account of, any claims or amount recovered for any infringement of patent, trademark or copyright; then this obligation shall be void; otherwise the same shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims and judgements hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that no modifications or omissions, or additions in or to the terms of the said Contract, or in or to the Plans or Specifications therefor, shall in anywise effect the obligations of said Surety on its bond, and the Surety hereby waives notice of same.

IN WITNESS WHEREOF the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

WITNESS OR ATTEST:

_____

_____

_____

_____

Principal

WITNESS OR ATTEST:

_____

_____

_____

_____

Surety

STD. 1/64 CB-2

SECTION VIII - 1

THE PRE-CONSTRUCTION CONFERENCE

Notification. Following the notification of award to the contractor, the engineer should take the necessary steps to prepare both the contractor and the field office for the forthcoming work. Section 107 of the Specifications should be referred to and followed carefully.

For all contracts it will be necessary to conduct a pre-contruction conference attended by representatives of the Authority, the engineer, the General Consultant, and the contractor.

This meeting is arranged through the General Consultant with representatives of the Authority and is conducted at the New Jersey Turnpike Administration Building, New Brunswick, New Jersey.

The date and time of the conference is confirmed in writing by the engineer to the contractor.

An outline for a pre-construction conference begins on page 31.

Notification of Intent to Subcontract forms are required for all sub-contractors. These forms will be supplied by the Authority. A sample of the form is on page 36. Also, the contractor should bring a signed copy of the Power of Execution Form to the pre-construction conference. (See page 37.)

The Power of Execution form a sample of which is indicated on page 37 is required in the executed contract document. Be sure to remind the contractor of this as it pertains to signatures on Pay Estimates, Change Orders and other documents in the contract.

OUTLINE FOR PRE-CONSTRUCTION CONFERENCE

1. Execution of contract. See page 25 for a sample Contract form properly executed. This should be discussed with the contractor at the conference with a reminder to follow the instructions of the Letter of Award.

2. Contract Bond. Four (4) copies of the Contract Bond should be signed by the contractor and delivered to the Authority.

3. Insurance. Insurance Certificate as required under Subsection 106.19 must be revieved and approved by the Authority before execution of contract. Contractor should be informed that in the near future a Notice to Proceed letter will be received from the Senior Attorney of the Authority returning one fully executed copy of the contract and containing the information that the insurance is in order and that the contract is in order to begin operations.

4. Subcontractors. The contractor should be furnished with a supply of Notification of Intent to Subcontract forms.

5. Plans and specifications. The contractor should be asked hov many additional copies will be required; and efforts should be made to secure them.

6. Contractor's organization. The contractor's superintendent should be present at the meeting. The contractor should be reminded of the need to submit weekly memoranda, on some suitable form, of the numbers and classifications of the workers and equipment used on the job each day of the previous week including those of sub-contractors.

7. Materials approval. Lists of proposed suppliers should be submitted to the engineer, in writing, at the preconstruction conference. For materials such as Portland cement concrete and asphalt concrete additional time is needed for mix designs and approvals. Up-dates may be required from time to time.

8. Shop drawings. Establish a procedure for the submittal and approval of shop drawings including:

   a. The name and address of the engineer who will receive them.

   b. The number of copies required.

   c. The specific items that will require shop dravings.

   d. Which shop dravings must later be submitted in permanent form as record dravings. They must be on mylar sheets 22" x 36" in size per Subsection 104.08.

9. Testing procedures. Outline for the contractor the following:

   a. The name of the laboratory that will test various materials.

   b. The approximate time involved to obtain results.

   c. The contractor must make all arrangements for picking up and delivering concrete cylinders to the testing laboratory.

   d. Materials that will require physical evidence of inspection (monograms) such as structural steel and concrete pipe.

   e. The need for laboratory equipment to be provided at concrete plants and asphalt plants.

   f. A list of materials that will require manufacturer's certification, such as reinforcing steel. (Note: On contracts requiring large amounts of asphalt concrete or structural steel, it would be helpful to have a representative of the testing laboratory present.)

10. Progress schedule. The need for prompt submittal of a detailed progress schedule should be strongly emphasized. Any critical scheduling problems should be intensively explored at the conference.

11. Insurance. The contract provisions should be revieved to determine who will provide general liability insurance. If a wrap-up policy covering both the Authority and the contractor is provided by the Authority, then the form of the policy is available for inspection at the Authority's legal department.

12. Right-of-way. There should be available at the meeting an up-to-date report on the status of right-of-vay acquisition together with specific estimates of anticipated dates for securing unacquired property.

13. Utility. For utility removals and relocations the engineer should have an up-to-date status report. For utilities that are to remain and may be a hindrance, the contractor should be reminded of the obligations to inform the utilities before starting work and of any safety measures that might be required.

14. Contractor's headquarters. Agreement should be reached as to the location of the contractor's office and yard.

15. Pay certificates. Discuss the following:

a. Power of Execution. Contractor should be made aware that only the person(s) signing the contract agreement for the contractor is authorized to sign the pay certificates and change orders. If other contractor personnel will be permitted to sign, then a Power of Execution should be consummated either with the signing of the contract agreement or immediately thereafter. (Sample on page 37.)

b. Inform the contractor that a semi-monthly payment can be obtained provided that a minimum of $100,000 worth of work, or 25% of the total value of the contract (whichever is less), is performed during any period of two consecutive weeks.

c. Establish a closing date when quantities will be determined for pay estimates. A deliberate effort will be made to have all contractors receive their payment within thirty (30) days after the established closing date for estimates. The following chart establishes closing dates:

Contract Nos. Ending In	Closing Monthly Date for Estimate	Period Covered by Interim Estimates
0	1st	1st to 15th
1	4th	4th to 19th
2	7th	7th to 22nd
3	10th	10th to 25th
4	13th	13th to 28th
A or 5	16th	16th to 30th or 31st
B or 6	19th	19th to 4th
C or 7	22nd	22nd to 7th
D or 8	25th	25th to 10th
E or 9	28th	28th to 13th

The last digit in a contract designation, whether a letter or a number, determines the date:

Example:

Contract W-705B - Closing date is 19th of month
Contract W-707 - Closing date is 22nd of month
Contract W-708-9 - Closing date is 28th of month

16. Traffic protection. Review the devices required; and if furnished by the Authority, when and where they may be obtained. If furnished by the contractor, the need for prompt approval of the supplier and for establishing target delivery dates.

Review and explain working hours, ingress and egress, traffic flow, traffic control material, layouts and special contract provisions.

Establish a check system for night patrol.

Require the contractor to apply for a traffic permit as required.

The contractor should provide the names and telephone numbers of at least two responsible supervisory employees who can be reached at any hour in an emergency.

Review and discuss the chain of command, responsibilities of, and role of:

a. The traffic protection supervisor.

b. The State Troopers.

c. The inspectors.

d. The Maintenance Department.

Describe the use of contractor's special construction toll tickets if the tickets have been approved for use for the contract.

(See Section XVIII of this manual for a more complete treatment of traffic protection considerations.)

17. Contruction stakes. Discuss the responsibility for staking out lines and grades for road work, centerlines for structures, and furnishing required benchmarks.

Establish mutually satisfactory clearances for offsetting reference stakes.

18. Buildings. Building contractors should be informed that the requirements expected of the highway or structural contractors apply to them as well. They should be further informed that coordination between all contractors at a building site is of the utmost importance since normally there are five (5) contractors working on or in a building at the same time and one is dependent on the other for continuity of work.

Contractors should be made aware of the requirements for submitting working dravings including data sheets, schedules, reinforcement bar lists, brochures, catalog cuts, etc. Four (4) prints of each working draving are submitted to the architect for approval. If prints are returned for correction, four (4) prints shall be submitted until finally approved.

Color chips or charts are also required of the contractor after approval of a paint or finishing manufacturer.

The engineer of architect involved in the construction of a building should place emphasis on supplying temporary electric power, heat and water. Discuss and clarify with the contractors which contractor is responsible for supplying each facility. The amount of power, heat or water required to satisfy all contractors, the hours per day each temporary facility will be required, and the approximate period of time a contractor will supply the temporary facility before the permanent installation is available for use should be determined.

Usually all building contracts are bid on a lump sum basis. The contractor is required to supply an itemized breakdown of the lump sum amount to the engineer or architect. This procedure will facilitate the preparation of monthly pay estimates and weekly and monthly progress reports by the engineer or architect.

In addition to the above guaranty, the supplementary specifications for building contracts require that the contractor must obtain and submit to the Authority, through the engineer, a roofing and flashing guaranty as provided in the specifications.

The contractor must also obtain and submit to the engineer a surety bond covering the metal flashing issued by the installer covering the installation for a period of five years.

The engineer or architect should stress that it is the responsibility of each contractor working in the building to provide for clean-up services within the building. A final inspection will not be conducted nor will a contract be accepted if the building site is not clean and ready for occupancy. The responsibility for trash in and around the building is often difficult to establish, and it might be suggested that all contractors associated with the building combine and obtain a cleaning service with each contractor contributing to the service.

A watchman will be provided at the building site whenever the building is in a stage that is vulnerable to vandalism. A review of the contract specifications on this subject would be appropriate at the pre-construction meeting.

19. Progress photos. Discuss with the contractor the requirements to furnish progress photographs, the frequency to be furnished, the number required, the type of photo required, how the identification block is prepared, and the information that is required therein.

20. Surety Bond. As a guarantee against defective work, the contractor must furnish a surety bond to the Authority in a sum equal to five (5) percent of the final contract price. The bond remains in full force and effect for a period of one (1) year from the date of final acceptance of the project by the Authority.

21. Question period. Provide an opportunity for the contractor to ask questions regarding plans, specifications, or methods of construction.

NOTIFICATION OF INTENT TO SUBCONTRACT

TO: Construction Engineer
New Jersey Turnpike Authority
New Brunswick, New Jersey

Date: _____

Contract No: _____

Pursuant to the provisions of Subsection 103.04 of the Specifications entitled "Subletting and Assigning Contract" the undersigned, as principal contractor for the above Contract, hereby advised the Engineer that the said firm intends to subcontract the following work:

Subcontract Firm Name and Address	Detailed Description of Subcontract Work	Subcontract Amount

The undersigned agrees that during the performance of the work herein described and covered by the said Contract, the Engineer shall be promptly advised by the principal contracting firm of any changed conditions including new subcontract work sublet by the principal contractor.

_____
Principal Contracting Firm

Consent to Sublet:

_____
Construction Engineer

By _____

Title _____

NEW JERSEY TURNPIKE AUTHORITY

* * * * * * * * * * * * * *

POWER OF EXECUTION

The undersigned, a _____ under the corporation, partnership, individual

laws of the State of _____, having principal office or registered agent in New Jersey at _____, (Street) (Town)

hereby nominates, constitutes and appoints _____

_____ with full power to act _____ alone or in

_____, on behalf of _____ name of company

to make, execute, seal and deliver on its behalf as contractor and as its act and deed, any and all contracts, change orders, monthly and final payment certificates and other like instruments.

Such contracts, change orders, monthly and final payment certificates and other like instruments shall be binding upon said company as fully and to all intents and purposes as if such instruments had been duly executed and acknowledged and delivered by the authorized officers of the company when duly executed, as indicated above, by either one of the aforementioned

WITNESS OR ATTEST:

_____ BY: _____ Signature

SIGNATURES OF AUTHORIZED PERSONS
TO ACT ON BEHALF OF ABOVE COMPANY:

_____ Address

_____

_____ Date

_____ Corporate Seal:

_____

CONSTRUCTION PHASE

Division Four

COST CONTROL

Cost control on Turnpike construction is maintained by the engineer through budgets, explicitly detailed contract items, and rigid criteria for instituting changes.

Budgets must be submitted to the General Consultant for the engineer's own costs, for estimated contract costs, and for all else that will require an expenditure of Turnpike funds. These budgets must never be exceeded without carefully documented written explanations well in advance of the expenditure.

All contract items must be tabulated daily, computed weekly and reported monthly. These various steps are explained in greater detail in this section. However, the point here is to re-emphasize that no estimated contract quantity may be exceeded without prior formal approval by change order. Any additional items unforeseen in the original contract must also be handled as change orders.

Each engineer should keep a complete file of calculation books showing in detail the precise computations for establishing the final pay quantity for each contract item.

Anticipated fees for testing services are estimated prior to the start of construction by the General Consultant, forwarded to the Authority, approved by the Chief Engineer, and authorized by the Commissioners. All invoices from testing laboratories for testing services must be certified by the engineer prior to submittal to the Authority throught the General Consultant. Accurate, current records must be kept of all such testing costs.

Estimated costs for relocating utilities are established by the utility companies and invoices are submitted periodically for the work performed. These invoices are directed to the engineer under whose management the work was performed. The invoices are revieved and approved for payment by the engineer, forvarded to the General Consultant then to the Authority for payment. Accurate, current records must be kept by the engineer of all utility costs to assure that actual billings do not exceed estimated amounts.

SECTION IX

PAY CERTIFICATES

Part 1

General. The contractor will be paid for work done (and, in some cases, materials supplied) during the preceeding month by means of a Certificate of Payment. This certificate is to be made up by the engineer on the standard forms supplied by the Authority, as outlined below, at monthly intervals on a closing date established at the pre-construction conference. Normally, only one certificate per month will be accepted for payment. However, semi-monthly certificates may be processed provided that the money earned for work accomplished in the two-week period amounts to a minimum of $100,000.00 or 25% of total contract amount. The inclusive interim dates for any one contract are established at the pre-construction conference using the table shown on page 35 of this manual.

Three distinct types of contracts are ordinarily used by the Authority in its construction work. They are; the unit price contract, the lump sum contract, and the cost-plus contract. Folloving is a brief description of each type contract indicating the differences in the monthly certificate.

Part 2

Unit Price Contract. In this type contract, the work is broken down and paid by item. (The column numbers referred to in the following discussion are those indicated on the sample Certificates of Payment shown on pages 41 through 46.)

A certificate for one period for one contract consists of one or more sheets. On the body of the certificate on sheet 1 (and subsequent sheets if required) list each item in the contract by number (column 10) and description (column 11) as soon as some work has been done on that item.

The items of work performed during the current period are listed under the heading "Quantity & Unit" (column 12) in the quantity per item actually installed during the period and in the unit in which the item is measured (L.F., S.Y., M.H., C.Y., etc.). Each item of the contract has a unit price determined by the contractor when estimating cost for bidding the contract and approved by the Authority when the contract is awarded. This amount is listed on each pay certificate in column 13. The amount of money earned by the contractor during the current period is determined by multiplying the quantity installed during the current period (column 20) by the unit price of the item (column 13). This amount is shown in column 14.

The "Quantity & Unit" (column 15) reflects the cumulative quantities of each item of work incorporated in the project from the starting date of the contract. The "Amount" (column 16) indicates the amount of money earned by the contractor by item from the start of the contract.

TOTAL THIS ESTIMATE			$ 90,724.00	TOTAL TO DATE	$ 191,568.47

17. *Verified as to quantities and amounts.*

/s/ John R. Johnes
SIGNATURE

Resident Engineer Oct. 2, 1989
TITLE DATE

18. *I certify that the above estimate is correct and just and that payment therefor has not been received and that, with respect to any items above covering payments for materials, said materials are on hand and are properly stored and protected at or near the site of the work, have been inspected and approved, are not in excess of the estimated quantities required, and are to be incorporated into the project. The invoice prices plus freight are the net prices paid, less all discounts and rebates, and there are no liens on said materials.*

Fairfax Construction Company
CONTRACTOR

BY: /s/ Charles E. Fox

Vice Ident. Oct. 4, 1989
DATE

19. *I certify that I have checked the quantities covered in this estimate; that the work was actually performed; that the quantities, including materials furnished but not incorporated in the work, are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.*

Estimate recommended for payment:

Bailey Bridges and Associates
ENGINEER

BY /s/ Kelly Vincent Oct. 6, 19 89
PROJECT ENGINEER DATE

20. *I hereby concur that the above certificate, reflecting changes by extra or reduction orders and supplementary agreements, if any, has been completed to our satisfaction as General Consultants.*

Concurrence with recommendations for payment:

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
GENERAL CONSULTING ENGINEER

BY /s/ Riley O. Jones

Project Engineer Oct. 9 19 89
TITLE DATE

21. *Estimate approved for payment:*

/s McAdam Rhoades Oct. 129 89
SENIOR ENGINE DATE

NEW JERSEY KE AUTHORITY

22. DEDUCTIONS:

1. RETAINED PERCENTAGE (10%) FROM CONTRACT ITEMS (SUB-TOTAL "A")	$	19,156.85
2. RETAINED PERCENTAGE (20%) FROM MATERIALS ON HAND (SUB-TOTAL "B")	$	0.00
3. OTHER DEDUCTIONS	$	0.00
4. AMOUNT PREVIOUSLY PAID	$	90,775.80
TOTAL DEDUCTIONS	$	109,932.65
Amount Due Contractor	$	81,635.82

NEW JERSEY TURNPIKE AUTHORITY

MONTHLY CERTIFICATE FOR PAYMENT TO CONTRACTOR

1. DATE: Oct 2 1989

2. SHEET 1 OF 1

3. CONTRACTOR AND ADDRESS: Fairfax Const. Co. 1516 Evergreen Avenue Secaucus, New Jersey 08213

4. CONTRACT NO.: W-7300

SECTION NO.: 5FX

5. DESCRIPTION OF WORK: Repair Damage to Existing Raritan River Bridge

6. PROJECT: New Jersey Turnpike - 1990 Widening

7. LOCATION: Middlesex County, New Jersey

8. PERIOD COVERED BY THIS ESTIMATE: FROM Sept. 3 1989 TO Oct. 2, 1989

9. ESTIMATE NO.: 2

ITEM NO. (10)	DESCRIPTION (11)	CURRENT PERIOD QUANTITY & UNIT (12)	CURRENT PERIOD UNIT PRICE (13)	CURRENT PERIOD AMOUNT (14)	TOTAL TO DATE QUANTITY & UNIT (15)	TOTAL TO DATE AMOUNT (16)
41	Furnish all labor, materials, equipment, insurance, tools, superintendance and service required to repair damage to portions of the sub and super structure steel and masonry. All on a cost plus basis in accordance with Article 7.1 of the Contract Specifications. Payment as follows:					
	1. Labor $78,146.28					
	2. Materials 29,242.88					
	3. Insurance 13,855.70					
	4. Overhead (10% or Labor, Materials and Insurance) 12,124.48					
	5. Owned Equipment (+5%) 20,674.00					
	6. Rental Equipment (+5%) 12,704.48					
	7. Profit (10% of Labor and Materials) 10,738.92					
	8. Welfare and Pension 7,277.10					
	9. Tolls 909.00					
	10. Sublet Work (+5%) 5896.00					
	$191,568.47	37.0% LS	245,200.00	90,724.00	78.1% ± L.S.	191,568.47

TOTAL THIS ESTIMATE	$ 61,000.00	TOTAL TO DATE	$ 252,970.00

17. *Verified as to quantities and amounts.*

/s/ John W. Hope
SIGNATURE

Resident Engineer Sept. 16 88
TITLE DATE

18. *I certify that the above estimate is correct and just and that payment therefor has not been received and that, with respect to any items above covering payments for materials, said materials are on hand and are properly stored and protected at or near the site of the work, have been inspected and approved, are not in excess of the estimated quantities required, and are to be incorporated into the project. The invoice prices plus freight are the net prices paid, less all discounts and rebates, and there are no liens on said materials.*

ABC Contracting Company
CONTRACTOR

/s/ Adam B. Charles
BY:

Pres t Sept. 19 88

19. *I certify that I have checked the quantities covered in this estimate; that the work was actually performed; that the quantities, including materials furnished but not incorporated in the work, are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.*

Estimate recommended for payment:

J.S. Slideryle Associates
ENGINEER

/s/ Charles J. Smith Sept. 20 88
BY PROJECT ENGINEER DATE

20. *I hereby concur that the above certificate, reflecting changes by extra or reduction orders and supplementary agreements, if any, has been completed to our satisfaction as General Consultants.*

Concurrence with recommendations for payment:

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
GENERAL CONSULTING ENGINEER

/s/ Riley O. Jones
BY

Project Engineer Sept. 21 88
TITLE DATE

21. *Estimate approved for payment:*

/s/ McAdam Rhoades Sept. 26 88
SENIOR ENG DATE

DRIVE AUTHORITY

22. DEDUCTIONS:

1. RETAINED PERCENTAGE (10 %) FROM CONTRACT ITEMS (SUB-TOTAL "A")	$	25,297.00
2. RETAINED PERCENTAGE (20%) FROM MATERIALS ON HAND (SUB-TOTAL "B")	$	0.00
3. OTHER DEDUCTIONS	$	0.00
4. AMOUNT PREVIOUSLY PAID	$	172,143.00
TOTAL DEDUCTIONS	$	197,440.00
Amount Due Contractor	$	55,530.00

NEW JERSEY TURNPIKE AUTHORITY

MONTHLY CERTIFICATE FOR PAYMENT TO CONTRACTOR

1. DATE: Sep 16, 1988

2. SHEET 1 OF 1

3. CONTRACTOR AND ADDRESS: ABC Contracting Company 619 Knapp Avenue Jersey City, New Jersey 07555

4. CONTRACT NO. W-784A SECTION NO. 4AB

5. DESCRIPTION OF WORK: General Construction - Building Interchange 9

6. PROJECT: New Jersey Turnpike- 1990 Widening

7. LOCATION: Middlesex County, New Jersey

8. PERIOD COVERED BY THIS ESTIMATE FROM Aug. 15, 1988 TO Sept. 16, 1988

9. ESTIMATE NO. 4

ITEM NO. (10)	DESCRIPTION (11)	CURRENT PERIOD			TOTAL TO DATE	
		QUANTITY & UNIT (12)	UNIT PRICE (13)	AMOUNT (14)	QUANTITY & UNIT (15)	AMOUNT (16)
	General Construction	10% L.S.	61,700.00	61,700.00	41% L.S.	252,970.00

43

				TOTAL THIS ESTIMATE	$ 410,648.96	TOTAL TO DATE	$ 1,093,593.50

17. *Verified as to quantities and amounts.*

/s/ James E. Redwood
SIGNATURE

Resident Engineer July 10 91
TITLE DATE

18. *I certify that the above estimate is correct and just and that payment therefor has not been received and that, with respect to any items above covering payments for materials, said materials are on hand and are properly stored and protected at or near the site of the work, have been inspected and approved, are not in excess of the estimated quantities required, and are to be incorporated into the project. The invoice prices plus freight are the net prices paid, less all discounts and rebates, and there are no liens on said materials.*

Ideal Construction Company, Inc.
CONTRACTOR

BY /s/ William E. Birch

Sup endent July 12 19 91
TITLE DATE

19. *I certify that I have checked the quantities covered in this estimate; that the work was actually performed; that the quantities, including materials furnished but not incorporated in the work, are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.*

Estimate recommended for payment:

Bailey Bridges and Associates
ENGINEER

BY /s/ Kelly Vincent July 15, 91
PROJECT ENGINEER DATE

20. *I hereby concur that the above certificate, reflecting changes by extra or reduction orders and supplementary agreements, if any, has been completed to our satisfaction as General Consultants.*

Concurrence with recommendations for payment:

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
GENERAL CONSULTING ENGINEER

BY /s/ Riley O. Jones
Project Engineer July 17 91
TITLE DATE

21. *Estimate approved for payment:*

/s/ McAdam Rhoades July 19 19 91
SENIOR ENG DATE

NEW JERSEY TURNPIKE AUTHORITY

22. DEDUCTIONS:

1. RETAINED PERCENTAGE (10 %) FROM CONTRACT ITEMS (SUB-TOTAL "A")	$	59,944.87
2. RETAINED PERCENTAGE (20%) FROM MATERIALS ON HAND (SUB-TOTAL "B")	$	98,828.96
3. OTHER DEDUCTIONS	$	
4. AMOUNT PREVIOUSLY PAID	$	550,440.16
TOTAL DEDUCTIONS	$	709,213.99
Amount Due Contractor	$	384,379.

NEW JERSEY TURNPIKE AUTHORITY

MONTHLY CERTIFICATE FOR PAYMENT TO CONTRACTOR

1. DATE: July 10, 1991 — SHEET 1 OF

3. CONTRACTOR AND ADDRESS: Ideal Construction Company, Inc. 1871 Cedar Avenue New Brunswick, New Jersey

4. CONTRACT NO.: W-728-2 — SECTION NO.: 5FW

5. DESCRIPTION OF WORK: Concrete Deck-Raritan River Bridge Mile 84.3 to Mile 84.2

6. PROJECT: New Jersey Turnpike-1990 Widening

7. LOCATION: Middlesex County, New Jersey

8. PERIOD COVERED BY THIS ESTIMATE: FROM June 24, 1991 TO July 10, 199

9. ESTIMATE NO.: 3 Inte

ITEM NO. (10)	DESCRIPTION (11)	CURRENT PERIOD QUANTITY & UNIT (12)	CURRENT PERIOD UNIT PRICE (13)	CURRENT PERIOD AMOUNT (14)	TOTAL TO DATE QUANTITY & UNIT (15)	TOTAL TO DATE AMOUNT (16)
1	Concrete in Superstructure	1174 CY	232.00	272,368.00	1335 CY	309,720.0
2	Bridge Approach Slab	160 SY	100.00	16,000.00	160 SY	16,000.0
7	Stud Shear Connectors	13,307 Lb	1.20	15,968.40	15,223 Lb	18,267.6
8	Steel Conduit 3"	200 LF	8.00	1,600.00	200 LF	1,600.0
13	Welded Bar Trusses	251,208 Lb	0.63	158,261.04	285,208 Lb	179,681.0
14	Reinforcement Steel	47,372 Lb	0.44	64,843.68	168,591 Lb	74,180.0
	Sub Total "A"			529,014.12		599,448.6
	Material on Hand					
1A	Permanent Metal Forms in Place		1.84		157,200 SF	289,248.0
7	Stud Shear Connectors	-13,307 Lb	0.42	-5,588.94	119,459 Lb	50,172.1
13	Welded Bar Trusses	-251,208 Lb	0.36	-90,434.88	346,464 Lb	124,727.0
14	Reinforcement Steel	- 47,372 Lb	0.15	-22,105.80	199,980 Lb	29,997.0
	Sub Total "B"			-118,365.16		494,144.1

45

	Sub-Total "A"			63,106.00	198,477.00
			TOTAL THIS ESTIMATE	$ 63,106.00	TOTAL TO DATE $ 198,477.00

46

17. *Verified as to quantities and amounts.*

/s/Harry S. Brown

SIGNATURE

Resident Engineer Aug. 10 92

TITLE DATE

18. *I certify that the above estimate is correct and just and that payment therefor has not been received and that, with respect to any items above covering payments for materials, said materials are on hand and are properly stored and protected at or near the site of the work, have been inspected and approved, are not in excess of the estimated quantities required, and are to be incorporated into the project. The invoice prices plus freight are the net prices paid, less all discounts and rebates, and there are no liens on said materials.*

Bulldog Sign Corporation

CONTRACTOR

/s/ Joseph R. Zink

BY:

Secretary Aug. 11 92

19. *I certify that I have checked the quantities covered in this estimate; that the work was actually performed; that the quantities, including materials furnished but not incorporated in the work, are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.*

Estimate recommended for payment:

J.S. Sliderule Associates

ENGINEER

/s/ Charles J. Smith Aug. 14 92

BY , 19

PROJECT ENGINEER DATE

20. *I hereby concur that the above certificate, reflecting changes by extra or reduction orders and supplementary agreements, if any, has been completed to our satisfaction as General Consultants.*

Concurrence with recommendations for payment:

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

GENERAL CONSULTING ENGINEER

/s/ Riley O. Jones

BY

Project Engineer Aug. 17 92

TITLE DATE , 19

21. *Estimate approved for payment:*

/s/ McAdam [illegible]des Aug. 21 92

SENIOR EN DATE 19

22. DEDUCTIONS:

1. RETAINED PERCENTAGE (7.6%) FROM CONTRACT ITEMS (SUB-TOTAL "A")	$	15,056.00
2. RETAINED PERCENTAGE (20%) FROM MATERIALS ON HAND (SUB-TOTAL "B")	$	0.00
3. OTHER DEDUCTIONS	$	0.00
4. AMOUNT PREVIOUSLY PAID	$	120,315.00
TOTAL DEDUCTIONS	$	135,371.00
Amount Due Contractor	$	63,106.00

NEW JERSEY TURNPIKE AUTH...Y

MONTHLY CERTIFICATE FOR PAYMENT TO CONTRACTOR

1. DATE: Aug. 10, 1992

2. SHEET 1 OF 1

3. CONTRACTOR AND ADDRESS: Bulldog Sign Corporation ~~654 Park Avenue~~ Bloomtree, New Jersey 07163

4. CONTRACT NO.: W-7433

SECTION NO.: 4A-1

5. DESCRIPTION OF WORK: Signing, Delineation and Pavement Striping ~~Mile 84.2~~ Mile 82.2

6. PROJECT: New Jersey Turnpike - 1990 Widening

7. LOCATION: Middlesex County, New Jersey

8. PERIOD COVERED BY THIS ESTIMATE FROM July 11, 1992 TO Aug. 10, 1992

9. ESTIMATE NO.: 3

ITEM NO. (10)	DESCRIPTION (11)	CURRENT PERIOD			TOTAL TO DATE	
		QUANTITY & UNIT (12)	UNIT PRICE (13)	AMOUNT (14)	QUANTITY & UNIT (15)	AMOUNT (16)
1.	Lane Closings	1 Ea.	90.00	90.00	3 Ea.	270.00
2.	Shoulder Closings	2 Ea.	24.00	48.00	4 Ea.	96.00
3.	Maintenance and Protection of Traffic Sign Structure No. 1.	30% L.S.	1500.00	450.00	50% L.S.	750.00
4.	Maintenance and Protection of Traffic Sign Structure No. 2.		1500.00		50% L.S.	750.00
5.	Sign Panel For Sign No. 1.	1 Ea.	80.00	80.00	2 Ea.	160.00
6.	Sign Panel For Sign No. 2.	1 Ea.	50.00	50.00	3 Ea.	150.00
7.	Sign Panel For Sign No. 3.		120.00		4 Ea.	480.00
8.	Sign Panel For Sign No. 4.		80.00		4 Ea.	320.00
9.	Sign Panel For Sign No. 5.	2 Ea.	90.00	180.00	2 Ea.	180.00
10.	Sign Panel For Sign No. 6.	4 Ea.	100.00	400.00	4 Ea.	400.00
11.	Alumimum Posts For Ground-Mounted Signs	800 Lbs.	5.00	4,000.00	1,000 Lbs.	5,000.00
12.	Steel Posts For Ground-Mounted Signs	30 Lbs.	5.10	153.00	50 Lbs.	255.00
13.	Overhead Span Sign Structure No. 1.	20% L.S.	101,600.00	20,320.00	80% L.S.	81,280.00
14.	Overhead Span Sign Structure No. 2.	25% L.S.	101,600.00	25,400.00	75% L.S.	76,200.00
15.	Concrete Foundations for Ground Mounted Signs	5 C.Y.	330.00	1,650.00	15 C.Y.	4,950.00
16.	Concrete Foundations For Sign Structures	30 C.Y.	160.00	4,800.00	80 C.Y.	12,800.00
17.	Reinforcing Steel	1,000 Lbs.	0.60	600.00	2,000 Lbs.	1,200.00
18.	Electrical Work For Sign Structure No. 1.	10% L.S.	5,000.00	500.00	50% L.S.	2,500.00
19.	Electrical Work For Sign Structure No. 2.	10% L.S.	5,000.00	500.00	50% L.S.	2,500.00
20.	Ground-Mounted Delineator, Single-Reflector	80 Ea.	7.00	560.00	100 Ea.	700.00
21.	Ground-Mounted Delineator, Double-Reflector	25 Ea.	8.20	205.00	50 Ea.	410.00
22.	White Pavement Striping, 6" Wide	10,000 L.F.	0.14	1,400.00	30,000 L.F.	4,200.00
23.	White Pavement Striping, 2' Wide	100 L.F.	1.40	140.00	290 L.F.	406.00
24.	Yellow Pavement Striping, 3' Wide	300 L.F.	2.00	600.00	500 L.F.	1,000.00
25.	Remove and Salvage Existing Guard Rail		2.00		200 L.F.	400.00
26.	Install 30 Triangular Signs Reading Yield" Change Order No. 1.		70.00		2 Ea.	140.00
27.	Furnish and Install "Keep Right" Signs. Change Order No. 2	2 Ea.	740.00	1,480.00	2 Ea.	1,480.00

13.	3" Fiber-Cement Conduit			0.234		21,000.0 L.F.	,914.00
17.	#2 A.W.G. Conductor			0.166		8,000.0 L.F.	1,328.00
18.	#4 A.W.G. Conductor			0.114		12,000.0 L.F.	1,368.00
19.	#6 A.W.G. Conductor						
20.	Concrete Junction Box, Type C	-47 Ea.	110.00	-5,170.00		49 Ea.	5,390.00
23.	Concrete Base For Lighting Standards Type A or B	-40 Ea.	120.00	-4,800.00		29 Ea.	3,480.00
29.	Lighting Standard		356.00			43 Ea.	15,308.00
33.	Luminaires, Type "A"	30 Ea.	54.46	1,633.80		99 Ea.	5,391.54
	Ballasts Type "A"	33 Ea.	66.06	2,179.98		99 Ea.	6,539.94
	Esna Connector Kits	1,250 Ea.	7.36	9,200.00		1,250 Ea.	9,200.00
35.	Type C Lamps	16 Ea.	50.00	800.00		16 Ea.	800.00
39.	Floodlight Tower Luminaires	24 Ea.	273.90	6,573.60		32 Ea.	8,764.80
	Floodlight Lamps	32 Ea.	50.00	1,600.00		32 Ea.	1,600.00
	Sub-Total "B"			12,017.38			126,624.06
	TOTAL THIS ESTIMATE			$ 90,301.68		TOTAL TO DATE	$ 476,921.00

17. *Verified as to quantities and amounts.*

/s/ John J. Doe

SIGNATURE

Resident Engineer August 7, 90

TITLE DATE

18. *I certify that the above estimate is correct and just and that payment therefor has not been received and that, with respect to any items above covering payments for materials, said materials are on hand and are properly stored and protected at or near the site of the work, have been inspected and approved, are not in excess of the estimated quantities required, and are to be incorporated into the project. The invoice prices plus freight are the net prices paid, less all discounts and rebates, and there are no liens on said materials.*

Sunburst Electric Company, Inc.

CONTRACTOR

/s/ Charles C. Coe

BY:

Vice President August 8 90

TITLE DATE

19. *I certify that I have checked the quantities covered in this estimate; that the work was actually performed; that the quantities, including materials furnished but not incorporated in the work, are correct and consistent with all previous computations as actually checked; that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.*

Estimate recommended for payment:

J. S. Sliderule Associates

ENGINEER

/s/ Charles J. Smith Aug. 9 90

BY PROJECT ENGINEER DATE

20. *I hereby concur that the above certificate, reflecting changes by extra or reduction orders and supplementary agreements, if any, has been completed to our satisfaction as General Consultants.*

Concurrence with recommendations for payment:

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

GENERAL CONSULTING ENGINEER

/s/ Riley O. Jones

BY

Project Engineer August 10 90

TITLE DATE

21. *Estimate approved for payment:*

/s/ McAdam Rhoades Aug. 15 90

SENIOR ENGINEER DATE

NEW JERSEY TURNPIKE AUTHORITY

22. DEDUCTIONS:

1. RETAINED PERCENTAGE (10%) FROM CONTRACT ITEMS (SUB-TOTAL "A")	$ 35,029.49
2. RETAINED PERCENTAGE (20%) FROM MATERIALS ON HAND (SUB-TOTAL "B")	$ 25,325.21
Liquidated Damages Phase 1 - 2 Days @$500/day	
3. OTHER DEDUCTIONS	$ 1,000.00
4. AMOUNT PREVIOUSLY PAID	$ 340,388.34
TOTAL DEDUCTIONS	$ 401,743.04
Amount Due Contractor	$ 75,177.96

NEW JERSEY TURNPIKE AUTHORITY

MONTHLY CERTIFICATE FOR PAYMENT TO CONTRACTOR

1. DATE: Aug. 7, 1990 | SHEET 1 OF

3. CONTRACTOR AND ADDRESS: Sunburst Electric Company Inc. 123 Sunshine Lane Newark, New Jersey 071

4. CONTRACT NO.: W-742 | SECTION NO.: 4A-1

5. DESCRIPTION OF WORK: Roadway Lighting Mile 84.2 to Mile 82.2 & Interchange

6. PROJECT: New Jersey Turnpike - 1990 Widening

7. LOCATION: Middlesex County, New Jersey

8. PERIOD COVERED BY THIS ESTIMATE FROM July 8, 1990 TO Aug. 7, 1990

9. ESTIMATE NO.: 5

ITEM NO. (10)	DESCRIPTION (11)	CURRENT PERIOD QUANTITY & UNIT (12)	CURRENT PERIOD UNIT PRICE (13)	CURRENT PERIOD AMOUNT (14)	TOTAL TO DATE QUANTITY & UNIT (15)	TOTAL TO DATE AMOUNT (16)
2.	Furnishing Batteries for Traffic Lights		8.00		30 Ea.	240.00
3.	Placing and Removing Traffic Cones	759 Ea.	2.00	1,518.00	1,105 Ea.	2,210.00
4.	Placing and Removing Signs and Barricades	81 Ea.	20.00	1,620.00	99 Ea.	1,980.00
5.	Uniformed Flagmen	67 M.H.	4.40	294.80	267 M.H.	1,174.80
6.	Trenching and Backfilling	30 L.F.	1.70	51.00	8,408.0 L.F.	14,293.60
8.	3" W.I. Conduit in Trench	21.4 L.F.	10.00	214.00	576.0 L.F.	5,760.00
10.	2" W.I. Conduit in Trench	55.0 L.F.	7.90	434.50	139.0 L.F.	1,098.10
11.	3" Steel Conduit, Exposed		20.00		530.0 L.F.	10,600.00
13.	3" Fiber-Cement Conduit in Trench	46.0 L.F.	1.80	82.80	9,735.0 L.F.	17,523.00
17.	#2 A.W.G. Conductor	2,140.0 L.F.	0.70	1,498.00	20,190.0 L.F.	14,133.00
19.	#6 A.W.G. Conductor	220.0 L.F.	0.46	101.20	1,114.0 L.F.	512.44
20.	Concrete Junction Box, Type C	90 Ea.	406.00	36,540.00	143 Ea.	58,058.00
23.	Concrete Base for Lighting Standards, Type A or B	90 Ea.	320.00	28,800.00	107 Ea.	34,240.00
24.	Concrete in Flood Light Tower Footings		260.00		93.1 Ea.	24,206.00
29.	Lighting Standard, Type 5A or 5B	4 Ea.	566.00	2,264.00	4 Ea.	2,264.00
31.	Floodlight Tower Installation Type "A"					
	1. Tower #2		37,000.00		98% L.S.	36,260.00
	2. Tower #3		37,000.00		98% L.S.	36,260.00
	2. Tower #4		37,000.00		98% L.S.	36,260.00
32.	Floodlighting Tower Installation Type "B"					
	1. Tower #1		31,500.00		98% L.S.	30,870.00
33.	Luminaire Installation Type "A"	4 Ea.	334.00	1,336.00	4 Ea.	1,336.00
39.	Floodlighting Luminaire Installation		574.00		24 Ea.	13,776.00
40.	Underbridge Lighting Installation		7,000.00		14% L.S.	980.00
44.	Removing and Salvaging Existing Roadway Lighting Facilities	5% L.S.	23,000.00	1,150.00	5% L.S.	1,150.00
45.	Temporary and Permanent Electric Service and Roadway Lighting Provisions	7% L.S.	34,000.00	2,380.00	15% L.S.	5,100.00
46.	Sub-Total "A"			78,284.30		350,294.90

The proper way to prepare a pay certificate is outlined in the following steps:

1. Calculate, each period, the total quantity used on each item from the beginning of the work to the date of the estimate.

2. Enter these quantities in Column 15.

3. Then subtract each quantity listed under Column 15 for the previous month from each quantity entered for the current month.

4. Enter that difference under Column 12.

5. Then enter the unit prices and perform the multiplication.

The reverse procedure of calculating only the quantity for the month and then adding it to the previous total invariably results in carrying errors from month to month. Avoid this common mistake. Follow the outline.

Part 3

Lump Sum Contracts. In this type of contract, the work is not itemized but is instead considered in its entirety and is bid at one "lump" price which is considered to be compensation for all labor and materials employed in the job.

When a contract is awarded on a lump sum basis, pay certificates are prepared to reflect the percentage of the total contract completed each month rather than on an item-by-item basis.

Prior to the preparation of the first certificate the engineer should have received from the contractor a breakdown of costs for items within the contract. This breakdown should show the value the contractor placed on the various items of work to arrive at the lump sum bid amount. From this breakdown the engineer can more readily determine the percentage of work completed during the period of the certificate. The procedure for preparation of the certificate is basically the same as for an itemized contract. Column 12 shows the percentage of Total Contract completed for the current month. Column 13 indicates the total lump sum bid and awarded. Column 14 is the monetary value of the total value of the contract completed during the current period and is the product of Column 12 and Column 13.

Columns 15 and 16 are cumulative totals as explained above. A sample certificate for lump sum contract is shown on page 47.

Part 4

Cost-Plus Contracts. A cost-plus contract is used where a relatively precise itemized or lump sum price for a job are either too difficult to estimate or where there is insufficient time to prepare a bid (such as on an emergency repair job).

When a contract is awarded on a cost-plus basis not to exceed a given amount, the monthly certificate is governed by the contract specifications and must show a breakdown on how the amount of money due the contractor was determined.

The following items are used in this breakdown and are discussed in detail in Subsection 108.04 of the Standard Specifications:

1. Labor (not to include welfare, pension, or personnel engaged in superintendent of the work or other categories listed below).
2. Materials.
3. Insurance and Taxes.
4. Overhead (10% of labor, materials and insurance; 5% of equipment and plant and sublet work).
5. Rental value of self-owned equipment.
6. Rental cost of rented equipment (+5%).
7. Profit (10% of labor and materials and not to include welfare, pension or overhead).
8. Welfare and pension.
9. Tolls.

Each of the above used in determining cost should be entered in Column 11 together with the amount chargeable to each item.

The costs related to these items are totaled and a percentage of the maximum amount authorized is determined. This percentage is entered in the Quantity and Unit Column 12 and the amount earned in the Amount Column 14.

For succeeding pay certificates the quantity and amount shown in Column 15 and Column 16 are cumulative as are the amount shown for items in Description Column 11. The total amount shown in the Description Column (11) should equal the figure shown in the Amount Column (16).

All other procedures for the preparation of the certificate remain as described elsewhere. A sample certificate for a cost-plus contract is shown on page 41.

For all types of pay certificates, lines 17, 18, 19, and 20 are the same. Eleven copies are individually signed by the resident engineer on line 17 and forwarded to the contractor for signature. The contractor signs all copies on the space provided on line 18, retains one copy for the record, and returns ten (10) copies to the engineer for further processing.

Then the project manager signs on line 19 and two copies are kept (one for the project engineer's files and one for the area office) and the remaining eight (8) copies are forwarded to the General Consultant who signs and forwards seven (7) copies to the Authority for final processing for payment. When payment is made to the contractor, a completed copy of the certificate stamped or perforated "Paid" is sent by the Authority to the engineer as a record. In most cases, contractors will receive payment within 30 days of the certificate closing date.

When a pay certificate has been prepared and proofread, the carbon papers should be removed prior to any signatures being affixed. This prevents illegible signatures beyond the second or third copies and further prevents all copies from becoming smeared or smudged during the various stages of transmittal.

The engineer should review the contractor's signature block to be certain that only an authorized person has signed for the contractor. The procedure for the contractor to obtain a Power of Execution was explained previously at the pre-construction conference.

Line 22 of the monthly certificate pertains to deductions to be made from money earned by the contractor.

If a contract is less than 50% complete (based on original contract value plus change orders) or if work is not proceeding satisfactorily on the basis of approved construction schedules, 10% of the total value of work permanently installed on the contract (Sub-total "A", Column 16) is retained. This amount is entered on line 22-1 and the figure "10" is placed in parentheses. Should the contract be 50% or more complete and the contract be proceeding satisfactorily, 5% of the original value of the contract plus approved change orders is retained. This figure is entered on line 22-1. There is one exception to the 5% rule; in the case of a cost-plus contract, 10% of the amount shown for Sub-total "A" (Column 16) is always retained.

For line 22-2, retain 20% of the amount shown for Sub-total "B" (Column 16) for "Materials on Hand".

Line 22-3 is for recording the amount of liquidated damages assessed against the contractor for failure to complete any phase of the contract by the scheduled completion date. Record the number of days assessed, the rate per day, and the total amount opposite line 22-3. These amounts remain on all subsequent pay certificates until or unless removed by an approved "Extension of Time" change order.

Line 22-4 is simply the total money received to date by the contractor as determined by the sum of all paid certificates. To arrive at the amount for Total Deduction, add the amounts shown for line 22-1, 22-3 and 22-4.

The Amount Due Contractor is obtained by subtracting the amount shown for Total Deductions from the amount opposite the Total to Date (Column 16). The result is the amount paid to the contractor for the period covered by the monthly or interim certificate.

Part 5

Materials on Hand. On some contracts it is advantageous to the contractor to have quantities of permanent construction materials delivered to the job site for future use on the project. Part of the cost of these materials may be paid to the contractor even though the materials are not used on the job during the payment period.

The value of materials furnished but not incorporated in the work shall be determined by the engineer and such value is to be included in the monthly certificates only if the materials have been delivered at a site near the work, are properly stored or protected, and have been inspected and approved.

These permanent construction materials may include such things as reinforcing steel, structural steel, pipe, and concrete blocks but not temporary material such as formwork lumber.

In preparing a monthly certificate all items permanently installed on the project are first listed as described previously and both Amount Columns (14 and 16) are totaled and labeled Sub-total "A".

Immediately below Sub-total "A' the "Materials on Hand" are listed by Current Quantity & Unit (Column 12), Unit Price (Column 15), Amount (Column 14), Total Quantity & Unit (Column 15) and Amount (Column 16), and labeled "Sub-total B".

When materials are taken from the stockpiles and made a permanent part of the project, they are deducted from "Sub-total B" By shoving a minus quantity on subsequent pay certificates and become a part of the regular items under "Sub-total A". This procedure is continued until the materials-on-hand list is depleted and "Sub-total B" is reduced to zero.

To establish the Amount (Column 14), shown opposite "Total This Estimate" near bottom of page, "Sub-total A" and "Sub-total B" are added together algebraically. The same applies to the Amount (Column 16) shown opposite "Total to Date". Three sample pay certificates for item contracts are shown on pages 41, 43 and 45.

Part 6

Liquidated Damages

If it becomes evident on the basis of approved progress schedules or otherwise that the completion date for the contract will not be met, the engineer is authorized to retain ten (10) percent of the value of the work done throughout the entire contract period and to make additional retention on the amount of liquidated damages which have apparently accumulated.

In order to avoid undue assessment of liquidated damages, the General Consultant normally sends a written reminder to the engineer approximately ninety (90) days prior to the scheduled completion date of a phase or stage of the contract requesting that a review be made on the progress of the contract and that the General Consultant be advised of the expected completion date. If the engineer determines that the scheduled completion date will not be met, every aspect of the contract should be examined to see if a time extension to the completion date is warranted.

In a letter to the General Consultant, the engineer should make a recommendation and list all reasons for the decision. If the recommendation is in favor of an extension of time and is concurred with by the General Consultant and the Chief Engineer, the engineer should take immediate steps to process a change order to reflect the revised completion date.

If liquidated damages are assessed, they will be accumulated until the phase or stage date(s) is completed to the satisfaction of the engineer. The accumulated days for each phase or stage(s) are reflected on each pay certificate and are not removed until a change order extending the completion date(s) to the new revised date(s) is approved by the Authority.

X-1
SECTION X
CHANGE ORDERS

Part 1

General. The Chief Engineer may make changes in the plans and specifications within the general scope thereof at any time by a written order referred to as a change order. Such change orders then become part of the contract. The change order is always prepared by the engineer. The amount to be paid the contractor for performing the work or furnishing the materials covered by a change order may be a lump sum, unit price or determined on a cost-plus basis.

Change orders show in detail the kind and quantity of work to be performed or omitted, or materials to be furnished or omitted, and the number of days, if any, that will be added to, or deducted from, the time for completion on account of the added or decreased work. Change orders are also used to increase or decrease estimated quantities in order to equal the final as-built quantities. Another function of a change order is to extend the scheduled completion date of a contract when, after concurrence among the engineer, the General Consultant, and the Chief Engineer, it is deemed advisable to revise a completion date. Change orders which are outside the scope of the contract require approval by commission action.

Part 2

Emergency Work. In nearly all cases the contractor is not allowed to perform additional work or furnish materials prior to receipt of an executed copy of a change order authorizing the work to proceed. However, in emergencies it sometimes becomes necessary to implement work without the benefit of an approved change order.

When an emergency arises that requires immediate attention, the engineer discusses the work to be performed with the contractor. Then, either by person or by phone, the engineer explains the situation to the General Consultant. The engineer describes the work to be done and the estimated cost to perform the work. The General Consultant will immediately confer with the Chief Engineer or the Construction Engineer explaining the nature of the emergency and request verbal approval for the contractor to proceed with the work. If approval is given, the engineer then prepares a Change Order.

Part 3

Types of Change Orders. Change orders are of three types. Type 1, for adjustment of quantities; Type 2, for unexpected developments and time extensions; Type 3, for changes to the scope of the contract. Types 1 and 2 will be issued directly by the Chief Engineer. Type 3 change orders require Authority approval prior to issuance to the contractor.

All change orders must be prepared by the engineer directly responsible for the administration of the contract. They are then forwarded to the contractor, who must sign and return them to the engineer. The engineer will then signify acceptance and forward to the General Consultant. The form is then revieved by the Engineering Department of the Authority, noted by the Comptroller, and then forwarded to the Chief Engineer.

Type 3 change orders are then prepared for inclusion in the next Commission Meeting Agenda. Subsequent to approval by the Authority and the 10-day waiting period, the approved Change Order is transmitted by the Engineering Department to all parties.

Items falling into different type categories cannot be placed on the same change order, i.e., adjustment of quantities (Type 1) and changes associated with unexpected developments (Type 2). However if a Type 2 item has been previously approved and an adjustment is being made to that item, the combination is then permissible.

Part 4

Preparation of Change Orders. A change order is made on a standard form supplied by the Authority and is prepared in six (6) copies. Each change order is numbered and the numbers run consecutively. The date the change order is prepared, the contract number, the project description and the name and address of the contractor are inserted in the spaces provided on the face of the form. The type of change order being prepared must be checked by the engineer in the box provided at the top of the form. If the items or information to be placed on the face of the change order exceed the space provided on the signature page, additional sheets are to be used on forms provided for this purpose. Additional sheets are stapled to the signature sheet so that the sheet containing the signatures is always the top sheet. A notation that additional items are attached is made just above the signature blocks on the top sheet. In addition, each sheet of back-up material; whether it be correspondence, contractor's time sheets, invoices, etc., is signed and dated by the engineer prior to attachment to the change order by the engineer.

1. **Contract Items.** If the purpose of the change order is to add to, or deduct from, a contract item, the affected item numbers are listed with the quantities to be added or deducted along with the unit of measurement. The item description follows and the unit price for each item is inserted. The quantity of the item is then multiplied by the unit price to determine the amount to be inserted in the "Additions" column or the "Deductions" column. All amounts in each column are totaled and the resultant amounts are inserted on the bottom of the appropriate column opposite the word "Total".

   If the addition or deduction of a contract item does not result in a change in the specified completion date of the contract, the statement "No extension of time is required by the issuance of the change order" should be typed on the face of the change order just below the last item listed. (See sample change order on page 59.)

2. Extra Work. When extra work is performed by the contractor which is not part of the original contract, a change order is prepared to reflect this additional work and its cost. If the item is an extra in the contract, the item number used is consecutive after the highest regular contract item number and an "X" is placed after the number. For example, should the last numbered item in the contract be 15, then the first extra item added to the contract would be 16X. The "Quantities" and "Unit" columns reflect lump sum or unit of measurement and a complete description and location of the work done is placed in the "Description" column. The "Unit Price" column shows the lump sum amount or unit price of the work done followed by the amount of the addition in the appropriate column. The total amount is carried down to the space opposite the word "Total". The "No extension of time" statement should be inserted as described previously.

   A confirmation of increase or decrease to contract items and extra work items can be reflected on the same change order provided they come under the same type category for change orders as described previously. (See sample change order on page 61.)

3. Extension of Time. Change orders requesting that extensions of time be granted the contractor may be prepared and submitted for approval, however, certain stringent conditions apply before such a change order is considered. To fully understand these conditions, the engineer should be aware of the four basic prerequisites that lead to time extensions and of the proper procedure for the contractor and the engineer to follow in formally requesting that a time extension be granted. All change orders for times extensions must have a full review by the engineer, General Consultant, and the Chief Engineer prior to being sent to the contractor for signature. (See Subsection 107.06 of the Standard Specifications.)

   a. When the contractor deems that an extension of time is necessary for work to be performed or materials to be furnished, which were not required by the contract, then the contractor must notify the Chief Engineer in writing, through the engineer, of intention to file a claim for a time extension before beginning the work or furnishing the material in question. If this notification is not given and the Chief Engineer is not afforded an opportunity to keep account of the work or materials, then the contractor shall agree and does agree to waive the claim for an extension of time.

NEW JERSEY TURNPIKE AUTHORITY

Bulldog Sign Corporation
CONTRACTOR

654 Park Avenue, Bloomtree, New Jersey 07103
Address

TYPE 1 [X]
TYPE 2 [ ]
TYPE 3 [ ]

Change Order No. 3
Date May 8, 1992
Contract No. W-743
Signing Delineation
Project Description
Pavement Striping,
M.P. 84.2-82.2

Item No.	Quantities	Unit	Description	Unit Price	Additions	Deductions
11	600	lbs.	Aluminum posts for ground-mounted signs	5.00	3,000.00	
16	-20	C.Y.	Concrete Foundation for sign structures	160.00		3,200.00
24	100	L.F.	Yellow Pavement striping 3' Wide	2.00	200.00	
			No extension of time is required by the issuance of the Change Order.			
			SUB TOTAL THIS PAGE:			

Accepted: - Date May 11, 1992
Contractor Bulldog Sign Corporation
By /s/ Joseph R. Zink

Approval Recommended: Date May 12, 1992
J.S. Sliderule Associates
Engineer
By /s/ Charles J. Smith

Approval Recommended: Date May 15, 1992
By /s/ Riley O. Jones
General Consulting Engineer
HOWARD, NEEDLES, TAMMEN & BERGENDOFF

Approval Recommended: Date May 18, 1992
/s/ McAdam Rhoades
Senior Engineer

Total		3,200.00	3,200.00
From Previous Work Orders		2,500.00	0.00
Total To Date		5,700.00	3,200.00
Net Additions ~~xxxxxxxxxx~~ (Cross Out One)	+		2,500.00
Original Amount of Contract			125,000.00
Indicated Amount of Contract to Date			127,500.00

NOTED: Date May 20, 1992
/s/ George M. Paymaster
Turnpike Comptroller

APPROVED: Date May 22, 19
/s/ Heywood S. Howard
Chief Engineer

1. CONTRACTOR'S COPY

This Change Order adjusts the contract quantities of Items 11, 16, and 24 to final as-built quantities.

WE RECOMMEND THAT THIS CHANGE ORDER BE APPROVED.

Signature

NEW JERSEY TURNPIKE AUTHORITY

Ideal Construction Company, Inc.
CONTRACTOR

1871 Cedar Avenue, New Brunswick, N.J. 08903
Address

TYPE 1 ☐
TYPE 2 ☒
TYPE 3 ☐

Change Order No. 4
Date August 14, 1992
Contract No. W-728
Concrete Deck Raritan River
Project Description
Bridge, Mile 84.3 to Mile 84.2

Item No.	Quantities	Unit	Description	Unit Price	Additions	Deductions
15X	Lump Sum	L.S.	Provide and Install a premolded joint filler in the median barrier joints	1,870.00	1,870.00	
16X	1.2	C.Y.	Concrete encasement caps for two (2) power pole bases for Jersey Central Railroad Company	175.00	210.00	
17X	Lump Sum	L.S.	Remove approximately 162 L.F. of 36" RCCP and 2 standard flared end sections; reset 24 L.F. of same 36" RCCP and 2 end sections; construct approx. 140 L.F. of open ditch and dispose of all excess materials. Estimated cost-plus amount.	5,500.00	5,500.00	
			No extension of time is required by the issuance of this Change Order			
			SUB TOTAL THIS PAGE:			

Accepted: - Date Aug. 17, 1992
Contractor Ideal Construction Company, Inc.
By /s/ William E. Birch

Approval Recommended: Date Aug. 18, 1992
Bailey Bridges and Associates
Engineer
By /s/ Kelly Vincent

Approval Recommended: Date Aug. 22, 1992
By /s/ Riley O. Jones
General Consulting Engineer
HOWARD, NEEDLES, TAMMEN & BERGENDOFF

Approval Recommended: Date Aug. 24, 1992
/s/ McAdam Rhoades
Senior Engineer

Total	7,580.00	0.00
From Previous Work Orders	76,543.21	5,550.00
Total To Date	84,123.21	5,550.00
Net Additions ~~Deductions~~ (Cross Out One)	+	78,573.00
Original Amount of Contract	943,280.00	
Indicated Amount of Contract to Date	1,021,853.00	

NOTED: Date Aug. 25, 1992
/s/ George S. Paymaster
Turnpike Comptroller

APPROVED: Date Aug. 28, 1992
/s/ Heywood S. Howard
Chief Engineer

1. CONTRACTOR'S COPY

TP 16

Item 15X is the result of a design revision which requires the use of a premolded expansion joint filler on median barrier joints.

Item 16X was initially part of Contract W-727 but was deferred by deletion from that Contract to avoid conflict with construction of substructure and superstructure units. The item was deleted from Contract W-727 by Change Order No. 6 and the W-728 Contractor with the engineer to perform the work for the amount of credit to the Authority under Contract W-727.

Item 17X was intiated at the request of the General Consultant and the Authority for better mosquito control in the area. It was requested that the pipe be lowered to conform to existing drainage facilities. The open ditch will be constructed instead of reseting the entire length of pipe. The two sections of pipe and flared end sections which will be reset will provide access to the area betveen the ditch and the Jersey Central Railroad.

The vork done on Item 15X was on a cost-plus basis. Item 17X was submitted as a lump sum price by the Contractor. The engineer has revieved this price and found it to be fair and reasonable.

WE RECOMMEND THAT THIS CHANGE ORDER BE APPROVED.

_____

Signature

NEW JERSEY TURNPIKE AUTHORITY

A.B.C. Contracting Company
CONTRACTOR

619 Knapp Avenue, Jersey City, New Jersey 07555.
Address

TYPE 1 ☐
TYPE 2 ☒ X
TYPE 3 ☐

Change Order No. 4
Date November 6, 19 92
Contract No. W-744A
Utility Building
Project Description
Interchange 9

Item No.	Quantities	Unit	Description	Unit Price	Additions	Deductions
2X			An extension of time is hereby granted by the Authority extending the total completion date for Contract W-744A from December 1, 1992 to December 15, 1992. Original Completion Date 12/1/92 Revised Completion Date 12/15/92 Calendar Days Elapsed 14 Days			
			SUB TOTAL THIS PAGE:			

Accepted: - Date Nov. 9, 19 92
Contractor A.B.C. Contracting Company
By /s/ Adam B. Charles

Approval Recommended: Date Nov. 9, 19 92
J.S. Sliderule Associates
Engineer
By /s/ Charles J. Smith

Approval Recommended: Date Nov. 13, 19 92
By /s/ Riley O. Jones
General Consulting Engineer
HOWARD, NEEDLES, TAMMEN & BERGENDOFF

Approval Recommended: Date Nov. 19, 19 92
/s/ McAdam Rhoades
Senior Engineer

Total	0.00	0.00
From Previous Work Orders	15,802.45	3,456.00
Total To Date	15,802.45	3,456.00
Net Additions ~~xx Deductions~~ (Cross Out One)	+	12,345.00
Original Amount of Contract	308,500.00	
Indicated Amount of Contract to Date	320,845.00	

NOTED: Date Nov. 20, 19 92
/s/ George M. Paymaster
Turnpike Comptroller

APPROVED: Date Nov. 30, 19 92
/s/ Heywood S. Howard
Chief Engineer

1. CONTRACTOR'S COPY

The original completion date of December 1, 1992 will not be met. by the Contractor because of a delay in obtaining the construction site on the scheduled starting date.

The site was to be graded and made available to the W-744A Contractor on August 3, 1992 by the W-741 Contractor. However, on that date, approximately 40% of the site was unavailable to the building contractor thereby delaying his start of construction. The site became available on August 17, 1992.

An extension of time for fourteen (14) calendar days is recommended to compensate for the time lost during the aforementioned delay.

WE RECOMMEND THAT THIS CHANGE ORDER BE APPROVED.

_____

Signature

NEW JERSEY TURNPIKE AUTHORITY

Cartwheel Construction Company
CONTRACTOR

752 Dollar Avenue, New Brunswick, New Jersey 08903
Address

TYPE 1 ☐
TYPE 2 ☒
TYPE 3 ☐

Change Order No. 4

Date July 26, 1992

Contract No. W-700

Excavation, Grading and Drainage, Mile 85 to Mile 87
Project Description

Item No.	Quantities	Unit	Description	Unit Price	Additions	Deductions
52X			In consideration of an extension of time herewith granted by the Authority extending the completion date of Stage II from July 31, 1992 August 31, 1992 the Contractor releases and discharges the Authority from any and all claims, costs, expenses and damages arising from the period covered by this extension of time for Contract W-700. Original Completion Date 7/31/92 Estimated Completion Date 8/31/92 Calendar Days Elapsed 31 days			
			SUB TOTAL THIS PAGE:			

Accepted: - Date July 27, 1992

Contractor Cartwheel Construction Company

By /s/ Joseph M. Morris

Approval Recommended: Date July 31, 1992

Hammermill and Bond
Engineer

By /s/ Samuel N. Paper

Approval Recommended: Date Aug. 2, 1992

By /s/ Riley O. Jones
General Consulting Engineer

HOWARD, NEEDLES, TAMMEN & BERGENDOFF

Approval Recommended: Date Aug. 4, 1992

/s/ McAdam Rhoades
Senior Engineer

Total	0.00	0.00
From Previous Work Orders	20,000.00	75,000.00
Total To Date	20,000.00	75,000.00
Net ~~Additions~~ Deductions (Cross Out One)	-	55,000.00
Original Amount of Contract	2,500,000.00	
Indicated Amount of Contract to Date	2,445,000.00	

NOTED: Date Aug. 8, 1992

/s/ George M. Paymaster
Turnpike Comptroller

APPROVED: Date Aug. 22, 19[illegible]

/s/ Heywood S. Howard
Chief Engineer

1. CONTRACTOR'S COPY

TP 14

The original completion date of July 31, 1992 will not be met because of delays in releasing Area A to the Contractor. The delays resulted from an extended and unforeseen consolidation period for embankments placed by another Contractor also contributing to the delay was the Contractor's failure to mobilize promptly when Area B was made available. Each of these delays is considered to have the effect of about fifteen days delay to the overall contract.

The present anticipated date of completion is August 31, 1992.

WE RECOMMEND THAT THIS CHANGE ORDER BE APPROVED.

_____

Signature

b. When the contractor deems that an extension of time is due because of a delay beyond the contractor's control, then the contractor must notify the Chief Engineer in writing, through the engineer, of an intention to make claim for such extension of time. Timely notification to the Chief Engineer in writing in accordance with Subsection 106.07 must be given. The notice shall give complete information of the nature, cause and probable extent of the delay.

The engineer places on the face of the change order the original completion date and the new revised date and the total calendar days elapsed between the two.

The change order is given the next consecutive number and also an "X" item number. (See sample change order on page 63.

c. Extensions of time for delays caused by non-completion of essential work of other contractors may be granted when such non-completion is the sole cause of the delay and where the contractor has available the plant, materials and labor necessary to proceed with the work. When this situation occurs and a time extension is requested, the engineer should place the following statement on the face of the change order:

> "In consideration of an extension of time herewith granted by the Authority, extending the completion date of (stage) (phase) or total completion from (date) to (date) the Contractor releases and discharges the Authority from any and all claims, costs, expenses and damages arising from the period covered by this extension of time for Contract_____."

Then the original completion date and the new revised date and the calendar days elapsed are shown. This change order is also given the next consecutive number and "X" item number. (See sample change order on page 65.)

d. Where the contractor causes delays coincident with delays caused by others, and extension of time is usually not granted. An exception can be made if the contractor sign a change order with the following statement inserted thereon:

> "In consideration of an extension of time of _____ calendar days herewith granted by the Authority to the Contractor extending the completion date for all work (phase or stage) under Contract_____, the Contractor does covenant and agree and by execution of this Change Order had indicated the intent to release and discharge the Authority, its agents, servants, and employees from any and all liability for additional monies for any reason whatsoever because of this extension."

The remainder of the change is completed as described above. (See sample change order on page 69.)

On the reverse side of copies three (3) and five (5) of the change order, the engineer explains why the change in quantities or additional work is necessary. A statement must be made in justification of paying for the work in the manner indicated. This information is placed on the reverse side after it is returned from the contractor. It is at this time that the back-up information is also attached to copies 3 and 5.

Part 5

Processing Change Orders. All engineers should follow the procedures listed hereafter when processing the different type change orders previously mentioned. Unnecessary delays can be prevented if the change order is complete, accurate, has all pertinent back-up material attached, and follows the proper procedure.

All Type 3 change orders shall be submitted to the General Consultant by the engineer prior to being sent to the contractor for signature. A thorough review is made by the General Consultant at that time. If it is determined that additional back-up information is needed or a more detailed description should be made, it will be returned to the engineer for the necessary action. If the change order is complete and satisfactory, the General Consultant indicates a recommendation for approval and it is forwarded to the contractor for signature.

After signature by the contractor, the engineer and the General Consultant, the Type 3 change order is transmitted to the Construction Engineer for review and recommended approval, then sent to the Chief Engineer for approval. All Type 3 change orders are then placed on an agenda for final approval by commissioners of the New Jersey Turnpike Authority.

NEW JERSEY TURNPIKE AUTHORITY

Ideal Cons-ruction Company, Inc.
CONTRACTOR

1871 Cedar Avenue, New Brunswick, N.J. 08903
Address

TYPE 1 ☐
TYPE 2 ☒
TYPE 3 ☐

Change Order No. 1
Date Dec. 12, 19 91
Contract No. W-728
Concrete Deck, Raritan River
Project Description
Br., Mile 84.3 to Mile 84.2

Item No.	Quantities	Unit	Description	Unit Price	Additions	Deductions
14X			In consideration of an extension of time of 11 calendar days herewith granted by the Authority to the Contractor extending the completion date for Phase I under Contract W-728 the Contractor does covenant and agree and by execution of the Change Order has indicated his intent to release and discharge the Authority, its agents, servants, and employees from any and all liability for additional monies for any reason whatsoever because of this extension. Revised Completion Date 1/11/92 Original Completion Date 12/31/91 Calendar Days Elapsed 11 Days			
			SUB TOTAL THIS PAGE:			

Accepted: - Date Dec. 16, 19 91
Contractor Ideal Construction Company, Inc.
By /s/ William E. Birch

Approval Recommended: Date Dec. 17, 19 91
Bailey & Bridges & Associates
Engineer
By /s/ Kelly Vincent

Approval Recommended: Date Dec. 20, 19 91
By /s/ Riley O. Jones
General Consulting Engineer
HOWARD, NEEDLES, TAMMEN & BERGENDOFF

Approval Recommended: Date Dec. 23, 19 91
/s/ McAdam Rhoades
Senior Engineer

Total	0.00	0.00
From Previous Work Orders	0.00	0.00
Total To Date		0.00
Net Additions or Deductions (Cross Out One)		0.00
Original Amount of Contract	943,280.00	
Indicated Amount of Contract to Date	943,280.00	

NOTED: Date Dec. 26, 19 91
/s/ George M. Paymaster
Turnpike Comptroller

APPROVED: Date Dec. 31, 19 91
/s/ Heywood S. Howard
Chief Engineer

1. CONTRACTOR'S COPY

The original completion date of Phase I of the Contract is December 31, 1991. Due to adverse weather conditions during the months of October and November, 1991, the Contractor was unable to effectively conduct operations involving both equipment and personnel for sustained periods of time. By actual count from weather reports for the NewarK Airport area, Essex County had 21 rain days during the period from October 1, 1991 thru November 30, 1991. During the preceeding five years, 10 days rain was normal for that period.

WE RECOMMEND THAT THIS CHANGE ORDER BE APPROVED.

_____

Signature

Prior to preparing Type 1 and Type 2 change orders, the engineer should discuss the contents of the change orders with the General Consultant, preferably through the liaison engineer so that the General Consultant is made aware of the pending change order and can offer advice if necessary.

Type 1 and Type 2 (with the exception of extension of time) change orders are then prepared by the engineer, sent to the contractor for signature, returned to the engineer for signature, and transmitted to the General Consultant for review and recommended approval. These change orders are then forwarded to the Construction Engineer for review and recommended approval and to the Chief Engineer for approval. Following approval by the Chief Engineer, the change orders are confirmed by the Authority at the next commission meeting. Once approved by the Chief Engineeer, the engineer may consider the Type 1 or Type 2 change order to be part of the contract and may include its contents in the next pay certificate to be prepared for that contract.

The exception to the processing of Type 2 change orders is the extension of times change order, which must have a full review (engineer, General Consultant and Chief Engineer) prior to being sent to the contractor for signature. This procedure was discussed earlier in this section.

Part 6

Cost Plus Work. Extra work may be accomplished on some contracts on a cost plus basis. This usually occurs when a fair-price agreement cannot be reached with the contractor. In such a case accurate daily records of the performance should be kept both by the contractor and the engineer.

Billing by the contractor for the work done is submitted to the engineer in the manner explained in detail in Subsection 108.04 of the Standard Specifications and in compliance with the breakdown shown on page 51 of this manual.

The engineer should carefully review the billing. Look for such common errors as including the "overhead" amount in the profit markup, which is not allowed in the specifications. In addition, the engineer should refer to the latest edition of the Associated Equipment Distributors' book on Rental Rates for Construction Equipment, commonly referred to as the "Green Book". Daily, weekly, and monthly rental rates can be verified from this book.

Prior to the start of cost-plus work the contractor should submit to the engineer an estimate of the cost to perform the work. If this estimate is considered fair and reasonable, then the engineer should immediately prepare a change order in the estimated amount before the cost-plus work is started.

Following the completion of the work the contractor submits an actual billing to the engineer. When the billing has been reviewed for completeness and accuracy and the engineer is satisfied with its contents, immediate steps should be taken to process another change order to adjust the original estimated amount for the cost-plus work to the final as-built amount. The contractor's billing should be included in the back-up material.

SECTION XI

OUTSIDE INVOICES

Part 1

Processing Invoices. Normally there are two types of invoices the engineer must review and certify during the course of construction operations. Historically, the Turnpike administrative staff has found that both of these items are the cause of great difficulty to both the Authority and the vendor submitting the invoice.

ALL SECTION ENGINEERS ARE URGED TO READ THIS SECTION WITH EXCEPTIONAL CARE, TO FOLLOW THE INSTRUCTIONS DILIGENTLY, AND TO IMPRESS UPON THEIR STAFFS THE NEED FOR PROMPT ACTION ON INVOICE APPROVAL.

Part 2

Testing Laboratory Invoices. The testing laboratory concerned submits to the engineer each month an invoice for payment for services rendered to the contract. This invoice is submitted on a standard New Jersey Turnpike form (see page 73) in duplicate. Forms are available to the testing laboratories from the Authority.

The engineer checks the invoice against copies of the associated test reports, and the fee schedule for the testing service. The engineer must verify the services rendered and indicate approval for payment on the face of the invoice by signature, date, and company notation.

The invoice is then forwarded to the General Consultant, by a letter of transmittal, for their review and forwarding to the Authority for payment. Copies of all relevant test reports must be included with all invoices.

Any back-up material submitted with the invoice by the testing laboratory should remain with the invoice and not be removed by the engineer.

ORIGINAL INVOICE

XI-2

TO RECEIVE PAYMENT THIS INVOICE MUST BE RENDERED IN DUPLICATE TO THE COMPTROLLER, **NEW JERSEY TURNPIKE AUTHORITY**
O. BOX 1121, NEW BRUNSWICK, N.J. 08903

FOR TURNPIKE USE ONLY	
REGISTER NO.	
DEPARTMENT	
RECEIVING REPORT NO.	
SERV. COMP. OR MDSE. REC'D.	
APPROVED FOR PAYMENT	
EXT. & ADD.	BUDJ. OR AUTH
ACCOUNT NO.	
V.C.	C.A. G.L. AUD.
CHECK NO.	

Shaker & Sieve — VENDORS NAME

PO 987 — TURNPIKE ORDER NO

200 Inch Road — REMITTANCE ADDRESS OR P.O. BOX NO

12-12 — VENDORS INVOICE NO

Perth Amboy — CITY

NJ — STATE

08080 — ZIP

22-1234567 — VENDORS I.D. NO.

Date

Terms

DATE	QUANTITY	DESCRIPTION	UNIT PRICE	AMOUNT
5/20	6	Compressive Strength Tests	15.00	90.00
5/22	4	Gradation Analysis	30.00	120.00
		SHOW THE ENGINEER"S APPROVAL STAMP		
		Total Amount of this invoice		210.00

DECLARATION BY VENDOR OR PERSON RENDERING SERVICE

I do solemnly declare that the within bill is correct in all its particulars; that the articles have been furnished or services rendered as stated therein, and that no bonus has been given or received on account of said bill.

SIGN HERE ☞ _____

OFFICIAL POSITION Treasurer

DATE June 1, 19 90

FOR INTERNAL USE ONLY

TP 30-10/86-10M-3P-B&R

PART 3

Utilities. The policy as described herein governs the procedures to be followed by the engineer during the inspection of utility work and in revieving utility order invoices.

Since the relocation of utilities is an important scheduling factor in many contracts, engineers must maintain a close association with utility owners to insure that anticipated completion dates are met.

The information that follows established the procedures to be used from the time that the utility order is prepared until payment is made for work performed.

Utility Order. A utility order is required for any relocation or modification, temporary or permanent, of an existing utility caused by Turnpike construction except when it is the direct responsibility of the contractor. The utility order is generally prepared by the engineer during the design phase of the project. A sample utility order is shown on page 75. The engineer must obtain copies of all executed and approved utility orders within the section for use in monitoring the work.

Traffic Permit. An application for a traffic permit must be submitted by the utility company ten days prior to the commencement of work. The traffic permit is required at all times. The traffic permit is issued by the Operations Department of the Authority. No work shall commence until the traffic permit is issued.

Inspection of Utility Work. Since the Authority reimburses utility companies on a direct cost basis, it is necessary for the engineer to monitor labor, equipment, and materials used on a daily basis. Work performed by utility companies should come under the same rigid inspection procedures as required for regular contract work. Daily inspector's reports on all utility work performed within their section shall be prepared by the engineers. The report should contain the owner's name, the contractor, the utility order number, the date, a description of the work and a tabulation of labor, equipment, and materials expended. A sample of a daily inspection report is shown on page 78.

The engineer shall also report all utility work on the engineer's daily report under the appropriate order number.

Payment of Utility Invoices. Costs for the relocation of existing utility will be borne by the New Jersey Turnpike Authority as provided in the approved utility order.

The utility owner shall submit an invoice for payment to the responsible engineer who in turn shall verify the invoice for work accomplished, labor, equipment, and materials expended. The engineer shall indicate approval for payment on the face of the invoice and forward the entire billing together with all attachments to the General Consultant for final approval. All billing must be completed and reviewed within 90 days of completion of the work so that the Authority may promptly reimburse the utility company. It is important that the Section Engineer check the invoice against the approved billing rates on file with the Public Utility Commission.

A standard letter of transmittal shall accompany each invoice for payment from the engineer to the General Consultant.

This transmittal letter should contain all information shown on the sample transmittal form on page 71.

Supplemental Utility Order. Under no circumstances will payments chargeable to a specific utility order exceed the authorized amount stated thereon. If for any reason during construction it is determined that the cost of the work, in conjunction with an authorized utility order, will exceed the estimated amount of the utility order, a supplemental utility order must be processed prior to the actual expenditure of additional funds. The engineer should keep a current running estimate of the monies expended for each utility order. By close monitoring of invoices the engineer can anticipate if the authorized amount of the utility order is likely to be exceeded.

It is also necessary to prepare a Supplemental Utility Order to conform a reduction in final cost of a Utility Order. In this regard, a Utility Order is analogous to a Change Order.

The form of a supplemental utility order is identical to the initial utility order. The supplemental order must be accompanies by a letter from the engineer explaining the anticipated increase or decrease in costs.

A sample supplemental utility order is attached on page 77.

INSPECTOR'S REPORT OF WORK ON UTILITY ORDER
NEW JERSEY TURNPIKE
SECTION 4A

J.S. Sliderule Associates

Utility Order No._____

Owner_____

Date:_____

Contractor_____

Description of Work Accomplished:

_____

_____

LABOR	EQUIPMENT	MATERIALS

Remarks_____

_____

Signed:_____

For office use only
Vendor's Invoice No._____
Approved by_____
Date Approved_____

J.S. SLIDERULE SLIDERULE ASSOCIATES

678 Blank Avenue New Brunswick, N.J. 08903

Section 4A

_____

_____
date

Invoice for Payment

To: Howard, Needles,Tammen & Bergendoff
330 Passaic Avenue
Fairfield, New Jersey 07006

Enclosed is Utility Order Invoice for your approval for Payment.

Vendors Invoice No. _____ Owner _____

Utility Order No. _____ Amount $ _____

U.O. Approved _____
Date

Description of Work (U.O. only) _____

_____

_____

J.S. Sliderule Associates

By: /s/_____

NEW JERSEY TURNPIKE AUTHORITY

(201) 247-0900 NEW BRUNSWICK, N.J. 08903

SUPPLEMENTAL UTILITY ORDER
SUPPLEMENTAL ORDER NO. _____
SUPPLEMENTAL TO UTILITY ORDER NO. _____

Issued to _____

_____

Original Order Covered _____

_____

_____

Estimated Cost of Original and Prior Supplements $ _____

Cause for Overrun _____

_____

Supplement Cost $ _____ Total Cost $ _____

This Supplemental Order is your authority for submitting additional billing under the same terms and conditions as the original Utility Order for the increased cost incurred.

APPROVAL RECOMMENDED

Date _____ _____

Attest:

_____ _____

Assistant Secretary William J. Flanagan
Executive Director

Accepted _____
Utility

By _____
Signature and Title

Date _____

DIVISION FIVE

PROGRESS MONITORING

On any project as large and costly as Turnpike construction, it is essential that close control be exercised on the scheduling and pace of the work in order to provide for effective use of contiguous sections and to gain the maximum benefit from borrowed funds.

Progress monitoring begins with a commitment to meet specified target dates established by the Authority, continues with a thoughtfully prepared sequence of construction as a part of design, and ends with careful attention to contract progress schedules, the prompt preparation of progress reports, and constant consideration of the comparative costs of acceleration programs or extensions of time.

SECTION XII

PROGRESS SCHEDULES

Progress Schedules. Progress schedules are to be submitted by every contractor, usually at the pre-construction conference, and approved by the engineer or architect. They should be prepared in accordance with the form supplied in the contract specifications.

Contractors may be reluctant to devote a sufficient time to schedule preparation. But a full understanding of a contractor's intent is vital to the engineer's work. This is so because the Turnpike generally awards a multitude of specialized contracts within a given area. For example on a major interchange it is not uncommon to have a dozen prime contractors working simultaneously as follows:

Earthwork and drainage
Structures
Paving
Lighting
Signing
Utility building
Structural steel erection for utility building
Electrical
Plumbing
Heating and ventilating
Toll booths
Landscaping

There would be chaos unless one central agency, in this case the engineer, has complete knowledge and control of the progress of each one.

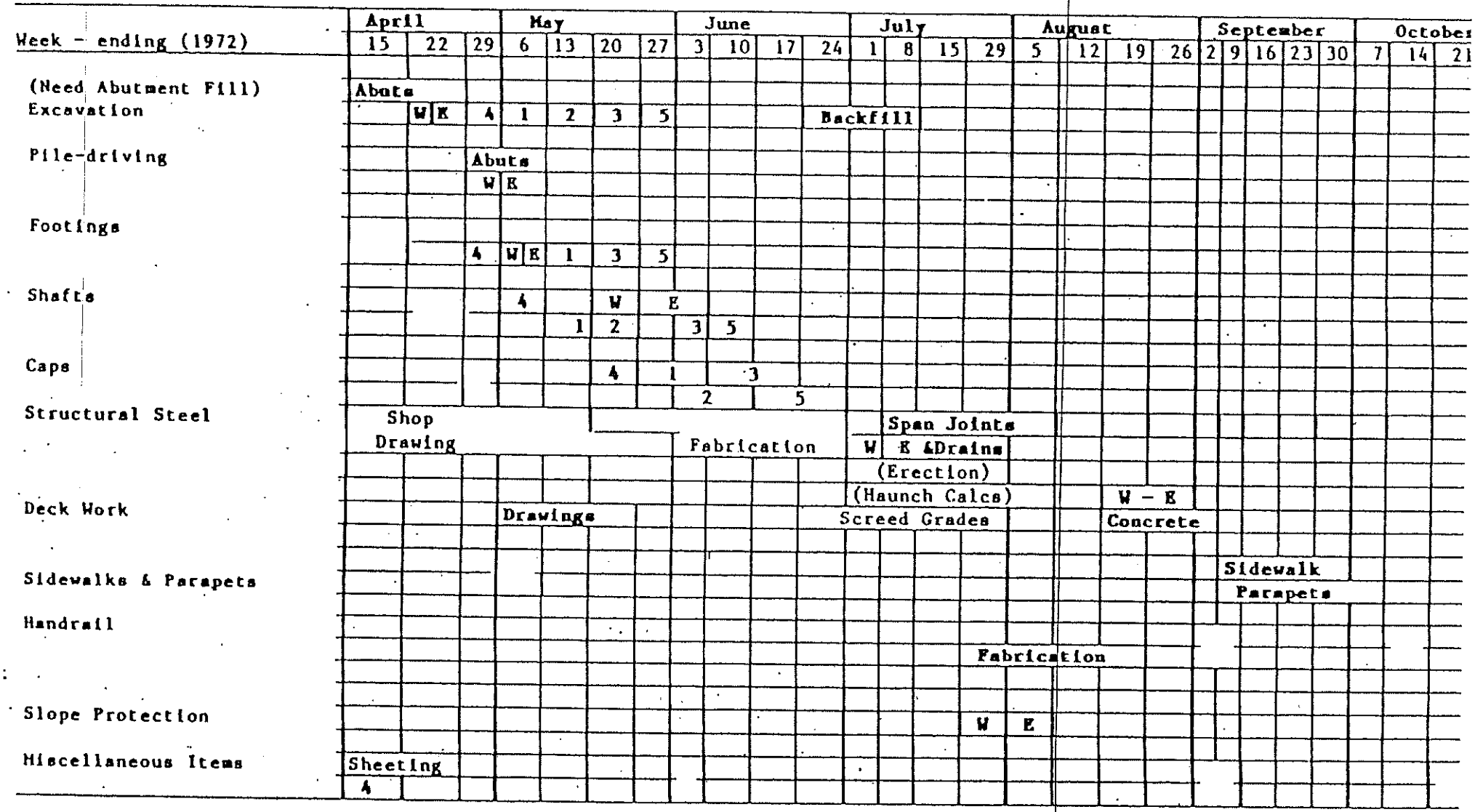
On page 83 is a sample of an adequate progress schedule for a small overpass. Also shown is a general outline for preparing a progress schedule for roadway construction on page 84.

Review of a contractor's progress schedule should be done in reverse order; that is, begin with the completion date. On structures, make sure ample curing time has been allowed before scheduling final items such as lighting standard installation on walls. On roadways, make sure sufficiant time has been allowed after completing paving work for the many late items such as signs, delineators, striping, berm surfacing and the like. Then, in all cases, work back through to make sure adequate time is given for inspection. For example, it may be possible to install reinforcement steel and place concrete in a footing the same day; but this is poor practice and often results in hurried, sloppy work. also, always make sure schedules are stretched at the end to allow time for such things as late deliveries, bad weather, and just plain mistakes. Finally, be absolutely certain that all areas will be ready when the contractor plans to occupy them.

In short, the engineer should spend as much time and effort in reviewing a progress schedule as a contractor spent in preparing it.

The approval or rejection of the schedule should be made known to the Authority through the General Consultant.

CONTRACTOR'S PROPOSED PROGRESS SCHEDULE



CONTRACTORS PROPOSED PROGRESS SCHEDULE

Week - Ending (1972)	FEB.				MARCH				APRIL				MAY				JUNE				JULY				
	5	12	19	26	4	11	19	25	1	8	15	29	6	13	20	28	3	10	17	24	1	8	15	22	29
NSO ROADWAY																									
Overload Removal																									
Grading																									
Drainage																									
Subbase																									
Curb																									
Sta 120-Plant Mix Base																									
140+80 A.C. Surfacing																									
Shoulders a. Stone																									
b. A.C.																									
Berm																									
Median Berm																									
Topsoil																									
Lip Curb																									
Guard Rail																									
Delienators																									
Striping																									
Clean-up																									
Sta. 140 + 80 - 175 + 00	(Information smiliar to above)																								

SECTION XIII

PROGRESS REPORTS

Progress reports are described in detail in the next few pages. They must be accurately prepared and promptly submitted so that the General Consultant and others may have reliable information to properly advise the commissioners of trouble spots and potential delays.

From time to time, and based on the engineer's reports, it may become necessary for the Chief Engineer to order an accelerated schedule or to grant an extension of time. In the first case, the engineer will be called upon to make detailed estimates of the cost of the speed-up and to evaluate its effect on the whole section. In the second case, the Chief Engineer will generally rely upon the recommendation of the engineer who must submit a full report on the need for the extension.

Progress Control Reports. All engineers managing contruction of sections of the work must keep records of work done and make reports of progress. These reports and records include:

1. Daily Reports

   a. Manager's, Inspector's or Party Chief's Daily Report

   b. Daily Quantity Report

2. Contract Weekly Quantity and Progress Report

3. Bi-weekly Narrative Report

4. Contract Monthly Progress Schedule (S Curve)

Daily Reports. Daily reports to the field office made by each resident or assistant resident engineer, inspection or survey party chief, who has duties managing the work of the engineering staff, overseeing the sampling and testing of materials, or inspecting the contractor's construction operations.

Reports to the area office are to be written or lettered in one copy and signed by the person making the report. Daily reports to the field office should be made out at the end of each day's work before leaving the job. The reports are to be used by the engineer's project office as a basis for preparing "daily reports for the section". They should be filed in order in the field office after their use in preparing daily reports.

Manager's, Inspector's or Party Chief's Daily Report. This report is to be used when reporting work of a general nature that does not necessarily relate to a specific contract item. Such work as engineering layouts, material inspection, sampling of materials, reporting discussions pertaining to some phase of the work with the contractor, should be reflected on this report. It is also used for contract work on a lump sum basis where a general description of the work performed by the contractor is required rather than an item-by-item account. A general description of the work performed by a survey party to supplement field notes by the partychief should be entered on this report.

A sample report form is shown on page 87 and is to be printed and supplied by each engineer.

Inspector's Daily Contract Report. This is a report prepared daily by an inspector for each contractor and/or subcontractor who performs work on any given day. It requires a detailed account of the work accomplished, the location of that work by station, pier, ramp, etc., the personnel and equipment used by the contractor, and an account of items installed as part of the permanent construction. A statement of any incidents delaying the work with approximate amounts of time lost and movement of all principal pieces of equipment are also recorded on the report.

The report number, date of report, the shift worked by the inspector, the weather and the temperature maximum and minimum are to be recorded on each report. (A sample is shown on pages 89, 90.)

Daily Quantity Report. This report is attached to each inspector's daily contract report for the purpose of reporting all quantities, either by actual measurement or calculation, or estimated under the contract each day. This report need not be made out for each subcontractor but only for each prime contractor with the work performed by each subcontractor being entered on it. Estimated daily quantities such as cubic yards of embankment placed, acres of clearing and grubbing and stripping topsoil or roadway excavation are circled indicating an approximated quantity which will be more accurately calculated in the future. A daily quantity report is submitted, even if no pay items are performed, by a notation to that effect written across the face of the form.

The report number and the date should coincide with that of the daily report to which it is attached.

Each contract item should be listed on the form by number and description, the unit by which it is measured, and space should be provided for the quantity to be inserted (see page 91).

Weekly Quantity and Progress Report. This report is prepared for each individual unit price contract and is submitted to the General Consultant and the Construction Engineer each week by the engineers.

ORRIN RILEY, P.E., P.C.
Construction Engineering Management

DAILY REPORT

From Resident Engineer, Supervisor, or Party Chief to Main Field Office

PROJECT _____ Report No. _____

Date: _____, 19__ Shift: from _____ to _____

Weather: _____ Temperature: min. _____ max. _____

Contract No. _____ Contractor: _____

ENGINEERING STAFF SUPERVISED

Name	Hours	Name	Hours
1. _____	_____	4. _____	_____
2. _____	_____	5. _____	_____
3. _____	_____	6. _____	_____

Report of Work Performed. Use a separate form for each contract. Described operations under sub-headings.

Signed _____

Forms should conform to the sample on page 92. The reports are to be numbered consecutively and show the estimated percentage of completion both for the previous week and the week of the report. The percentages of completion are based on the estimated dollar value of the contracts.

The reports list all contract items in order by item number and show the quantity increments in each item on a day by day basis.

Three percentage figures relative to each item must be indicated on the reports. The first is the percent completion of an item relative to the total price bid for the item and is simply the monetary value completed divided by the total price bid. The second percentage figure is permanently imprinted on the report and indicates what percentage of the total contract an item is, i.e., the total price bid for an item divided by the total contract value. The third figure shows the percent completion of an item relative to the total contract and is determined by multiplying the percent completion of an item (expressed in decimals) by the percent the item is to the whole contract. For example, if a particular item is 50% complete and represents 10% of the contract, then its contribution to contract completion is $\frac{50\%}{100} \times 10\% = 5\%$.

Bi-weekly Narrative Report. The narrative report is a written progress summary prepared by the engineer and submitted bi-weekly to the General Consultant with one (1) copy sent directly to the Chief Engineer at the Authority.

The purpose of this report is to review broadly the progress made, to discuss fully any progress problems, and to provide engineers with an opportunity to comment on potential delays. A sample is shown on pages 93 & 94.

Contract Monthly Progress Schedule ("S" Curve). Once each month a contract progress schedule (sample shown on page 92) must be prepared and forwarded to the General Consultant.

This progress schedule is prepared for each contract as each contract is awarded. Based on the contractor's approved progress schedule, the engineer plots a base curve showing the starting date of the contract and the scheduled completion date of the contract. It is the engineer's estimate of the various stages of completion at any given time in the contract. The curve normally appears as an "S" shape with the beginning of the contract indicating slow progress as the contractor begins operations. Toward the middle or upper portion of the curve, the line rises sharply to indicate increased production, then again flattens out toward the end as minor operations take over.

INSPECTOR'S DAILY REPORT

Report No. _____ Noted _____

Date _____ 19 ___ _____

Hrs. _____ to _____ CONTRACT W-2742
NEW BRUNSWICK INTERCHANGE
NEW JERSEY TURNPIKE AUTHORITY

Weather _____ P. C. WHIZZES & ASSOCIATES

Temp. _____ SUNBURST ELECTRIC COMPANY, INC. Sheet ___ of ___
Contractor

Work Accomplished* Location - Ramp Sta.Pier,etc.	CONTRACTORS					
	Personnel			Equipment		
	No.	Hrs.	Craft	Make & Type	Size	Hrs.

* For delays over 1/2 hour duration see back of report.
# See back of report for additional information on equipment.

REMARKS _____

	Yes	No
Quantity Report Attached	___	___
Subcontractors Report Attached	___	___
Information Recorded on Back	___	___
Sketch Sheet Attached	___	___

INSPECTOR _____ HRS ___ to ___

ASSISTED BY _____ HRS ___ to ___

* If the Contractor was delayed in any operation for more than 1/2 hour, describe in detail below.

Time of Delay: From _____ to _____ Reported to _____

Contractors Personnel and Equipment Involved _____

Nature of Delay _____

Did Contractor Assign Personnel and Equipment Elsewhere? _____

Record Below the Movement of all Principal Pieces of Equipment, Use Pier to Pier if on Structure, Sta. to Sta. if Not.

MAKE	TYPE	CAPACITY	MOVED FROM	MOVED TO

If Any Equipment was Idle Today, State Below.

MAKE	TYPE	CAPACITY	PERIOD IDLE	REASON

NEW JERSEY TURNPIKE AUTHORITY

Orrin Riley, P.E., P.C.

Construction Engineering Management

DAILY QUANITY REPORT

Contract R-609

Water & Sewer Improvements

Service Area 7S

Report No. _____ Date _____

Inspector _____ Noted ____

Posted on Weekly Report No. _____

Anselmi & Decidcco, Inc., Contractors

Item No.	Description	Quantity*	Location	Item No.	Description	Quantity*	Locati
1.	10" Ø Ductile Iron Water Main			23.	Crossing of N.J. Turnpike		
2.	12" Ø Ductile Iron Water Main			24.	Conrail Crossing		
3.	6" Ø Ductile Iron Water Main			25.	Pump Sta. Gen. Bldg, Wet Well		
4.	Fire Hydrants			26.	Elec. Work, Valve & Elc. Chbr		
5.	6" Ø Gate Valves			27.	Elec. Work, Wellhouse Comvers		
6.	10" Ø Gate Valves			28.	New Metering Facilities		
7.	12" Ø Gate Valves			29.	Elec. Work for Pump Sta., Etc		
8.	6" Ø Insertion Valve						
9.	6"x6" Tapping Sleeve & Valve						
10.	8"x6" Tapping Sleeve & Valve						
11.	Const. of Value Chamber						
12.	Const. of Block Elec. Chamber						
13.	Abandoment of Well No. 2						
14.	Conversion of Wellhouse No. 2						
15.	8" Ø Gravity Sewer, Cl. 5000						
16.	8" Ø Gravity Sewer, Cl. 3300						
17.	10" Gravity Sewer, D.I.						
18.	6" Ø D.I. Force Main						
19.	4' I.D. Manholes						
20.	Drop Conn. At M.T.M.U.A.						
21.	Air Release Manholes						
22.	6" Ø Gate Values, Force Main						

* Circle All Estimated Quantities

WEEKLY PROGRESS REPORT
NEW JERSEY TURNPIKE AUTHORITY

Report No. _____

Estimated % Complete _____

Last Week _____

Noted _____

Orrin Riley, R.E., P.C.
Construction Engineering Management

Anselmi & DeCicco, Inc.
Contractors

Contract R-609
Water & Sewer Improvements
Service Area 7S

Year 19__

Item No.	DESCRIPTION	Date Unit	Mon	Tue	Wed	Thu	Fri	Sat	Last Weeks Totals	Total to Date	Contract Total	%of Item	% of Item in Contract	% Contra Complet
1.	10" Ø D.I. Water Main	L.F.									2515		13.97	
2.	12" Ø D.I. Water Main	L.F.									1820		11.38	
3.	6" Ø D.I. Water Main	L.F.									100		0.28	
4.	Fire Hydrants	Ea.									4		1.11	
5.	6" Ø Gate Valves	Ea.									4		0.22	
6.	10" Ø Gate Valves	Ea.									2		0.28	
7.	12" Ø Gate Valves	Ea.									6		1.00	
8.	6" Ø Insertion Valve	Ea.									1		0.28	
9.	6"x6" Tap. Sleeve & Valve	Ea.									1		0.17	
10.	8"x6" Tap. Sleeve & Valve	Ea.									1		0.21	
11.	Const. of Valve Chamber	L.S.									-		3.06	
12.	Const. of Elect. Chamber	L.S.									-		1.39	
13.	Abandonment of Well #2	L.S.									-		0.69	
14.	Conversion of Wellhouse #2	L.S.									-		2.08	
15.	8" ØA.C.Grav. Sewer Cl.5000	L.F.									95		0.40	
16.	8" ØA.C.Grav. Sewer Cl.3300	L.F.									1050		2.92	
17.	10"Ø D.I. Grav. Sewer	L.F.									18		0.10	
18.	6" Ø D.I. San. Force Main	L.F.									5680		19.73	
19.	4' I.D. Precast Manholes	Ea.									6		1.25	
20.	Drop Connection at M.T.H.U.A	L.S.									-		0.14	
21.	Air Release Manholes	Ea.									2		0.56	
22.	6" Ø Gate Valves, Force Main	Ea.									3		0.25	
23.	Crossing of N.J. Turnpike	L.S.									-		13.89	
24.	Crossing of Conrail	L.S.									-		0.69	
25.	Pump Sta, Gen.Bldg, Wet Well	L.S.									-		20.84	
26.	Elec.Work, Valv & Elec Chbrs	L.S.									-		0.69	
27.	Elec.Work, Wellhouse Conv.	L.S.									-		0.69	
28.	New Meter Facilities	L.S.									-		1.04	
29.	Elec. Work, Pump Sta., Etc.	L.S.									-		0.69	

Total 100.00 _____

J.S. Sliderule Associates
New Brunswick Field Office

New Jersey Turnpike
1991 Widening

For Period
June 13, 1992 thru June 27, 1992

Original-Field Office
1 copy-Main Office
1 copy-Gen. Conslt.
1 copy-Chief Eng.NJTA
1 copy-Sup. Eng. NJTA

Highlights

The approved progress schedule for Contract W-745 indicates certain construction of the southern portion of this Contract was to begin June 29, 1992. Work will be deferred in this area due to other contractors occupying the site. Riley O. Jones of the General Consultant was notifed by phone of a possible delay on June 22, 1992.

Progress schedule for W-748 returned to Contractor for a more detailed breakdown of work to be performed on ramps. Revised schedule received and being revieved. Discusssed traffic protection set up along existing Turnpike with Brett Noel of Howard, Needles, Tammen & Bergendoff. He will review with the Engineering Department of the Authority for possible change which could effect traffic flow into Interchange No. 9.

McAdam Rhoades, Supervising Engineer for the Authority, visited job sites on June 16 and June 17. He requested that repairs be made to torn fence along R.O.W. line.

Utilities

W4A-E5 - No work as of this date
W4A-T2 - Started work 6/16/92
W4A-T1 - Completed 6/22/92
W4A-W1 - Started work 6/17/92. Remaining work has no effect on W-741 Contractor.

Contract W-740

Structure for south abutment and piers 1 thru 5 completed. Erected structural steel on spans 1 thru 3. A meeting was held with the Contractor on June 15 to discuss methods and equipment to be used when deck concrete is placed. Grading and drainage progressing as scheduled.

Contract W-741

Received Contractor's request for additional payment in connection with inverted Siphon modifications. This request is being reviewed.

All piles are completed, footings are 80% completed and substructure 50% completed.

Contract W-742

Contractor installing 3" W.I, conduits between roadway manholes at Toll Plaza. Making up light standards for ramp R-Q. Contract progressing satisfactorily.

Contract W-743

Ground mounted signs delivered and being installed. Overhead signs 12 and 14 will be erected next week.

Utility Building, Contracts W-744 A-E

Brick work has been completed on outside walls of the main floor. Tile work started in locker room. Heating and ventilating Contractor completed installation of boilers and started work on piping. Plumbing Contractor started installation of drainage piping on both floors. Electrical Contractor wiring in toll sergeants room.

Contract W-745

Progress is unsatisfactory because of delay in acquiring the Bayroot property. Authority has advised General Consultant that acquisitin should be within the next two-week period. Contractor has started placing embankment material adjacent to existing Turnpike for placement at North abutment of Ramp XY bridge.

Contract W-746

Contractor mobilizing forces to start work in two weeks.

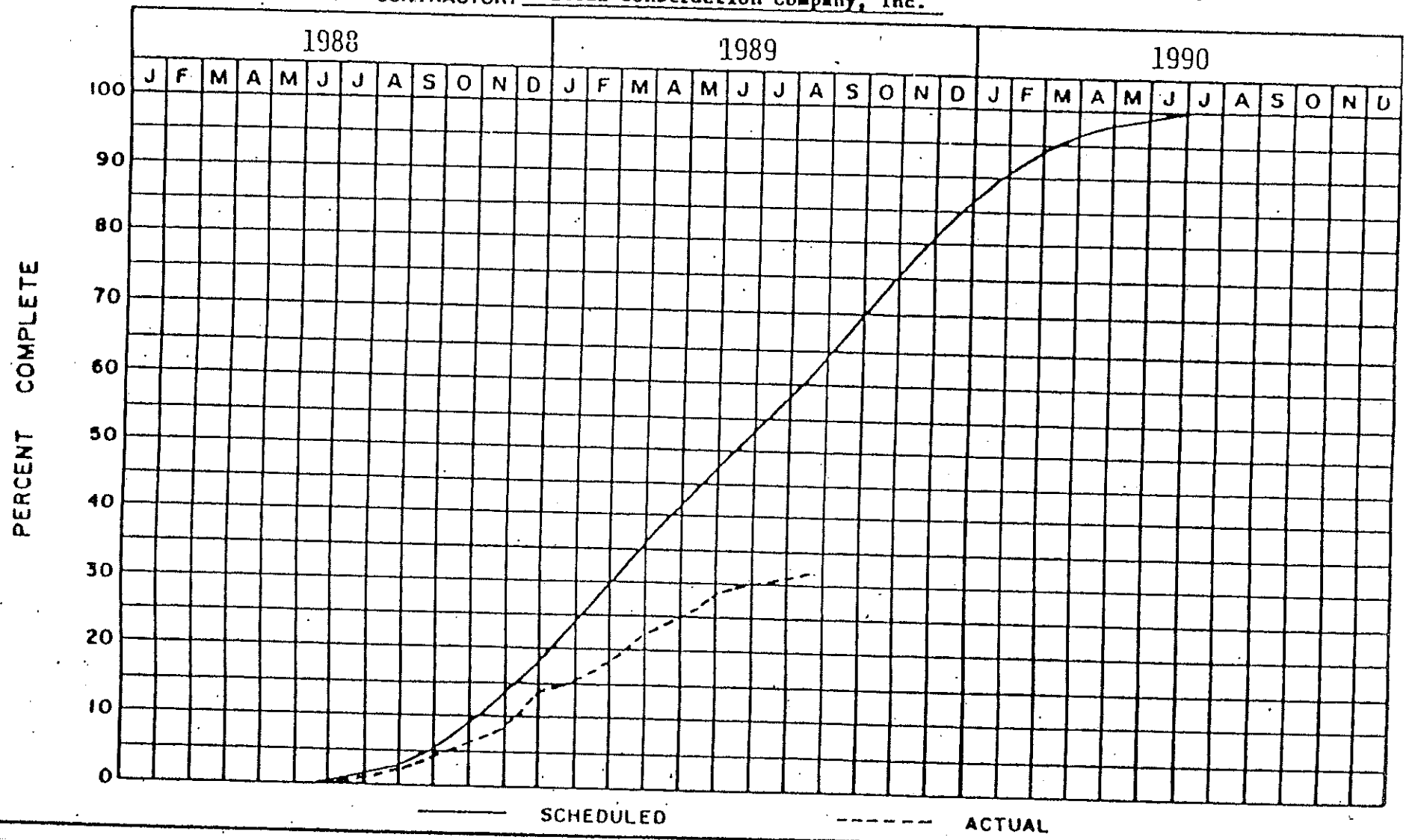
Contract W-748

Work on this contract has not started.

By: /s/ Charles J. Smith
Project Engineer

NEW JERSEY TURNPIKE WIDENING
PROGRESS SCHEDULE

SECTION: 5F
CONTRACT NO.: W-2707
SECTION ENGINEER: Bailey Bridges & Associates
CONTRACTOR: Ideal Construction Company, Inc.



An example is a contract where the initial work involves clearing and grubbing. The work is slow and the amount earned by the contractor is nominal. Then a sharper rise occurs when fill material or embankment is placed or subbase materials are incorporated into the contract and the value of the work performed increases. Then a still sharper rise when the paving is placed indicating the greatest value of the contract. Then the tapering off period for the minor work to be performed and the cleaning up.

The same applies to building construction. A slow initial start with the excavation work, forming for footings, and pouring the foundation; then the rapid rise of the walls, placing the roof, and the interior work; and the tapering off period when the painting and clean-up work is in progress.

An approved extension of time or a major addition or revision to the contract by change order would probably involve a change to the base curve. These revisions should be plotted and forwarded to the General Consultant as soon as possible after the approved changes.

Each month the engineer plots the actual progress of the contract as opposed to the base curve. One can tell at a glance if the contract is ahead, behind, or on schedule.

If the contract is running behind schedule, then it is the responsibility of the engineer to take forthright action. At least review the schedule, convene a job meeting, and ascertain whether or not additional personel and equipment may be required to meet the contract completion dates.

CHECK LIST FOR PROGRESS REPORTS

(All to be prepared on the engineer's own forms)
(Restrict size to 8-1/2" x 11")

Daily

1. Supervisor's, Inspector's and Party Chief's Report
2. Inspector's Daily Quantity Report
   - to the field project engineer's office

Weekly

3. Weekly Quantity and Progress Report
   - indicating percent complete of each contract item and forwarding with report 3. above to General Consultant

Bi-Weekly

4. Narrative Progress Report
   - a free form report summarizing progress and commenting on progress problems to the General Consultant, the Chief Engineer, and the Construction Engineer

Monthly

5. Contract Monthly Progress Schedule ("S" Curve)
   - a base type "S" curve showing estimated contract progress from start of contract to specified completion date. Actual progress plotted against base curve. Submit each month to General Consultant.

SECTION XIV

Progress of Others

In addition to the construction progress made by the contractors, there are many other aspects of progress that need to be monitored and reported by the engineer.

Right-of-Way acquisition will normally have been accomplished before the construction contracts are awarded. However, in some cases title transfer of certain parcels or properties may be delayed for a variety of reasons. If so, then construction may be allowed to proceed around or beside the missing piece so as not to delay the overall completion of the project. In such instances it is vital that the engineer keep in continual contact with the Real Estate Department of the Authority, through the General Consultants, so as to be thoroughly informed of potential impact on the final completion date.

Utility relocations frequently are relocated after construction begins, particularly on phased projects. In such circumstances, the schedule and pace of the utility work is especially critical to the project schedule. In those instances, the engineer is expected to keep in daily contact with the utility -- particularly on days when no work is being performed -- so as to appraise the Authority of potential impediments.

Other public or private entities such as wetland commissions, cable or pipeline operators, or railroad interests may have vital and urgent work to perform simultaneously and unpredictably with the work on the Turnpike. thus the engineer, once informed of the nature and urgency of the affecting work, will need to keep a close eye on, and a careful record of, the proceeding so as to be able judge its potential impact, if any, on the Turnpike schedule and costs.

Also, the Turnpike Maintenance Department may from time to time need to occupy sites on or near constuction areas for both emergency reasons (such as repair after accidents) and routine operations (such as snow removal). Engineers are expected to follow and document all such activity.

In short, all activity on or near the project, regardless of its obviousness or urgency, needs to be viewed as potentially significant factor to the completion of the project. Consequently, the responsible engineer will have clear and continuous records of all such events.

Division Six:

QUALITY COMMITMENTS

During all aspects of the construction phase, the engineer's commitment to a quality constructed project is manifest. This means selecting quality materials, seeing that they are properly utilized, and maintaining a safe and pleasant environment. This division deals with matters of that kind and with the process of inspection by which quality is enhanced.

SECTION XV
MATERIALS

Responsibility for Materials Control. An adequate and effective system for control of the materials used in Turnpike construction is absolutely essential to be certain that the materials furnished and incorporated in the work are in reasonable compliance with the requirements of the plans and specifications. It is the engineer's or architect's responsibility to monitor this control and to implement a system of tests and records to account for all aspects of quality control. Such a system should be organized in a straightforward manner to facilitate review by interested representatives of the General Consultant or the Authority. It is extremely important that a complete set of records, including test and inspection reports, be maintained in the engineer's files. In case of failure to meet specified requirements, the materials control data will constitute the basis for rejection of the work deemed unfit for acceptance or it may be the basis for its acceptance upon appropriate credit considerations where this is in the best interests of the Authority.

General Procedures for Materials Control. Specifications define minimum requirements for materials to be used for a specific purpose. Tests generally must be made for all materials and compared against the contract requirements to determine acceptability.

All sampling and testing of materials are under the direct control of the engineer. Although independent testing laboratories are engaged directly by the Authority to perform certain testing services, the laboratory will report test results to the engineer with a specified number of copies to the General Consultant and the Supervising Engineer. All decisions to accept or reject materials rest with the engineer.

In general, there are three separate ways in which materials are tested for acceptance on Turnpike contracts:

On-site inspection includes all testing normally done on the project. Such testing is done directly by the engineer personnel usually operating out of a field laboratory located at the job site.

Off-site inspection of such products as Portland cement concrete, asphalt concrete, and structural steel fabrication is done by independent testing laboratories working under the specific direction of the engineer.

Certification; for some products such as guard rail, H-piles, cement, sign panels, and similar materials. The manufacturer may maintain excellent quality control procedures and testing facilities at the plant. In these cases the engineer may accept the testing performed by the producer's quality control personnel and accept materials represented by such tests provided it meets specification requirements. In all such cases, the engineer should require valid certifications of compliance along with the test results.

Following are lists indicating generally accepted procedures for approving various types of materials. These lists are not meant to be conclusive but will serve as a guide for establishing materials approval prcedures.

On-site inspection by the engineer will cover such items as:

Gradation of embankments
Compaction of embankments
Subbase
Porous
backfill
Stone
base
Formwork
lumber
Untreated timber piles
Fertilizer
Premolded joint filler
Jute
mesh
Granite curb
Lighting fixtures
Topsoil
Mulch

The testing laboratory will generally conduct off-site inspection on the following items:

Asphalt concrete
Metal castings
Portland cement concrete
Concrete cylinders
Pre-cast concrete products
Structural steel fabrication
Overhead sign structure fabrication
Paint

The folloving items will most often be approved by certification of compliance together with test reports from the manufacturer:

Structural steel (except for fabrication)
Steel piles and sheeting
Portland cement
Reinforcement steel
Corrugated metal pipe
Light standards
Fence
Epoxy
Admixtures
Concrete liquid curing compounds
Asphalt cement
Electrical wire

Obtain samples of materials for possible testing where there is a question of compliance.

Approval of Materials Suppliers. Prior to the start of work on any contract, the contractor is required to submit, in writing, a list of all sources of supply setting forth the company name, address, brand name, and the approximate quantities of materials to be purchased. If the suppliers are not known to the engineer, then the contractor is required to submit from the supplier a list of similar projects serviced by the proposed source. This list should include the name and location of the project, the project owner, the name of an owner's representative familiar with the project, and the date that the proposed source supplied the project. If the reliability of the source of supply still remains in doubt, then the proposal should be referred to the General Consultant for further review. Approval will be by means of the form letter shown in on page 17 of this manual.

Instructions to Testing Laboratory. The engineer must inform the testing laboratory of all requirements for sampling and testing materials. It will be the responsibility of the engineer to establish a report procedure from the testing laboratory to the engineer and from the engineer to the contractor. Under no circumstances should the testing laboratory be authorized to report directly to the contractor or supplier. It is a primary charge to all engineers that they constantly scrutinize and inspect all delivery tickets, shipping tags, seals and the like to unquestionably establish that all products and rav materials have been properly inspected by the authorized testing laboratory and procured from an approved source.

Testing Laboratory Assignments. The Authority has engaged several testing laboratories to perform asphalt concrete plant inspection, inspection of structural steel fabrication, concrete batch plant inspection, and fabrication of pre-cast concrete products. Testing laboratories are also available for miscellaneous product inspections as deemed necessary by the engineer.

Testing laboratories in close proximity to the job site will be assigned the duties of testing concrete cylinders. The General Consultant should be contacted for detailed information regarding testing laboratory assignments for the Turnpike construction projects.

SECTION XVI
WORKMANSHIP

Part 1 - Location

General. The engineer or architect is responsible for providing such controls and surveying checks as are necessary to insure that all elements of the construction project are satisfactorily constructed according to the approved plans. The degree of accuracy used in the various operations of construction surveying and staking is to be consistent with the intended use.

~~The licensed surveyor required by the Agreement is directly~~ responsible for all surveys and stakes set. The engineer should have full knowledge of the methods used and results accomplished.

In addition to these general requirements, there are certain elements of the construction which must be checked specifically and without exception by the engineer's survey personnel. These checks are generally made just prior to or just after the construction of a major portion of the contract. A summary of these minimum requirements follows.

Structures. The engineer must check each footing form and column dovel stubouts before the footing is concreted. The intent here is to avoid the possibility that a footing abutment or column shaft might be mislocated. A second and equally significant check is made after the anchor bolts are placed by the contractor but before the column caps or abutment wall is cast.

The final controls on the structure are made on the deck concrete. Elevations are measured at all quarter-points on each and every stringer or girder to calculate haunch depths and thus provide assurance that all points on the concrete deck will be a minimum thickness as shown on the plans. Secondly, the elevation of the carrying bars must be checked to insure proper clearance from the reinforcement to the surface of the concrete deck. Finally, the support rails for the concrete finishing machine must be checked for both alignment and elevation.

Roadway. Although the contractor must set all control stakes necessary to construct the various layers within the structural section, checks must be provided by the engineer to make certain that the specified thickness and elevation tolerances are met. This can best be accomplished by checking the completed grading at the Grade A elevation (subbase interface). Subsequent to this check, it is necessary to check the contractor's elevated stringline grade control. Generally this erected wire control is required by the Authority to be used for at least one lift of asphalt concrete--generally the first lift. Successive layers are often placed using a thickness criteria with automatic screed controls such as skis or mobile gradelines.

The Authority also insists that all layout for traffic stripes be checked by a survey on the part of the engineer.

Building Layout. The architect is generally responsible for providing control lines and grades for all buildings unless otherwise specified in the agreement. In addition, the architect will verify the location and elevation of batter boards or such other control as the contractor might use in locating the footings or floor slab for the building. He should also check the location and elevation of all utilities.

Part 2 - Tolerances

Although no arbitrary standard will serve all situtations, the following guidelines will constitute acceptable results in most cases:

Base-line traverses	1:20,000
Structures layout	1:10,000
Highway layout	1:5,000
Right-of-way lines	1:10,000
Permanent bench marks --	first order
Temporary bench marks --	second order
Grade stakes --	third order

Specific common features should be within the following tolerances:

Embankment base widths	± 1.0 ft.
Embankment base heights	± 0.1 ft.
Culvert lenghts	± 1.0 ft.
Invert elevations	± 0.1 ft.
Inlets and manholes, station	± 1.0 ft.
Inlets and manholes, offset	± 0.1 ft.
Ditch lines	± 1.0 ft.
Ditch grades	± 0.1 ft.
Berm widths	± 0.2 ft.
Berm elevations	± 0.05 ft.
Subbase thickness	± 0.04 ft.
Base thickness	± 0.03 ft.
Levelling course thickness	± 0.02 ft.
Surface course thickness	± 0.01 ft.
Shoulder width	± 0.2 ft.
Shoulder thickness	± 0.04 ft.
Lane width	± 0.1 ft.
Line-stripe width	± 0.03 ft.
Line-stripe layout	1:1,000
Guard rail, station	± 6.0 ft.
Guard rail, offset	± 0.1 ft.
Sign location, station	± 10.0 ft.
Sign location, offset	± 0.5 ft.
Outside sign panel elevations	± 0.5 ft.
Overhead sign panel elevations	± 0.5 - 0.01 ft.
Lighting standard, station	± 2.0 ft.
Lighting standard, offset	± 0.2 ft.
Curb offset	± 0.1 ft.
Curb elevation	± 0.04 ft.
Reference center line of bearing	± 0.01 ft.

Footing locations	± 0.1 ft.
Shaft and cap alignments	± 0.04 ft.
Pile layouts	± 0.50 ft.
Sand-drain location	± 0.5 ft.
Pile cutoff elevations	± 0.1 ft.
Anchor bolt locations	± 0.02 ft.
Bearing pad elevations	± 0.01 ft.
Span length bearing to bearing	± 0.02 ft.
Stringer spacing	± 0.02 ft.
Deck slab thickness	Minimum Thickness as shown on plans
Parapet wall thickness	± 0.02 ft.
Handrail elevations	± 0.01 ft.
Grade tolerance, all road surfaces	1/8" in 16'

Part 3 - Shop Drawings

Definition. For purpose of this manual, shop or working drawings are considered to be any drawings required of the contractor by the engineer or architect for carrying out the project. They may cover materials and their fabrication, falsework design, formwork, and construction methods. In building construction, the general term shop drawings is meant to include the detailed working drawings, manufacturers' brochures, catalog cuts, parts listings, wiring diagrams, operating and maintenance instructions, and similar materials.

Form of Drawings. The contractor should be encouraged to use drafting film in a 22 x 36 inch size wherever such use is practical. If not, the Standard Specifications permit drawings to be 8-1/2 x 11 inches. Manuals, operating brochures, catalog cuts and the like used on building contracts should be 8-1/2 x 11 inches in size.

Submittal of Drawings. The contractor must submit to the engineer or architect such detailed shop or working drawings as may be required by the engineer for carrying out the project. Delays in processing shop drawings will not be tolerated. Such delays can affect the contractor's scheduling or purchase of materials and might result in added costs to the contractor and possibly the Authority. A two-week cycle in revieving shop drawings should be considered the maximum.

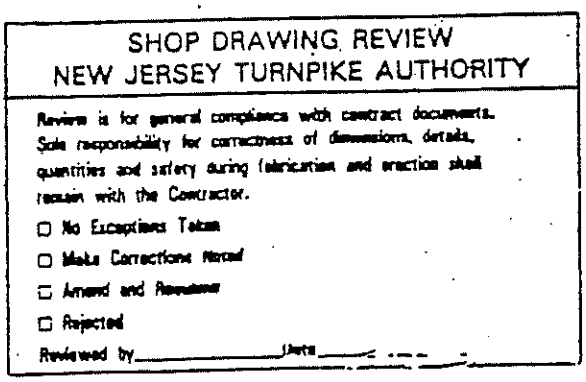
Three prints of each working drawings including data sheets, bar lists, brochures, catalogs, etc. should be submitted to the engineer for approval. The engineer must check to see that these are complete and in order. If prints are returned for correction, three (3) additional prints should be resubmitted until finally approved. For highway or building construction, six (6) prints of all finally approved working dravings and sheets are sufficinet for record and distribution. The number of dravings discussed here is approximate only, but is adequate in most instances. Individual contract requirements should be revised prior to the preconstruction meeting and discussed at the meeting.

Each submission of drawings for approval should be accompanied by a dated letter of transmittal indicating the contract number, description and drawing number and the purpose of the transmittal, i.e., for approval, review, etc. The above information should be followed by comments, if any.

The contractor must coordinate, check and stamp his approval on all drawings prepared by suppliers or sub-contractors prior to forwarding them to the engineer for approval. An acceptable shop drawing review stamp is shown on the bottom of this page. Drawings submitted to the engineer without the signed and dated approval of the contractor should not be accepted.

Final Disposition. On completion of the project, the contractor is required to deliver to the engineer one (1) complete set of reproducible working drawings on drafting film. After review by the engineer, the drawings are forwarded on to the General Consultant who will transmit them to the Authority for permanent filing. In submitting shop drawings to the Authority for permanent filing, only those drawings which might be needed for future maintenance, modification or expansion of facilities need be forwarded. Structural steel, building electrical and mechanical working drawings are examples of those drawings to be submitted to the Authority. Falsework and formwork drawings and similar information need not be part of the permanent records. The contractor's retained percentage should not be fully released until all necessary shop drawings have been satisfactorily submitted.

It is important to remember that shop drawing sheet numbers must be shown on the corresponding structural drawings in the contract plans. This requirement is discussed further in Section XX on Record Drawings.


SHOP DRAWING REVIEW
NEW JERSEY TURNPIKE AUTHORITY

Review is for general compliance with contract documents. Sole responsibility for correctness of dimensions, details, quantities and safety during fabrication and erection shall remain with the Contractor.

☐ No Exceptions Taken

☐ Make Corrections Noted

☐ Amend and Resubmit

☐ Rejected

Reviewed by_____Date_____

Part 4 - Methods of Construction

Introduction. The engineer's staff must maintain a constant and thorough inspection of the contractor's methods of construction to both assure compliance with the plans and specifications, with provisions for safety to both the traveling public and the contractor's own forces without assuming the contractor's responsibility. The engineer must have a thorough knowledge of the contract documents and the designer's intent and exercise sound judgment in the interpretation of both. To do the job properly and still be able to obtain the respect and confidence of the contractor, and full cooperation, is in large part the measure of the engineer's competence.

The engineer assures compliance with the contract provisions by reviewing all proposed methods of construction well in advance of the start of operations. Where necessary, job meetings are scheduled with the contractor to explain contract requirements. These meetings are usually held in a cooperative atmosphere in order to promote understanding and respect on both sides.

Enforcing the use of agreed-upon methods is largely a matter of tactful firmness. In extreme cases of recalcitrance, the matter may eventually be referred to the Chief Engineer. Rarely, if ever, will the careful engineer allow a situation to develop to the point of withholding payment, or worse, the calling of default of contract as provided in the specifications.

On the following page is a chart summarizing examples for implementing policy on methods approval.

Equipment. The determination of construction methods rests in large part with the selection of construction equipment. With the rapidly expanding technology in the equipment field, the engineer must rely heavily on judgment in revieving a contractor's proposed construction equipment. Nevertheless, the requirements of the specifications should not be modified in any way without full and open discussion with the General Consultant.

Procedures. A contractor may rely upon the experience and day-to-day judgment of trusted foremen and superintendents who may have an adroit ability to get a job done swiftly and well. But it is precisely to discourage sole reliance on such potential talent and personality that procedures should be thoroughly revieved and analyzed ahead of time. Initially, the key employee may not be available when the crucial decision is needed. For another, there may be peculiar requirements that have been overlooked in certain items of work. For example, the Turnpike specifications do not allow tie-rods through parapet forms for aesthetic reasons. A superintendent, unaware of this, may have spent a good deal of money and effort constructing a sturdy and economical form with tie-rods only to have them rejected as they near completion. This will almost inevitably lead to tension, conflict and delay. Careful discussion ahead of time by the engineer avoids such situations.

APPROVAL OF METHODS OF CONSTRUCTION

METHOD REQUIRING APPROVAL	COMMON EXAMPLE	MEANS OF DETERMINING	PRIMARY CONSIDERATION	SECONDARY CONSIDERATION	LEVEL OF ENFORCEMENT
Construction Equipment	compactors pile-drivers	job meetings	reliability	availability vs. schedule	demanded by contract
Materials Handling	bulk fragile	job meetings	reliability efficiency	segregation of particles contractor's risk	letter of approval verbal
Equipment	hazardous massive	written request	safety	efficiency availability	demanded by law & contract letter of approval
Concrete Work	forms curing	drawings written request	reliability efficiency	Cost	Noted approval Letter of approval
Steel Work	sequence connections	drawings job meetings	efficiency	effect on schedule	Noted approval verbal
Excavation	sheeting dewatering	drawings job meetings	safety efficiency	schedule cost	Noted approval verbal
Traffic Protection	permit lane & Shoulder closing	written request drawings & suppl. specs	schedule safety for patron traffic	efficiency schedule	letter of approval engineers and State Police

Secondly, the preparation of working drawings, writing of letters, and attendance at meetings costs the contractor time and money and is never directly reimbursed by pay item and may have been insufficiently budgeted. So it rests with the engineer to convince the contractor that greater expense -- perhaps even long delays -- could accrue by the rejection of questionable methods after the fact.

Also, some contractors may look upon methods approval as an unwarranted intrusion into their freedom to effect economies, improve profits, and maintain a competitive edge. Thus they may tend to view darkly the submission of methods of construction as being totally restrictive for arbitrary reasons. Here it must be the duty and the will of the engineer to maintain a posture of understanding and progressiveness; to assure the contractor that methods approval is meant to be informative and cooperative in order to avoid pitfalls, not create them; to reaffirm that substitutions, revisions, and alternates will always be entertained; and to always demonstrate reasonableness, such as by never rejecting an idea because it is new.

An example of this would be the Turnpike specification requiring bridge deck finishing machines supported by elevated rails for concreting bridge decks. With this in mind, the engineer should discuss at job meetings in advance equipment for:

excavating,
- roadways, structures, drainage

spreading,
- earth
- stone
- asphalt
- topsoil

compacting
- embankments
- around culverts
- behind walls
- pavement courses

placing concrete,
- vibrating concrete
- finishing concrete
- pile-driving and layouts
- sand-drains
- bolting steelwork
- cleaning steel
- devatering excavations

procedures for,
- material storage
- waste disposed
- proof-rolling
- traffic protection
- security from vandalism
- temporary drainage
- access to site
- securing reinforcement steel prior to concreting

In evaluating the various methods proposed, there are really only two criteria -- the requirements of the specifications and the engineer's judgment. And the first of these may often be altered by new developments in equipment technology or new research into techniques. So it is almost entirely a matter of judgment. The important things to keep in mind are: the necessity of making comments well in advance of use; the ability of the proposed method to keep pace with progress after allowing time for inspection and a margin for error; and some demonstrated history of suitability either through experience, trial used, or well-documented reports.

With this important background in mind, the following lists will serve as guidelines for approval of methods.

Secure working drawings for:

- sheeting
- shoring
- formwork
- steel erection sequence
- steel fabrication
- anchor bolt layouts
- reinforcement steel layout
- all phases of building work
- toll booth and plaza assemblies
- all electrical connections
- screed grades
- sign construction
- concrete and metal castings

Secure written descriptions of:

- precautions for handling explosives
- procedures for heavy erection
- concrete curing methods
- concrete weather protection features
- pipe-jacking procedures

Reports. Most major decisions relating to the approval of construction equipment and procedures are documented in the job correspondence, working drawings, traffic permits, and minutes of job meeting. Copies of these documents, with the exception of working or shop drawings, are forwarded to the General Consultant, thus providing a continuous review of these matters for the Authority.

Additionally, and importantly, the engineer's daily report provides a complete tabulation of the equipment used on each contract. This report is a summary report collecting the information from the various inspectors' and supervisors' reports and daily quantity reports. These reports are prepared daily, accumulated weekly, and forwarded to the General Consultant as discussed in detail in Section VI of this manual.

SECTION XVII
INSPECTION

General. Inspection requires an understanding of the intent of the plans and specifications, which can only be gained by studying the contract documents; an awareness of the process of construction, which can only be gained by education and experience; and an appreciation of the need to record and document important aspects of the work, which is the responsibility of each individual and of the management of the inspector's employer. Beyond those fundamental requirements, inspection of specific items on the New Jersey Turnpike frequently requires considerable detailed reporting of key features of the facility. The purpose of this section is to emphasis some of the more common or more difficult of those features and to set forth the detailed attention expected of competent inspectors. The list of features is by no means complete and because an item of work is not mentioned does not mean that its inspection is any less important.

Certification of Inspectors. The Authority has instituted a program for certification of inspectors assigned to work on electrical installations, concrete bridge decks and asphalt pavements. The prequalification of an inspector will be based on an evaluation of each individuals training and experience and may require successfully passing a written test.

Engineers should submit inspector's names for certification in each of these fields to the General Consultant together with a resume of the candidates' training and experience well in advance of the start of work.

In addition, each concrete field technician (those assigned to preparing cylinder molds for strength tests, performing tests for entrained air content, or performing slump tests) must carry a valid certification as a Technician, Grade I issued by the New Jersey Chapter of the American Concrete Institute.

Part 1 - Earthwork

Scope. Over ninety percent of the Turnpike pavements rest upon natural soil subgrades or embankments. The strength and ridability of the pavements are therefore dependent on having strong and unyielding subgrades and embankments. This part of the manual describes the requirements for the construction of strong subgrades and embankments.

Stripping. The first earthwork operation is stripping. The stripping operation will in general remove objectionable material and produce topsoil for future use. In many areas, the quantity of topsoil which could be made available, may exceed that which will be required. The inspector should direct that the best quality material be stockpiled for future use in sufficient quantity to meet all needs and that the excess be used in embankments, if suitable, or wasted. Stripping is not required if material is not needed for topsoil and the subgrade soil is suitable for embankment.

During stripping operations an inspector should make sure that the good material underneath the layers of topsoil is not mixed in with the topsoil.

Stockpiles of topsoil should not be scattered but concentrated in a few large piles and graded to prevent water from puddling on top.

Subgrade Preparation. After stripping, the next operation is subgrade preparation for either embankment construction or pavement construction. The subgrade must be firm. If the subgrade soils are loose they must be compacted to a dense state. If they cannot be compacted then they must be removed and replaced by soils that can be compacted. It is the inspector's job to be sure that either the existing subgrade soils are compacted or that they are replaced by soils that can be compacted.

Embankments. Embankments support pavements that are to be elevated above the existing ground. The embankment can be constructed of natural soils (common embankment) or of selected soils (select borrow), depending on the requirements of the construction plans. With the use of either material, the end result is to provide a strong, unyielding embankment. Inspection helps assure that these objectives are achieved.

An important part of embankment construction is the knowledge of the different types of soils used and their characteristics.

General Classification of Soils. The major factor in soil classification for engineering purposed is the size of the grains of the soil and their distribution.

Soils are classified according to their particle sizes as follows:

Gravel	Larger than 2.0 mm
Sand	From 2.0 to 0.074 mm
Silt or Clay	Smaller than 0.074 mm

Silt and clay soils are fine grained soils and are classified by their plasticity. Silt is non-plastic, a clayey silt has low plasticity, a silty clay has medium plasticity and a clay has high plasticity.

A third class of soil is peat or organic silt. These soils are characterized by their high organic contents and very high moisture contents. They are weak and very compressible. Consequently they are not usable for highway earthwork construction.

A field procedure for classification is to first determine that basic soil type which is most abundant; either gravel, sand, silt or clay; and then determine the lesser soil types. There are a few simple tests that will aid in this determination. The quantity of finer materials present in a dry cohesionless or sandy soil, may be estimated by dropping the sand in a thin stream and noting the amount of dust created. Otherwise a small amount of the soil may be mixed with water, shaken up in a test tube, and the deposit in the bottom and the rate of its deposition will be an indication of the nature and amount of the finer materials.

A silt can be readily indicated by a high mobility of water if a small quantity is shaken in the hand, while a clay soil will not exhibit any expulsion of water if shaken. If a cohesive soil is dry, the cohesion may be estimated by crushing in the fingers; the greater the resistance to crushing, the higher the clay content. If the cohesive soil is wet the clay content can be estimated by rolling into a thread. The finer the thread that can be formed without breaking up, the higher the clay content. Both the cohesion and plasticity will increase as the clay content increases. Rubbing a sample with a knife or other piece of metal will cause the surface of the soil to become shiny if the soil has a high clay content, while this will not occur in the case of a silt or clayey silt.

A definite odor in a soil sample usually indicates the presence of organic matter.

Soil Characteristics. Gravels and sands are excellent materials for embankment construction because of their good strength and low compressibility. Silt and clay soils are not as good construction materials, their strength and compressibility being very dependent on their density and moisture content. At the right moisture content silt and clay soils can be readily compacted and achieve strengths approaching that of sand. When too wet, these soils turn to mud when being worked and lose all strength. When too dry they can not be compacted and if later become saturated, they lose significant strength.

Select Materials. Often special construction requirements necessitate the use of special select materials. These materials may be found in selected borrow pits or may have to be processed. The special requirements of these select materials can be one or more of the following: (1) extra strength, (2) high permeability and rapid drainage, (3) non-susceptible to frost and (4) non-sensitive to water. Examples are compacted gravel fill to support bridge foundations (extra strength), sand

drain material and drainage blankets used with sand drain stabilization (high permeability), select subgrade used as the subgrade for the roadway pavement (rapid drainage and non-susceptible to frost) and underwater fill used to build up embankments in open water such as in lakes, ponds or rivers (non-susceptible to water).

Slags. Slags and other waste products derived from smelting and other ore extraction processes are often proposed for use in embankment constructions. Through the years blast furnace slab obtained from steel furnaces has proved to be an excellent construction material. However, other types of slag have produced many problems in highway construction because they were not chemically stable and reacted to moisture. Only slags that have a proven construction history should be used in highway construction.

The field inspector should be familiar with these different types of soil materials and their characteristics.

Material Sources. Usually soils used for embankment construction are obtained from adjacent cut areas provided they are suitable. Field inspection is an important part of assuring that unsuitable cut materials are not incorporated in the embankment.

When there is insufficient soil material on the site for all the embankment construction, or special material is required, then the contractor must import the material from a borrow pit. It is the field inspector's responsibility to be sure that the materials being imported from borrow sources meet the contract specification requirements and are suitable materials. Usually the borrow source must be approved prior to bringing in the soil materials from that borrow source. The approval is usually based upon the results of soil tests on samples of the proposed borrow material.

Laboratory Tests for Materials. The field laboratory tests to be performed on the proposed materials for the construction of the embankment are largely dependent upon the proposed use of the soil. Because of their inherent properties, certain soils are more suitable for certain uses than others. It is the intent of the tests to determine whether the proposed soil meets the requirements for its proposed use noted in the contract specifications.

In investigating the properties for common embankment soils the primary consideration is compaction. Other tests are used to classify the material and to indicate its general behavior. These secondary tests are performed to determine the grain size distribution and soil plasticity.

To determine the various properties of soils, the following methods shall be used:

The procedure for determining maximum soil density is "Method of Test for Moisture - Density Relations of Soils," AASHO Test Method T-180 or ASTM Designation D1557 as modified by the Standard Specifications.

The procedure for determining grain size distribution is the "Standard Method of Mechanical Analysis of Soils" ASTM Designation D422.

The procedure for determining the liquid limit and plastic limit are the "Standard Method of Test for Liquid Limit of Soils" ASTM Designation D423 and the "Standard Method of Test for Plastic LImit and Plasticity Index of Soils" ASTM Designation D424.

California Bearing Ratio is determined by using the standard method of test for California Bearing Ratio (CBR) ASTM Designation D1883.

The field laboratory tests on soils proposed for select subgrade material are generally similar to those just outlined. However, due to the limited types of soil that meet the requirements of this material, the grain size determination is important. The purpose of this material is primarily to prevent frost heaving of the pavement placed just above. In order to effect this requirement, it must have good drainage properties and still be able to effectively support loads, which requires good gradation of sand or gravel. Thus the first test is a sieve analysis followed by a CBR test. Once such a proposed material has been shown to be suitable then its compaction properties will be determined to effect a control of its placement in the field.

No attempt has been made to mechanically outline the actual steps of the test procedure for the various tests mentioned. These have been extensively and clearly set up in the references noted. Also no attempt has been made to give actual numerical values, resulting from these test procedures, that would be required for the various types of materials. Those values and properties are set up in the specifications.

Typical forms used for these tests are shown on the following four pages.

Obtaining Samples for Laboratory Testing. Samples shall be prepared for testing according to ASTM Designation D421 "Standard Method of Preparing Soil Samples for Mechanical Analysis and Determination of Subgrade Soil Constants."

The Inspector should be aware of the requirements to obtain samples for laboratory tests. The above methods require that selection of representative test samples be made by quartering the representative field sample when a riffle sampler or sample splitter is not used. A sample may

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P. C. WHIZZES & ASSOCIATES
CONSULTING ENGINEERS
SECTION NO. _____ CONTRACT NO. _____

SOURCE: _____
STA: _____
OFFSET: _____
ELEV. : _____

DATE: _____
TEST NO: _____
MATERIAL: _____
ACCEPTABLE: YES___ NO___

SIEVE ANALYSIS

Coarse Aggregate				Fine Aggregate (1)				
Sieve	Wt. Ret.	Wt. Pass	Specs.	Sieve	Wt. Ret.	Wt. Pass.	% Pass.	Specs.

(1) Insert sizes required by specification for material tested.

Tested Performed By: _____

Resident Engineer: _____

ATTERBERG LIMITS

SOIL SAMPLE _____

_____

_____

LOCATION _____

BORING NO _____ SAMPLE DEPTH _____

SAMPLE NO. _____

SPECIFIC GRAVITY, G_s _____

TEST NO. _____

DATE _____

TESTED BY _____

PLASTIC LIMIT

DETERMINATION NO.	1	2	3
CONTAINER NO			
WT CONTAINER + WET SOIL IN g			
WT CONTAINER + DRY SOIL IN g			
WT WATER, W_w, IN g			
WT. CONTAINER IN g			
WT. DRY SOIL, W_s, IN g			
WATER CONTENT, w , IN %			

NATURAL WATER CONTENT

1	2	3

LIQUID LIMIT

DETERMINATION NO.	1	2	3	4	5
NO. OF BLOWS					
CONTAINER NO.					
WT. CONTAINER + WET SOIL IN g					
WT CONTAINER + DRY SOIL IN g					
WT. WATER, W_w, IN g					
WT. CONTAINER IN g					
WT DRY SOIL, W_s, IN g					
WATER CONTENT, w , IN %					

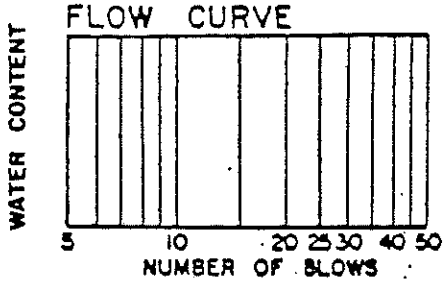
WATER - PLASTICITY RATIO, $B = \frac{w_n - w_p}{w_l - w_p}$

SHRINKAGE LIMIT

DETERMINATION NO.	1	2
UNDISTURBED OR REMOLDED SOIL PAT		
WT. DRY SOIL PAT, W_s, IN g		
WT. CONTAINER + HG. IN g		
WT. CONTAINER IN g		
WT. HG. IN g		
VOL. SOIL PAT, V, IN cc		
SHRINKAGE LIMIT, W_s, IN %		

$$W_s = \frac{\gamma_w V}{W_s} - \frac{g_T}{g_s}$$

FLOW CURVE



RESULT SUMMARY

PLASTIC LIMIT	NAT. WATER CONTENT	LIQUID LIMIT	SHRINKAGE LIMIT	B VALUE	PLASTICITY INDEX	FLOW INDEX	TOUGHNESS INDEX

NEW JERSEY TL .PIKE - 1990 WIDENING
P. C. WHIZZES & ASSOCIATES
CONSULTING ENGINEER

MATERIAL: _____
SOURCE: _____
USE: _____

SECTION _____ CONTRACT _____

MOLD: DIA. _____ VOL. _____ WT. _____

TEST NO.: _____
DATE: _____
DONE BY: _____

MOISTURE - DENSITY RELATIONS - SOILS - AASHO - T - 180

	Unit	Test No. ___	Test No. ___	Test No. ___	Test No. ___	Test No. ___	Test No. ___	Test No. ___
DRY DENSITY:								
1. Wt. Wet Sample + Mold	lbs.							
2. Wt. Mold	lbs.							
3. Wt. Wet Sample	lbs.							
4. Vol. Mold	lbs.							
5. Wet Density Sample	lbs./cft.							
MOSITURE CONTENT:								
1. Wt. Wet Sample + Container	gms							
2. Wt. Container	gms							
3. Wt. Wet Sample	gms							
4. Wt. Dry Sample + Container	gms							
5. Wt. Container	gms							
6. Wt. Dry Sample	gms							
7. Wt. Water	gms							
8. % Moisture (1)	gms							
Dry Density Sample (2)	lbs/cft.							

(1) % Moisture = $\frac{\text{Wt. Water}}{\text{Wt. Dry Sample}} \times 100$

(2) Dry Density = $\frac{\text{We Density}}{1 + \frac{\% \text{ Moisture}}{100}}$

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P. C. WHIZZES & ASSOCIATES
CONSULTING ENGINEER

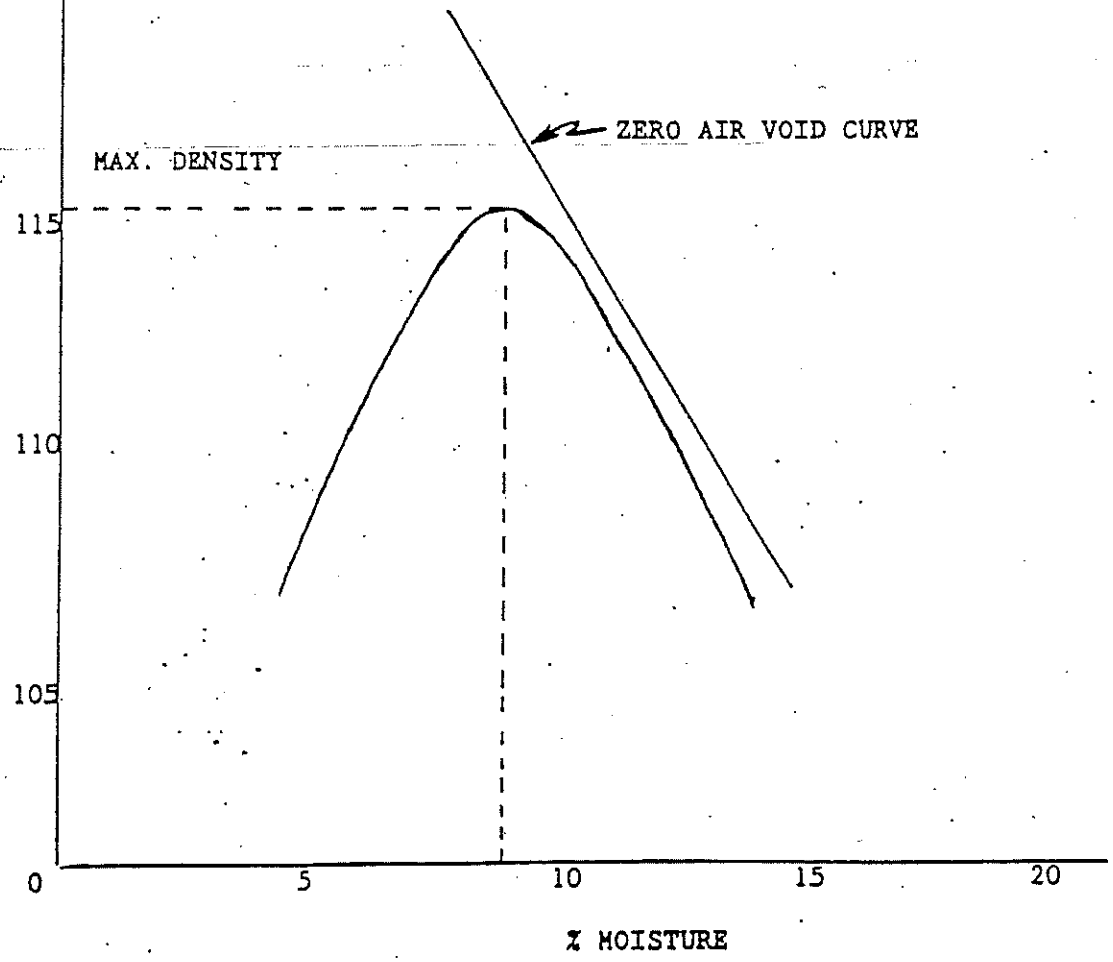
TEST NO. _____
DATE: _____
DONE BY: _____

SECTION _____ CONTRACT _____

MOISTURE - DENSITY RELATION CURVE
(AASHO T-180)

MATERIAL: _____

SOURCE: _____
USE: _____
MAX. DENSITY: _____
OPT. MOIST. _____



be readily quartered on a plane smooth surface with a trovel, or for large samples of coarse materials, with a square nosed shovel and a brush. The procedure is to thoroughly mix the material, heap it into a neat cone and then divide it into quarters roughly through the axis of the cone. In every operation of quartering always include the fine materials by use of the brush. A 1-1/2 inch or 2 inch paint brush is best for the smaller field samples and a counter type brush is best for the large samples requiring a shovel to quarter. Next remove two opposite quarter piles of the material from the quartering surface and place in a suitable container and then thoroughly mix the remaining two quarters into a cone. The principle of this process is that any irregularity in the mixing shall be compensated by combining opposite quarters. This process may be carried on repeatedly until a quantity of suitable size is obtained for the various laboratory tests.

The actual quantities required for the various laboratory tests are noted in the ASTM Specifications noted previously. When performing a mechanical analysis for grain size distribution for sands and gravels, the minimum quantity of a representative test sample is proportional to the nominal maximum size of the particles.

Embankment Construction. Clearing and grubbing and subgrade preparation, the first steps in embankment construction, have been covered previously.

Embankments are to be constructed to the lines and grades shown on the plans and to the density required by the specifications. Density is obtained by compaction.

Lift thickness is an important factor in embankment construction. Usually the maximum allowable lift thickness is noted in the Specifications. The Inspector should make sure that the Contractor does not place lifts too thick to be compacted to the specified density for the full depth of the lift.

Compaction. The ease of compaction is dependent on the type of soil being used and its moisture content.

Moisture is the key to the compaction of cohesive soils and fine sands. By controlling the moisture content in the soil one can obtain maximum stability and water tightness of earth structures in the most economical and efficient manner.

Optimum moisture content is the amount of water needed in a given soil for compaction to maximum density. In any soil there are voids between the grains which are filled with air and water. Insufficient water will not lubricate the grains enough to let them side into their tightest arrangement when being compacted. Too much water destroys the frictional bond between the particles and causes plastic flow.

The compaction test, sometimes called a Proctor test, determines the change in density with moisture content. It gives the maximum practicable density of a soil mass. The "Maximum Density" to which the specifications refer is the maximum density obtained from the test.

The effect of "Compaction Effort" that is being made on a fill area is determined by six factors: unit pressure provided by the compacting equipment, the vibration provided by the equipment, the number of passes made over the area, the moisture content of the fill soil, the thickness of the layer being compacted, and the kneading action (if any) of the equipment. The moisture content of the fill, especially for cohesive soils, should be kept to within 2% ± of the optimum moisture content.

A heavy rain lasting three hours or more will usually saturate the soil so that when a moisture content test is made it will indicate a moisture content well over optimum. In this case the Inspector should require the contractor to stop compacting until the fill moisture content can be reduced to specified levels by either air drying or disking. Excessive moisture in an embankment will result in the soil moving and wearing under the compaction equipment and other traffic.

The benefits gained by compaction are threefold: there is an increase in load bearing capacity; there is a reduction of settlement under traffic; and excessive saturation of the pavement subgrade is prevented.

The table below is a rough guide as to the most suitable compaction equipment to be used for different types of soil.

Type	Soil Best Suited For	In Loose Lift (In Inches)	Max. Effect Max. Weight In Tons
Sheepsfoot	Clays, clayey silts, silty clays, gravels or sands with clay binder.	7 to 12	20
Vibratory	Sands, sandy silts, silty sands and gravel.	12 to 15	20 to 30
Pneumatic Tire	Sandy silts and sandy clays, gravel, sands and clays.	8 to 12	12 and over
Steel Three Wheel	Granular or granular-binder material with clay.	8 to 12	20
Steel Tandem (Two Axle)	(Same as above)	8 to 12	16
Steel Tandem (Three Axle)	(Same as above)	8 to 12	20

Too often the soil compaction behind abutments is not adequate, resulting in a bump in the pavement at this location. Such areas need special attention.

To properly compact materials placed behind a completed abutment, there must be adequate working room for the equipment. It is suggested that embankment be placed no closer than 25' from the back face of the footing and sloped towards the top of the embankment one vertical to three horizontal prior to completion of the abutment. After completion of the abutment, embankment can be placed and effectively compacted in this intervening space. The slope should be benched similarly to placing embankment adjacent to a hillside.

In the event that the embankment has to be placed for settlement prior to constructing the abutment, a similar area should be excavated behind the abutment when it is constructed and backfilled. Porous fill behind the abutment should be brought up at the same level as the embankment.

Testing. The embankment compaction is checked by the Inspector making density test checks of the percent compaction. There are several good methods of making density tests using a sand cone, ASTM D1556; using a balloon method, ASTM D2167; or a drive sampler for clay soils, ASTM D2937; or nuclear gages, ASTM D467. Nuclear gages are very quick and allow a lot of testing to be done economically and therefore its use is recommended.

The number of field density tests made should be dependent upon the quantity of material placed. At least one test should be made per 2,000 cubic yards of embankment material placed.

Much of the success of the compaction program depends upon the efforts of the inspector. All the studies and compaction plans are useless without proper inspection. A general program to follow in the field follows.

1. Preparation

   a. Run all necessary compaction tests on both original ground and proposed embankment material before the fill is placed.

   b. Become familiar with the condition and feel of the soils at optimum moisture.

   c. Set up a schedule to follow with the contractor for regular moisture and density tests in the field. Plan to take the required tests on at least every lift placed.

2. During Construction

   a. Be sure the contractor provides sufficient water distributed over the soil to keep it at the optimum

moisture.

b. Arrange with the contractor a plan to mix the water uniformly into the soil.

c. Make sure the contractor has the right type and weight of equipment to achieve the required compaction.

d. Learn to get a feel for the degree of compaction with your heel.

e. Make frequent density tests.

It is the Inspector's responsibility to be sure the contractor adequately compacts the embankment, that record density tests are made and to be aware of any unusual problem that occur so that they can be resolved quickly. The Inspector should encourage the contractor to shape the embankment such that should it rain, the water will run off rapidly and not pond on the embankment and thereby prevent excessive moisture from getting into the soil of the embankment.

Special Embankment Foundation Treatment. In the great majority of the cases compaction of the embankment subgrade is all that is required to provide a firm base for the embankment. However, in major portions of the Hackensack Meadowlands, tidal marsh areas and a few other locations, this is not the case. At these locations special foundation treatments are required to provide a stable embankment and limit embankment settlement to tolerable amounts. A number of these treatment methods are described below. An Inspector should be familiar with these different methods in order to perform the inspection duties adequately and intelligently when such conditions are encountered, and these treatments are called for in the contract documents.

Excavation and Replacement. The easiest and best embankment foundation treatment is to excavate the weak foundation soil and replace it with good quality material. Normally this is easy to do. However, when the undesirable material to be removed extends below the water level it becomes more difficult to determine that all the undesirable material is removed. Often the inspector must probe the excavation bottom to be sure all the bad material is excavated. Also, observing the excavation process will give clues as to how well the excavation work is being accomplished.

Dynamic Compaction. A recent method of foundation improvement is dynamic compaction which consists of dropping large weights of 15 to 25 tons from heights of up to 75 feet. This method is suitable for granular soils and trash areas. The performance of this treatment method is usually checked by monitoring the settlement of a test fill constructed on top of the treated foundation.

Preload and Surcharge. Preloading is the construction of the embankment on the soft foundation and allowing it to settle. After all, or most of the settlement occurs, then the drainage structures and pavement are constructed. Settlements are usually monitored by use of settlement platforms. The settlement platform data tells when the settlement is complete and the quantity of embankment material required to compensate for

the settlement. Piezometers can also be used to determine when the settlement is near completion. The Inspector should be aware of the importance of settlement platforms and piezometers and be sure that the contractor maintains them in working condition. Otherwise the Inspector's duties are the same as for normal embankment construction.

Surcharge treatment is similar to preload treatment. The difference is that an extra height of soil, the surcharge, is placed on top of the embankment to speed up the settlement rate. Settlement platforms and piezometers are utilized for control of surcharge treatment also.

Sand Drains. Sand drains are used to speed up the rate of embankment settlement and are normally utilized along with surcharge or preload treatment.

The rate of embankment settlement is dependent on how fast the pore water can be squeezed out of the compressible foundation soil. For thick compressible deposits the process is slow. The use of sand drains provides a path for the pore water to escape more rapidly and hence, speeds up the rate of settlement.

In recent years cardboard or plastic wick drains have been used in a similar manner to sand drains. Wick drains are smaller than sand drains so more of them are required to obtain the same rate of settlement.

Settlement platforms and piezometers are also used extensively with sand drain construction.

Field inspection personnel for sand drain installation are expected to be either experienced in sand drain work or be supervised by an individual possessing the necessary experience.

It is required that a daily sand drain driving report be filled out for each day's work by the sand drain Inspector. Only one daily report is necessary and it is made out by the inspector. A sample form is included in this section.

Similar to pile driving, a system of numbering is required for sand drains which will allow any given sand drain to be located on the plan at a future date. In most cases the huge number of sand drains to be installed and the complicated geometry of their layout requires a very thoughtful approach if the system is to have any logic and value. The numbering system should be complete before driving begins so that the inspector's reports do not contain any conflicting information. Each sand drain is to be staked in the field.

The top of the report should show the contractor's name, the date on which the sand drains were driven, the shift on which the work was done and the make and size of the rig and hammer.

The body of the report should show the entries for each drain in the order in which it was driven -- the drain number being the plan number.

The column headed "Driving Log" should indicate either the blows per foot when driving was terminated or the fact that the casing was driven. The other columns are self-explanatory.

Each report should be signed by the Inspector and the Soils Engineer in charge. After the daily total is entered on the contract daily quantity sheet, the sand drain report should also be signed by the Office Engineer.

THE NEW JERSEY TURNPIKE
1990 WIDENING PROGRAM
LOESS, MARL & CLAYMORE
Geotech Engineers

INSPECTOR'S DAILY SAND DRAIN DRIVING REPORT

Contractor or Sub _____ Date_____ Shift_____

Make and Size of Rig _____ Of Hammer _____

Drain No.	Driving Log	Bottom Elev.	Air Pressure	Remarks	Pay Length
				Total for Shift	

Signed _____ Quantity recorded by _____
Inspector Office Engineer

Approved _____
Soils Engineer

Only one copy of the report is necessary and it should be filed until the end of the job at which time all reports should be turned over to the Authority with other job records.

Instrumentation. There is special instrumentation utilized with the special foundation treatments described previously. Two, settlement platforms and piezometers have been mentioned previously and are utilized to determine when settlement is completed. Often times when preload, surcharge and sand drain treatment is utilized stability of the embankment is of concern. In stability analyses piezometers and slope indicators are often used. Slope indicators show if there is any lateral movement of the embankment.

The Inspector should be aware of these instruments and be sure that the contractor maintains them in working condition.

There may be times when the Inspector will be required to assist in obtaining data from these instruments. The Inspector should be aware that accurate readings are necessary and the data should be forwarded as quickly as possible to the engineer responsible.

Settlement platforms are read by leveling. A stable bench clear of any settlement is necessary to obtain accurate settlement readings. As the fill is built up the settlement platform pipe must be extended. It is necessary that when the pipe extension is added the elevations on top of the old pipe and the extended pipe both be noted so that an accurate settlement record can be maintained as the settlement platform pipe is extended upward with the embankment.

Piezometers are read by either observing a pressure gage or measuring the level of the water in the piezometer tube with a probe or ruler. In addition, the gage elevation or the reference elevation for the water level reading must be noted. These reference elevations can change as the embankment is constructed upward. Therefore, it is important that when the reference elevations are changed the new elevations be noted.

[A handy form for recording piezometer and platform data appears on the following page.]

Slope indicators require special instruments and training to be read. These instruments are expensive, time consuming to read and reduce the data. However, they are the best instrument for evaluating stability so should be protected from damage at all times.

Quite often with these types of construction the Specifications note an allowable construction rate for the contractor to use so to maintain stability of the embankment. It is important that the contractor does not exceed the permitted construction rates. A good method for the Inspector to monitor the contractor's embankment construction rate is to make one foot interval marks on the settlement platform pipes or special stakes placed for this purpose and note the readings daily in the field book. If the contractor is starting to exceed the permitted rate of construction, then work must be halted to maintain the embankment stability.

LOESS, MARL & CLAYMORE
Geotech Engineers

NEW JERSEY TURNPIKE
1985-1990 WIDENING

PIEZOMETER AND PLATFORM FIELD DATA

Date: _____ Survey Crew: _____

Remarks: _____

Cell or Platform No.	Station	Offset	Emb. Data		Piez. Data			Platform Data			
			HI	Elev. h_1	h_2	p	Elev. HI-h_2+h_3	h_4	h_5	h_6 = h_4+h_5	Ele· HI-h_6

Note: HI Height of Instrument
h_1 Measured to top of existing embankment at platform or piezometer
h_2 Measured to gage elevation or water level in plastic tube
p Gage reading - psi
h_3 2.31p
h_4 Measured to top of outside 3" platform pipe
h_5 Top of outside 3" platform pipe to top of inside 1-1/2" platform pipe

Part 2 - Asphalt Concrete Paving

General. The intent of this section is to aid the engineer and the asphalt concrete inspector in becoming familiar with certain general requirements of the Authority. The ultimate aim of the Authority is to have a good, smooth-riding pavement free from bumps, rutting and depressions. They will accept nothing less. To accomplish this goal, the engineer will provide full-time inspection of all asphalt paving operations with experienced, knowledgeable inspectors.

The Asphalt Institute's publication "Asphalt Paving Manual," Current Edition, is an excellent handbook for inspectors. The engineer should provide copies to each inspector and resident engineer assigned to the project.

Having become familiar with fundamentals expressed in the "Asphalt Paving Manual," the inspector will readily see that the quality of asphaltic pavement depends on many factors, any of which could result in inferior pavement if not properly controlled. Since some factors such as sound and well-graded aggregates, proper mix design and correct batching are not under the field inspector's direct control, one cannot assume that the delivered mix conforms with specifications. Therefore, the constant visual examination for mix deficiencies, as expressed in the manual, is of prime importance. Transference of the accepted mix into quality pavement starts at the preliminary conference with the contractor.

As described in the Asphalt Institute's Manual, agreement is attained on the plan of operation, the interpretation of specifications and general construction details. This is followed with an informal conference between the field inspector and the superintendent to cover specific details. They may include the desired type of transverse joints, handling of approach grades, longitudinal joint adherence, equipment breakdown, disruptions due to rain and the further amplification of specifications to suit the particular job.

Transporting Material. Mixed materials are hauled from the plant to the spreading operation in trucks. These trucks may vary in size and dumping methods but uniformity of equipment is desirable and often a necessity for any given operation. If paving machines have received materials directly in their hopper from trucks, the trucks must be adaptable to the hopper to prevent spillage.

Load slips must be collected by the inspector at the time of delivery whenever they are required. Collection of load slips by contractor's personnel, to be accumulated and delivered to the engineer later, is not to be permitted.

All contact surfaces of truck beds should be given a light coat of lime solution (one part lime to three parts water) to prevent the asphalt mixture from adhering to the truck beds. Also, each truck should be provided with a heavy tarpaulin with provisions for tightly fastening it and insulation for truck beds when excessive drops in temperature of the mix during hauling are encountered. Turnpike regulations require that all trucks, regardless of materials hauled, must always be covered.

The number of trucks to be used should be agreed upon well in advance of paving, bearing in mind that the number should provide for continuity of operations.

Spreading Material. The contractor establishes the rate of spread and the engineer checks the spread for compliance with specification requirements.

From information available in the form of test reports, planned paving areas and thickness, the engineer should compute the total job requirement. Errors which would cause a substantial over or underrun in quantity should be brought to the attention of the project engineer and corrective measures taken.

As work progresses, cumulative weights from load slips may be used to verify the spread rate.

Spreading temperatures at the laydown operation must conform to specifications. These are provided in Subsection 302.05.

Strict requirements are set forth in this Subsection specifying the sequence to be followed in paving adjacent lanes with one or tandem pavers. When paving areas on the existing Turnpike mainline, interference with traffic must be kept to a minimum in which case the supplementary specifications may be expected to radically revise multiple lane paving procedures.

Automatic screed controls are required in both pavement overlay and construction of new pavement.

Echelon paving is required by the specifications. (Two or more machines working simultaneously in adjacent lanes staggered one slightly behind another.) This is an important requirement to insure high density at the longitudinal joint and should not be waived unless specific concurrence has been granted by the General Consultant.

All cooled vertical joints must be tacked with a coat of emulsified asphalt.

Paving Machines. For a successful paving machine operation, manipulation of thickness control must be held to a minimum, adjustment devices maintained in operating condition, and the operation kept uniform and continuous. The tamper and other moving parts are best operated at the manufacturer's recommended speeds, and the mechanical condition of the paver must be in working order and adequate to perform the work.

Trucks must never be used to pull the paver but they should be held firmly against the rollers on the paver by means other than brakes to prevent bumping of the machine and spillage of material. Any spillage must be cleaned up to prevent the formation of a bump in the finished product.

Some pavers use vibrator screeds and others use tamping bars, either of which will provide the initial compaction. Tampers must be coordinated with forward speed of the machine. Material in front of either type of screed must be uniform in depth.

When constructing a taper to conform to existing pavement, the paver is started with a screed on a lath and set at one-fourth to one-half planned thickness. As the paver progresses, the screed is adjusted with each adjusting screw until full thickness is obtained. Coarse stone is then raked out and replaced with fines to transition smoothly from the existing pavement.

When conforming to existing pavement at the end of a lane, the thickness adjustment screws are gradually adjusted to one-half thickness and the paver stopped. If an attempt is made to run the screed dry, an unsatisfactory conform is usually obtained.

When starting from a cold transverse joint, the screed is first placed directly on the end of the cold mat with the heater on until the cold mat is hot. The screed is then raised one-fourth thickness of compacted mat and placed on shims. The machine should start out with the screed elevation control set at the planned thickness.

Standard Specifications also require paving with automatic devices in order to attain grade, but this requirement may be waived when paving small restricted areas, irregular sections intersections, turnouts, or other locations where it is impractical to spread and finish the leveling of surface course mixtures by machine methods.

Rolling. The engineer is encouraged to control density of asphalt concrete pavement through use of nuclear test gages. The General Consultants are available to assist in establishing such controls.

Initial breakdown rolling with three wheel steel rollers or vibratory rollers is performed to obtain density. Secondary rolling by a vibratory roller or pneumatic-tired roller achieves further densification and obtains a more impervious mat. Final rolling of the top course of dense graded and open graded mixes by two axle steel wheel tandem rollers is required to provide a smooth finished surface. The number of passes to be made by each type of roller is determined by taking nuclear density tests after each pass on a test strip and establishing a roller pattern.

Rubber-tired rollers must be checked to see if they satisfy the requirement for air pressure.

Asphalt mixes are thermoplastic and become brittle and resist movement when cold but are flexible and can be molded or shifted when hot. Adherence to specified minimum temperatures for both spreading and compacting the mixture is essential for satisfactory results.

The important factors to consider in rolling are:

Breakdown rolling must be performed as closely behind the paver as possible.

Breakdown and rubber-tired rolling must always be performed while the mix is at or above the minimum specified temperature.

The breakdown roller should roll toward the paver and return to the compacted section in the same path to assure uniformity of coverage and compacted effort.

Rollers should roll with the drive wheel toward the paver to obtain maximum consolidation.

A roller should not be permitted to stand idle on a hot surface pavement because it will leave marks or indentations.

On rolling the second lane, the longitudinal joint is rolled first by lapping onto the new pavement approximately six inches on the path toward and on the pass away from the paver.

Longitudinal joints between traffic lanes must be either protected from damage or distortion by traffic or other causes until the adjacent lane is constructed or trimmed to a neat line and vertical face. Excess material which develops at the joints during construction of an adjacent lane should be wasted and not cast over the surface of the uncompacted material.

In rolling at a cold transverse joint, the joint should be cross rolled starting with the roller on a cold mat with about six inches of the roller extending onto the new hot mat. The roller is moved onto the new mat in successive increments of twelve inches, one-half roller width, and finally entire roller width. To prevent shoving of the material and breakdown of longitudinal edges, a timber should be provided at each free edge of the roller to cross on. Construction of this joint should be checked with a straight-edge while the material is still workable.

Surface Requirements. In keeping with the Authority's demands for a good riding surface, the engineer shall require that the surface of each finished course be free from waves or irregularities so that when a straightedge sixteen (16) feet long is laid on the surface parallel to the centerline, the surface shall in no place vary from the lower edge of the straightedge more than the following amounts:

For base course	1/2 inch
For leveling courses	3/16 inch
For surface course	1/8 inch

On vertical curves, straightedges ten (10) feet long may be used when approved by the engineer. The finished surface of the surface course shall be within 1/4 inch, measured vertically, of the required grade and cross section shown on the plans. Deviations of more than 1/4 inch will not be accepted.

Part 3 - Landscaping

General. Landscaping under the control of the engineer will usually mean topsoil and seeding only. Work which involves inanimate materials such as steel and concrete can be specified with considerable definition whereas work which deals with living plants can only be defined in general terms. The success of roadside development operations of seeding and planting is, therefore, largely dependent on two conditions. First, a strict adherence to the specifications, and second, on that quality of supervision which is based on experience, practical knowledge and good judgement in order to properly act within the meaning of the specifications and at the same time meet such conditions as delays and variations in weather and soils.

This part of the manual is intended for the use of the topsoil and seeding resident engineer and inspector who will supervise this work. It comments on the general nature of the Authority's requirements, specific problem areas which may develop, and the keeping of job records.

Before commencing any topsoil or seeding work it is desirable to hold a conference with the contractor and review the specifications in detail. The schedules as required under the conditions of the contract will benefit the planning of programs and avoid misunderstandings, particularly with respect to materials and methods which are affected by conditions of the weather.

Inspection Requirements. The inspector must study and become thoroughly familiar with the Standard Specifications covering topsoiling and seeding.

Placing Topsoil. A layer of nevly placed topsoil may slough off when not bonded with the subsoil. Grass roots do not readily penetrate a lower and different layer of soil. Therefore scarification of the subsoil which may leave three or four inch furrows and ridge before topsoil is placed may be important in order to avoid failures.

Topsoil should not be handled when it is so wet that it will become densely compacted during its placement. During the placing of topsoil the inspector should check to assure that there is no change in kind or source of material. Finished surfaces of all topsoiled areas should be in a condition to permit seeding immediately.

Depth of topsoil may be determined by digging test holes in back of the operation of spreading at frequent enough intervals to assure that the minimum required depth is being placed. Depth checks should be entered in the project records.

Seeding. It is the contractor's responsibility to order materials delivered in quantities, according to areas and rates as specified. The inspector's count of the number and weight of bags of seed, fertilizer and lime used is part of the record for approving the payment of areas completed. There should be a definite system of making such a count as the material is used rather than when it is delivered to the job. The actual amount of seed sown will be used in calculating payments.

Seed stored on the job should be protected from moisture, heat and rodents.

Special attention should be given to construction and obtaining satisfactory growths of crown vetch or birdfoot trefoil in their prescribed areas, namely all slopes 2:1 or steeper. The Authority's intent in planting these specific varieties is to obtain a permanent low growing ground cover which will require practically no maintenance and thus will reduce mowing costs substantially. These plants must be seeded separately and the seed must directly contact mineral soil in order to germinate. This means that in newly seeded areas these two legumes must be broadcast before mulching. Inoculants are required, even though the seed is scarified. Instruction for using inoculants are shown on the package. Usually the inoculant is mixed in water and sprinkled on the seed while it is stirred. Seed should be sown promptly after inoculation. It should not be dried by heat or exposed to sunlight.

Reseeding. The absence of crown vetch and birdfoot trefoil may reflect improper seeding methods since hydraulic methods are not to be used. Quite possibly the seeds may never have been planted. In either case reseeding will be required until a satisfactory growth is established.

If the slopes to be reseeded have barren areas, where the seed may be placed in direct contact with the mineral soil, reseeding is a relatively simple operation. Where a heavy growth of grass prohibits direct contact with topsoil, it will be necessary to either plug in the seed or reseed scarified areas. The latter method has been found quite satisfactory if the furrows are made level and continuous on about three foot centers. Before the final inspection, reinspect all slopes two to one or steeper throughout the section to insure compliance with these requirements. An established covering with either of the two varieties will be acceptable, however reseeding should always include both.

Mulching. Mulching is an important part of the seeding operation to help retain moisture at the seeded surface and to discourage birds from feeding on the new seed. In areas where jute mesh is used for erosion control mulching is not necessary because the jute performs the same functions.

Moving. All areas that are flatter than 1 vertical on 2 horizontal shall be moved by the contractor until final acceptance. The grass shall be moved at a height of not more than 5 inches per Subsection 704.03.

Part 4 - Piling

The strength and durability of a structure is ultimately dependent upon the quality of its foundation. Once a foundation is constructed and a structure is build upon it, there is no second chance--the foundation must be right the first time. The construction of a pile foundation is a specialized task which is affected by many factors, some of which are defined and regulated by the specifications. The control of other critical factors is solely at the discretion of the field inspection forces and calls for a blend of experience, information obtained from reference works and intelligent judgment.

The Turnpike Authority requires that each engineer station an inspector at every pile-driving rig to observe the full driving time for every foundation pile on the project.

Hammers. The specifications under Subsection 405.03 discusses this equipment at length. The Engineer should clearly review this specification. Refer to Paragraph 405.03A for discussion on the start-up of the pile driving operation.

The minimum size hammer (ft.-lbs. of energy delivered per blow) is set by the specifications, leaving a broad range of selection. When driving heavy piles such as precast concrete into dense strata such as hardpan, shale or stiff clay, a fairly heavy blow delivered at low velocity in a short stroke has been found to be very effective. Single-acting hammers are often well suited to this purpose.

Double-acting hammers are most satisfactory for driving light or average weight piles or casings in materials of average consistency since the pile may be driven more rapidly than with an equivalent single-acting hammer.

Of course a hammer which may cause damaging stresses within a pile before the desired penetration is reached should be avoided. If it is found that a pile cannot be driven to the designated depth without damage, then other means of sinking the pile should be used such as boring, spudding or jetting.

A rule of thumb used to select the size of hammer to be used can be stated as follows:

1. For single-acting or double-acting steam/air hammers, the ratio of Ram weight to pile weight should fall between 1:2 and 1:1.

2. For diesel hammers, the ratio of Ram weight to pile weight should fall between 1:4 and 1:1.

Hammers should be operated at the air/steam pressure and speed recommended by the manufacturer and for the full stroke for which it is designed in order to obtain bearing values reasonably close to calculated values.

Rigs. Rig selection is limited by the following factors:

1. Leads must be fixed.

2. Extendable leads are sometimes necessary, e.g., one may be forced to utilize extendable leads in areas where the rig must sit above the excavation, preventing the hammer from reaching pile heads below a certain elevation. The extendable leads should be constructed in such a manner that the hammer is given firm lateral support and is within the extension at all times during the latter stages of driving;

3. The rig, if of the crawler or truck-crane type, should have counterweight sufficient to fully counteract the weight of the boom, leads, hammer and largest pile anticipated, regardless of whether the driving is done parallel with the longitudinal axis of the rig or square with that axis;

4. The boom and leads should be of a length sufficient to handle the longest pile section anticipated.

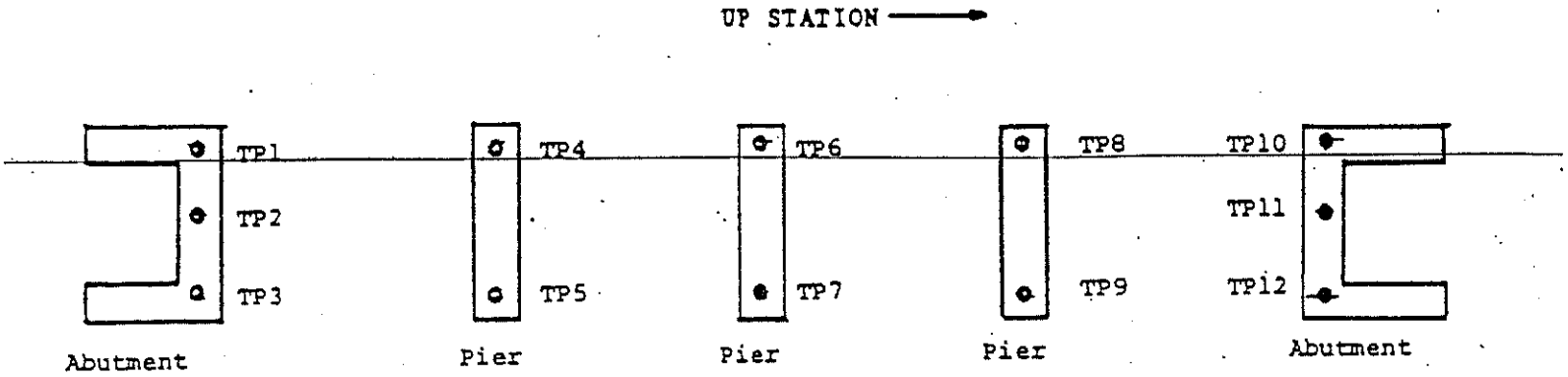
Air or Steam Supply. The air or steam supply for the hammer should be capable at all times of meeting the manufacturer's recommendation.

Driving Accessories. the use of followers are prohibited unless approved in writing by the engineer.

Driving caps should be large enough and have a shape such that the hammer blows will be uniformly distributed over the head of the pile. The caps should be so designed that an effective cushioning material (such as oak block) may be interposed between the cap and the hammer.

Driving of Test Piles. Test piles are often driven before the installation of production piles in order to verify that design bearing capacity can be achieved at the penetration desired and as an aid in determining production pile order lengths. However, in many areas of the widening, reference to existing pile data may be available. If test piles are to be installed, the length to be driven should be determined by the engineer's staff--the choice being based on penetrations shown on the plans and as modified by an inspection of the boring logs. The usual practice is to pay for test piles as a lump sum or on the basis of unit price for the total length of stock designated by the engineer. Test pile cutoffs are not paid for.

The actual installation of test piles should be preceded by the setting up of a system of numbering. The numbering should be continuous from left to right in each structural unit (abutment footings, pier footings) as one faces up-station and should progress from structural unit to structural unit in an up-station direction, being continuous throughout the entire structure--a simple example is shown below:



TYPICAL TEST PILE NUMBERING PLAN

Each inspector should have, before test pile driving begins, a full of the results of borings in the area, plotted to scale, which should show profiles of underground stratifications. There should also be available tables or graphs which indicate the approximate bearing capacity of the type pile being driven for a range of blow counts encompassing the blow count required for the desired bearing capacity. These blow count bearing capacity tables or graphs should be made up for several hammer speeds near and at the manufacturer's designated speed (in the case of double-acting hammers).

Each test pile should be marked off in feet for its entire length. Comments on driving technique will be found in the section on production pile driving and apply here.

A test pile report should be made out for each test pile. A sample is shown on the following page.

This report may require several pages per pile depending on the depth to which the pile is driven. Consult the specifications for each contract to determine the method of test pile payment for a particular contract.

TEST PILES FOR _____

P. C. WHIZZES & ASSOCIATES - Engineers

_____ - Contractor

TEST PILE NO. _____

Sheet ____ of _____

Pay Length _____

Pile Location _____

Rig No._____ Crew _____ Type Hammer _____

Date _____ Weather _____

Time Start _____ Time Finish _____

Elv. Ground _____ Elv. MLW _____

Pile Material _____ Dia. Tip ____ Dia ____ from butt _____ Pile Length _____

Tip Elev	Pen.in Ft.below Gr	Blows Per Foot	Steam Press. lbs.	Strokes Per Minute	Energy Ft. Lbs.	Pen. Inches Per blow	BRG Tons	Remarks

Inspector _____

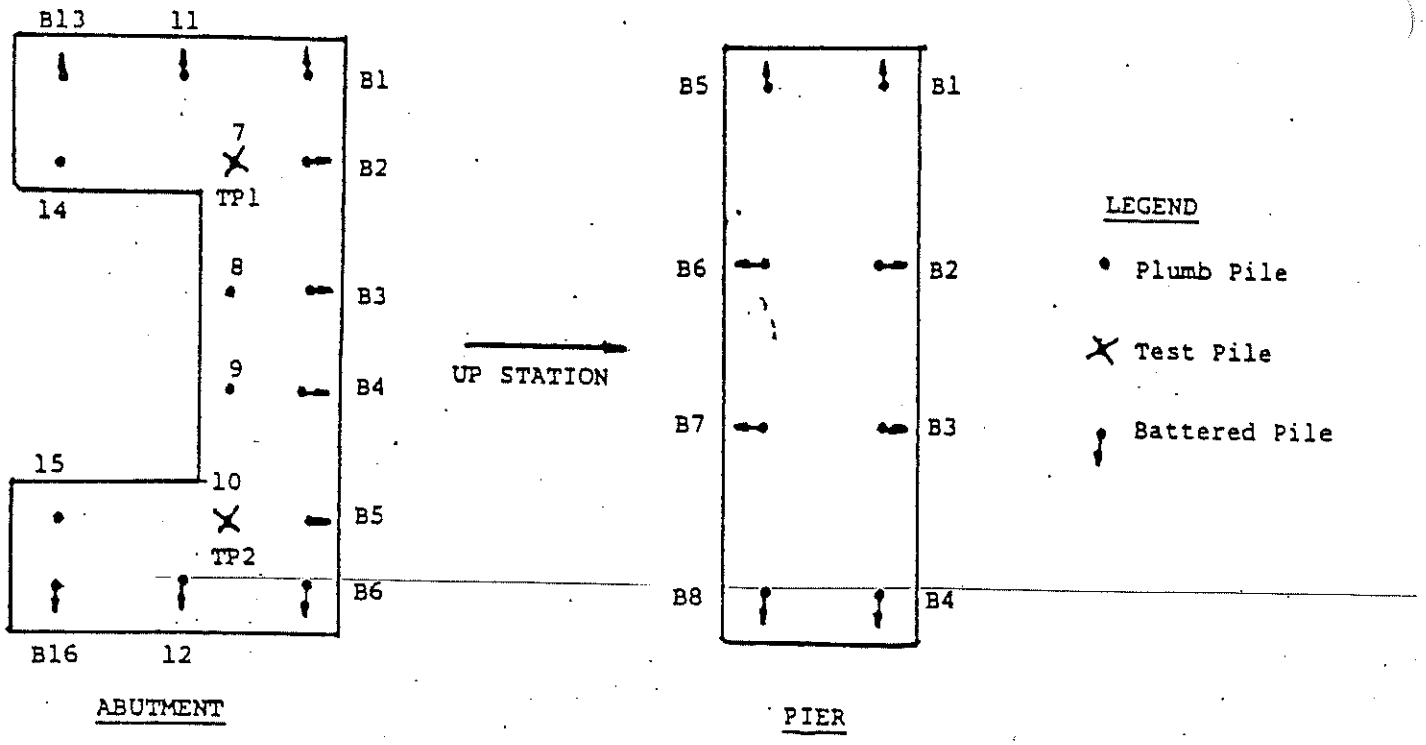
Prior to driving, the top portion of the report should be filled out. Of special interest is the lower line beginning with "Pile Material." The first space on this line should include a brief but complete description of the type pile driven. In the case of a timber pile, the tip diameter should be measured and recorded, as well as the butt diameter. The latter is measured at a designated distance from the butt (PER AASHTO M168), and this distance should be so recorded. The pile length should be entered on the report, and if the pile is made up in sections, the lengths used in the make-up should be recorded on the reverse side of the report. If trimming is necessary during driving or if a cut-off is made after driving, this information should be entered on the reverse side of the report. If any notes or data are recorded on the reverse side of the report, place a conspicuous note to that effect at the bottom of the sheet.

Four columns must be filled in during the course of driving. They are: penetration below ground, blows per foot, steam pressure (or air as the case may be) in lbs. and strokes per minute. Later, the other columns may be filled in. Energy in ft. lbs. will be recorded at each operating speed if it is a function of speed, otherwise one entry will be sufficient at the top of the column. Bearing in tons for friction piles should be calculated with applicable formulas from the specifications or from formulas designated by the engineer. Any pertinent remarks during the course of driving should be entered in the remarks column. The remarks would include such information as breakdowns. unusual pile or equipment behavior, shutdown and start-up times, reasons for shut-down, etc. After completion, each test pile report should be turned into the resident engineer for further processing.

As a last note, test pile driving should be continuous once driving has started (except for shut-downs incident to splicing). At no time should the contractor be allowed to cease driving for a prolonged period of time. If a prolonged shut-down necessitated by equipment failure occurs during driving of a test pile, an adjacent plumb pile location should be used as a nev test pile location.

Ordering Production Pile Lengths. The specifications require that the contractor prepare an itemized pile order list (after driving the test piles and performing necessary load tests) which must be approved by the engineer before the actual ordering of the piles. The list should show the number of each pile length ordered and in what portion of the structure they are to be driven. The engineer's check of the list should verify that the pile lengths will allow for reasonable variations in penetration.

Driving Production Piles. Before driving of production piles begins, the resident engineer should prepare a pile numbering sheet (if none has been included in the plans). The system of pile numbering, for the sake of clarity and uniformity throughout the Turnpike should be as follows: The numbering should run from left to right on each structural unit (abut. ftgs., pier ftgs.) as one faces up-station and should commence at the high station side of the structural unit and proceed to the low station side row by row. Each structural unit should have its own numbering sequency. Test piles should be included in the general pile numbering and should also bear the test pile numbering as discussesd previously under "Driving of Test Piles." Batter pile numbers should have the prefix "B". An example is shown on the following page.



TYPICAL GENERAL PILE PLAN NUMBERING

The inspector should be supplied with a pile plan with the piles numbered thereon as specified above and with a full set of the results of borings in the area, plotted to scale, which should show the underground stratification. Also needed are tables or graphs indicating the approximate bearing capacity of the type pile being driven for a range of blow counts encompassing the blow count required for the desired bearing capacity. These blow count-bearing capacity tables or graphs should be speeds near and at the manufacturer's designated speed (in the case of double-acting hammers).

As incidental equipment, the inspector should have a clipboard, a watch equipped with a sweep second hand (for counting hammer blows), a good flashlight (for illuminating cast-in-place pile interiors), a 100-foot tape and a six foot ruler.

The resident engineer should conduct a meeting, prior to commencement of driving, at which responsible contractor's personnel, the resident engineer and the pile inspectors should be in attendance. Subsurface and surface conditions should be outlined and discussed. Minimum and maximum driving requirements should be stated and the reasons for their adoption given. Driving procedures should be outlined, covering driving sequence, handling and storage of piles, the need for complete excavation prior to driving, and the necessity

for safety. Objectionable practices should be mentioned, such as retardation of stroke, breaking of the hammer suspension cable, driving out of alignment, and the insertion of wood chips in the driving head during driving. The need for correct hammer speed in the case of double-acting hammers and full stroke for single-acting hammers should be emphatically stressed.

The resident engineer should make sure that the inspectors are aware of the basic principles of pile driving. For example, it is sometimes found that inspectors ignore the hammer speed of double-acting hammers and the stroke length of single-acting hammers being unaware of their crucial importance in making a valid determination of pile bearing capacity by means of the dynamic formulas.

Others are unaware of the great variation in energy absorption characteristics of various cushioning materials and the effect caused by the insertion of fresh material near the end of driving. It should be made clear to the inspectors that if fresh cushion material is necessary near the apparent end of driving (as may legitimately be the case), the blow count should not be considered valid until time has been allowed for the cushion material to be reasonably well compacted.

The inspector should initially make sure that pile position, plumbness or batter are correct. During the course of driving, it is important to be alert for damage to the pile head, which can waste pile energy and indicate erroneously high pile bearing capacity--this damage should be trimmed when necessary. Near the end of driving, the inspector should time the hammer speed, making sure it is correct, and check the air or steam pressure. Finally, record the blow count for the last foot of penetration.

If metal piles are used and welding is expected in the course of the work, each inspector should have more than a working knowledge of good welding practice and, if necessary, should be supplied with a good manual on the subject. It goes without saying that the welders should be thoroughly experienced and prequalified by a testing laboratory. Poor welding will cause no end of problems such as splice failures during driving and water leakage in shell piles. Usually, one will find that a contractor is as anxious as the inspector to secure a good welder since costs can skyrocket with too frequent weld failures. It should be added that another source of weld failure is resumption of driving too soon after the weld is completed. The weld should be fairly cool to the touch before driving of the pile is resumed.

If a pile fails during driving, it should be pulled and redriven; or if this is not possible, the situation should be reported to the resident engineer with a view to driving a replacement pile adjacent to the pile which has failed.

This discussion has of necessity touched only a few brief highlights of pile driving, and it is therefore recommended that those who may have only a rudimentary knowledge of the subject consult and study a book or manual giving a more extensive treatment of the subject such as "Pile Foundations" by Robert D. Chellis.

A necessary part of the inspector's and resident engineer's duties in production pile driving is the preparation of reports. Two reports are required, the "Inspector's Daily Pile Driving Report" and the "Pile Driving Summary" which are discussed as follows:

Inspector's Daily Pile Driving Report (Production Pile Report). This report is essentially self-explanatory (see next page for example). The piles are entered in the order in which they are driven each day (including test piles if they form a part of the structure). The pile number refers to the plan number as assigned by the resident engineer. Test piles are labeled as such. Type S or T refers to steel or timber piling. Elevation of top of pile after driving is taken before cut-off. The last column, blows per inch for last 12 inches, will not be necessary in the case of steel bearing piles driven to absolute refusal. Each finished daily report should be turned in to the resident engineer for further processing.

Pile Driving Summary. This report is to be filled out for each footing by the resident engineer. (An example is shown on the page following the daily pile report. The information for this report should be extracted from the inspector's daily pile driving reports. The top of the report should contain information identifying the structure, the pile location (pier number or abutment), the contractor and the make and type of hammer. The symbols W, H & E are defined as follows:

W = Weight of Striking Ports of Hammer in Lbs.
H = Height of Fall of Ram in Ft.
E = Manufacturer's rated energy delivered by hammer at recommended operating speed or at the speed attained in the field.

The bearing value may be obtained from the contract documents. The data for each pile should be entered on the report in the numerical order shown on the pile plans, not in the order of driving. All piles should be entered on this report including test piles (if they are included in the structure). Test piles are labeled as such.

S _____ of ___ Recorded by _____ _____
Office Engineer

THE NEW JERSEY TURNPIKE

1990 WIDENING PROGRAM

P. C. WHIZZES & ASSOCIATES
NEW BRUNSWICK FIELD OFFICE

INSPECTOR'S DAILY PILE DRIVING REPORT

Structure No._____ Pier No._____ Date _____ Shift _____

Pile Driving Contractor or Sub _____ Make & Size of Rig _____ of Hammer _____

Pile No.	Type S or T	Batter	First Length	Second Length	Cut off	Total Length	Cut-Off Elev.	Elev. Top of Pile After Driving	(blows per inch) Driving Log (for last 12 inches)

Signed _____
Inspector

THE NEW JERSEY TURNPIKE
1990 WIDENING PROGRAM
P. C. WHIZZES & ASSOCIATES
NEW BRUNSWICK FIELD OFFICE

PILE DRIVING SUMMARY

Structure No. ________________ Pier No. ____________ Sheet ___ of ___

Pile Driving Contractor or Sub ______________________________

Make and Type of Hammer ______________ W: ______ H: _____ E: ______

Bearings required by Specifications ____________ Tons

Pile No.	Date Driven	Pile Type	Pen.Last 20 Blows	S	Bearing in Tons	Original Length	Point Elev.	Cut-off Length	Pay length for Driving
Estimated point elevation on plans									
								Total this page	

Average Bearing This Pier ______ Tons

Pay Quantity for Furnishing Piles (Approved Ordered Lenghts) ____________ lbs.

Pay Quantity for Driving Piles ____________________ Lin. Ft.

Signed ____________________
Resident Engineer

Signed ____________________
Project Engineer

Most of the columns need no discussion with the exception of the following. The information for the column headed "Penetration Last 20 Blows" will be extrapolated from data contained in the inspector's "Daily Pile Driving Report," i.e., from the column labeled "Blows per Inch for Last 12 Inches." The column labeled "S" contains the "Set" value which is simply the average penetration per blow for a designated number of final blows, in this case 20 blows. The column headed cut-off lengths will represent pay cut-off if such an item exists; therefore, bear in mind that individual cut-offs under one foot in length are not measured for payment. It would be wise to label each non-pay cut-off as such. The "Pay Length for Driving" will depend on the definition of pay length provided by the specifications for each contract. Ordinarily it is simply the total length of pile picked up and driven minus the cut-off length; but as stated above, this will not necessarily be so. In addition, test piles are usually paid as a separate item, so ordinarily no pay length or cut-off length would be entered for them on the Pile Driving Summary Report.

The last box at the bottom of the "Point Elev." column should contain the estimated point elevation given on the plans. Cut-off lengths and pay lengths for driving should be totaled at the bottom of their respective columns. If there is a pay item for cut-offs, the non-pay cut-offs (less than 1 ft. long) should not be included in the cut-off total. Also, label the cut-off total as "Pay C.O. Total" in the event that an item for this exists.

The bottom of this sheet contains three last lines which are to be filled in "Average bearing this pier" is also to be determined in the case of abutment piles and should be so labeled. The pay quantity for furnishing piles (approved ordered length) refers to steel piles and will be entered in the appropriate space if the contract contains an item for same. The unit for this item is usually lbs. and is based on the theoretical weight of all steel piles ordered from contractor's lists and approved by the Authority. This weight should include both permanent piles and test piles, whether driven as permanent piles or not. The theoretical weights will be taken as the nominal weights, as given by recognized trade handbooks. The "Pay Quantity for Driving Piles" is, of course, obtained from the approprite column above. The Pile Driving Summary Report should be signed by both the resident engineer and the job project engineer. A pile sketch showing pile numbers and relevant Test Pile Reports and Inspector's Daily Driving Reports should be attached to it, and it should be filed until the end of the job, at which time it is turned over to the Authority with other job records.

The set-up of pile reports as discussed above of necessity referred to the most general type jobs encountered, and it is to be expected that the reports described may have to be modified to include other essential data or items on some contracts. If any doubt arises as to the make-up of reports, the General Consultants are available to offer guidance.

Part 5 - Pipe Jacking

When the Turnpike construction is being done adjacent to an existing active embankment which cannot be trenched across, it may often be necessary to install sleeves through the old embankment in order to provide continuity for new drainage and utility lines. Such sleeving operations are extremely sensitive since they disrupt the coherence of the old embankments which could cause sharp differential settlements leading to abrupt pavement failures. To avoid these consequences, rigid standards have been developed for performing such work.

Engineers are not authorized to revise these standards without the express consent of the Turnpike Authority.

General Requirements for Installing Sleeves Under the Turnpike Roadway

1. All sleeves under the Turnpike roadway shall be installed by a "jacking" method. Boring will not be permitted.

2. If a mucking auger is used, the auger must be attached to the sleeve in a manner that will keep the cutting edge at least one (1) diameter behind the cutting edge of the sleeve. When a mucking auger is used, said auger shall completely fill the inside of the sleeve. If there is any indicatiaon that more than a normal amount of material is being removed, the auger shall be reversed to maintain as much pressure as possible on the plug. If materials should still discharge from the sleeve in a quantity that could threaten settlement of the pavement, the end of the sleeve shall be closed in such a manner as to prevent any further material discharge.

3. The contractor shall submit a detailed schedule of the method of operation including a description of the method and equipment to be used. Detailed drawings of the jacking pit shall also be submitted for review and approval.

4. Jacking shall be performed on a 24-hour basis once the sleeve has passed a point ten (10) feet from the near shoulder and until it has passed a point ten (10) feet from the far shoulder.

5. The sleeve shall be of new steel pipe having a minimum thickness of 0.375 inches. 0.500 inches is preferable.

6. The horizontal limits of casing under all roadways must be at least from toe-of-slope to toe-of-slope and in most cases from fence line to fence line.

7. The cover minimum shall be 6 feet under roadway and 3 feet under ditches.

8. Sheeted pits may be constructed if ten (10) feet from the edge of the paved shoulder. Sheeting must be left in place and cut off two (2) feet below grade.

9. Unsheeted pits are not permitted within 30 feet of the edge of the paved shoulder and cannot have a slope steeper than one to one facing the roadway.

10. Test borings should be taken before starting the job.

11. The engineer must constantly check the line and grade as the pipe is jacked.

12. Jacking and hand mining is the best method because the inspector has continuous visual inspection of the material being removed.

13. If a jacking machine is used with an auger as a vehicle for removing the material, the machine must be able to jack independent of the auger.

14. Jetting will not be permitted under any circumstances.

Part 6 - Subsurface Structures

General. Subsurface structures as discussed herein includes all underdrains, bleeder drains, storm drains, pipe culverts, sewers, water pipe and gas pipe. The comments in this part of the manual are limited to specific Turnpike requirements and are not meant to be a full treatment of the subject. All subsurface structures should be placed before the paving work is done. If it becomes necessary to install any such structure after the paving is down, it should be placed either by jacking or tunneling and not by trenching through the new or old pavement. The engineer's inspection personnel should be experienced and should rely heavily on the Turnpike Standard Specifications and any of the many available handbooks on the subject for further guidance.

Excavation. The excavation for a structure should be adequate to accommodate the structure to be installed and should provide sufficient working space and room for forms and bracing if required. Economy will generally dictate that the excavation be the minimum necessary. This is usually desirable for stability also. Undisturbed natural ground under and at the sides of the structure will ordinarily furnish better support for the structure itself and the embankment to be constructed over it, than will backfill.

The trench for an underdrain should be at least the width as shown on the plans. A trench may be dug with vertical sides in stiff clay or other stable earth but in most other types of material will have to be given a slope to counteract the tendency to cave in.

Excavations with depths as specified in OSHA shall have the sides sloped back to a stable condition per the Federal requirements or shall be sheeted or shored.

The contractor should find and the engineer should check the exact location of any existing buried utilities before permitting the contractor to commence excavation.

The maintenance of temporary drainage during excavation and installation of new drainage facilities is extremely important. This is generally the contractor's responsibility by contract, however the engineer must watch this closely to prevent any possibility of flooding or washouts of embankment affecting the flow of patron traffic.

Foundation. It is essential that the foundation under a structure provide support as firm and as nearly uniform as possible under the entire bearing surface. Whenever conditions permit, the bottom of the excavation should be on solid ground for its full length and width. If it can be avoided, culverts should not be placed partially on filled ground and partly on undisturbed natural ground because of the probability of unequal settlement which might distort or break the structure. If part of the culvert must be on filled ground, the filled material should be placed in thin layers and thoroughly compacted so that it will provide a foundation as nearly comparable to that afforded by the natural ground as possible.

For installation in new embankment, the embankment should be constructed and thoroughly compacted to a height at least three feet above the elevation of the bottom of the structure. The excavation should then be made in the compacted fill.

Unstable foundation material should be removed and replaced with satisfactory material to the extent practicable. If this cannot be done reasonably, a layer of sand, gravel or other suitable material should be placed on the foundation and worked into the unsatisfactory material until a stable foundation is formed. If a pipe culvert is to be placed in rock excavation, the rock should be removed at least six (6) inches below the bottom of the pipe and a well-compacted cushion of gravel, sand or other suitable material should then be placed as a bed for the pipe. When bell and spigot type is used, holes should be excavated to fit the bells so that the pipe will have uniform bearing throughout its length rather than resting on the bells.

Cambering of a culvert grade line may occasionally be considered before installation of the pipe is started. Subsidence varies widely depending on the fill height, the depth of foundation soil to a solid stratum and the compressible character of the foundation soil.

Camber should not be used as a substitute for foundation stabilization. Poor foundation should be corrected before installing culverts and the amount of camber should be based on the foundation soil profile after stabilization.

Installation and Backfill. Before beginning installation, it is the engineer's responsibility to see that the contractor reestablishes grade controls before setting any structures. Treatment of specific installation methods for the many types of structures is beyond the scope of this manual; however, the appropriate sections of the Standard Specifications spell out the Authority's requirements.

Backfill material should be the best available in order that uniform bearing may be provided. Granular material is preferable. In any event, the material should be free from muck, large stones, lumps and rubbish. To obtain uniform pressure against the pipe or structure the backfill material should be placed in layers about 6 inches thick and thoroughly compacted. Add water if necessary to bring the material to the optimum moisture content for maximum consolidation. To avoid displacing or unduly stressing the structure, backfill on both sides simultaneously.

In the case of pipe culverts, there should be ample compacted material on each side of the pipe. Special care should be given to tamping material under the haunches of pipes. Excessive compactive effort under the haunches may raise the pipe above intended grade.

Density tests shall be made in adequate or required number. Material with low density shall be removed and replaced with material which is fully compacted.

The backfill for trenches and other small areas should be deposited and compacted in thin layers. hand tampers or mechanical tampers are normally used. Whenever space will permit, the backfilling may be done by means of tractors and bulldozers, special backfilling attachments for tractors and power shovels or other suitable equipment, and the compacting may be accomplished by means of rollers.

Special Installations

Bleeder Drains. These drains are intended to provide positive drainage paths for the structural section of the project. The locations and spacings are as shown on the plans. Consideration should always be given to eliminating these drains entirely where the underlying embankments are constructed of free draining sands.

Bleeder drains are generally constructed after the shoulder has been paved or subbase placed. Great care must be given to compaction of the backfill material to insure that a bump does not develop on the completed shoulder due to subsidence of the backfill material. Gravel, crushed stone or an open graded plant-mix bituminous material may be used as filter rock. An absolute minimum of 3" of asphalt concrete is needed to backfill the top portion of the drain up to finish shoulder grade; a 6" thickness is preferable.

Added Facilities. If it becomes necessary to install additional or revised storm drain facilities due to field conditions, the project engineer should generally use Class IV reinforced concrete pipe. Corrugated metal pipe should be used only for temporary drainage installations.

Ladder Rungs. The Turnpike has a specially designed ladder rung for use in access-holes, catch basins and drop inlets. The step on the rung is dropped to reduce the possibility of accident or injury during use. The engineer who might be unfamiliar with Turnpike design standards should be alert to guard against substitutions of conventional ladder rungs.

Part 7 - Concreting

General. The inspection of concrete and concreting operations is one of the most important jobs the engineer will have in the inspection of construction. It requires continuous inspection from the design of concrete mixes to the curing of the concrete in place. The engineer must assure adequate coverage of all these phases of concreting operations and support this inspection by the keeping of thorough records. An inspector is always present at the point of discharge of concrete into the forms.

The American Concrete Institute (ACI) "Manual of Concrete Inspection" is an excellent aid with regard to proper and adequate inspection coverage. The engineer should provide a copy of the latest edition of that manual to each inspector and laboratory technician assigned to concrete inspection. The ACI manual, this construction manual, and the specifications should be used conjunctively and the inspector must be acquainted with all three.

Under contract with the Authority, a commercial testing and inspection laboratory will render certain services related to the design and plant control of concrete mixes. These services will be discussed further under their appropriate headings.

Mix Design. The contractor is required to design all concrete proportions. Past experience suggests the ACI method as very suitable for this purpose. Once the job mix formulas have been established, there should be no modification permitted without careful restudy of the design calculations.

Sampling and Testing. Sampling and testing of all materials to be used in the production of concrete will be performed by the laboratory in accordance with accepted methods noted in the specifications. As promptly as possible after the performance of tests, the laboratory will submit written reports of the test results to the Authority and the engineer. Reports of tests should note whether or not the materials tested comply with the requirements of the specifications. If tests show that a material does not meet the specified requirements, the engineer should be verbally notified by the laboratory at once. The engineer and the contractor can then explore ways and means of obtaining a material which will meet the job requirements. Possibly, it will be necessary to seek other sources of supply to find acceptable materials. In this case, the laboratory should be advised and directed to proceed with testing.

Concrete test cylinders will be prepared by the engineer's inspector at the job site. The Authority requires that four or six test cylinders be made for each 100 cubic yards of concrete of each class placed during a day of concreting. This may be waived for minor work such as filling fence post holes. At least one set of cylinders should be taken for each major portion of a structure (such as a pier bent or a deck section) placed during the day. In other words, the cylinder sampling should be as representative as possible of major elements of a structure and should be made at the rate of at least four every 100 cubic yards.

Sampling of fresh concrete should be done in accordance with ASTM Designation C172, and cylinder preparation should be as directed by ASTM Designation C31.

The methods for preparing the specimens can be found in the ACI Manual. Some of the more important points to follow are:

1. Proper positioning of the specimen molds on a firm and level surface.

2. Representative sampling of the plastic concrete. Best results are achieved after the concrete has been placed in the conveying bucket or deposited in the forms. (Do not obtain sample while the concrete is moving down a chute or falling from a bucket. Representative sampling is next to impossible that way.)

3. Extreme care in storage, curing, and handling of the specimens should be exercised from time of casting to receipt in the laboratory. Closely follow instructions in this regard. Storage at the site should be limited to forty-eight hours in a centrally located curing box. This is followed by prompt shipment to the laboratory for controlled curing.

Identification tags and transmittal forms for the specimens should be furnished to the inspector. It is the inspectors duty to see that the specimens are properly identifed and that the pertinent test data is transmitted with the cylinders.

The entire procedure from obtaining the specimens to their delivery to the testing laboratory should be under the direct supervision of the engineer.

The contractor is responsible for the safe and timely delivery of the specimens to the testing laboratory. Generally, the laboratory provides a "pick up" service. The contractor should be encouraged to use this service, as the laboratory has the equipment and personnel necessary for proper and careful handling and transporting.

The laboratory will perform all necessary tests of the specimens and report results to the Authority and the engineer as promptly as possible. Should the test results and other job records indicate the possibility of faulty concrete in the structure, the engineer may request that cores be taken for further testing. Should this be the case, the coring will be done by the laboratory under the supervision of the resident engineer or inspector. Complete details of the coring operations must be recorded by the inspector, e.g., location, position and size of core; speed of the bit (R.P.M.); depth of core and time required to drill to each depth; re-steel encountered, if any, and position of the re-steel in relation to the concrete surface.

Batch Plant Inspection and Control. The laboratory will assign an inspector to the batching plant, whether at or away from the job site. It is the engineer's responsibility to see that the inspector performs the following duties:

1. Determine the free moisture in the aggregates so that the correct scale weights of the various size batches can be given to the plant operator. This should be done well enough in advance of the time the first batch is scheduled to be proportioned so that there will be no delay to the contractor in the placement operation. From charts prepared in advance, the weights of cement and wet weights of aggregates, at different percentages of moisture content for the various batch sizes, can be determined. When large quantities are involved, the moisture content must be rechecked at regular intervals. Always get a moisture check when the operator is changing the hoppers from one stockpile or scow to another.

2. Observe the weighing and charging of ingredients of all batches for the job. Bring to the attention of the operator any discrepancies in weights and see that adjustments are made.

3. Periodically check gradation of aggregates to see that they come within the range specified.

4. Be on the alert for improperly functioning and worn equipment -- particularly for worn blades in mixer drums. Report any such deficiencies to the engineer at once.

5. If winter concrete, see that the aggregates and water are adequately preheated to the desired temperature.

6. If concrete is from a transit mix plant, send with each batch a signed slip to the job site inspector, giving the size of the batch (Cu. Yds.), the scale weights for that batch, the quantity (in gallons) of water contained in the aggregate, and the quantity of admixture (if any) in the batch.

7. If concrete is from a central mix plant, the slip must also contain the load number and the time the truck left the plant.

8. Keep adequate and clear records of the batching operation.

Job Site Inspection

Preparation for Concreting. Actually, the inspection of concrete placement starts well in advance of the arrival of the first batch of concrete, preferably the day before. All preparations that have gone before must be checked and approved before concrete placement can be allowed to begin. Forms must be checked for soundness and alignment. They must be free of dirt, rubbish and other foreign matter. Forms also must be wet down prior to the placement of concrete. Reinforcement steel must have the proper clearance, be securely tied (at alternate intersections) and supported, and free from oil and mud. For deck concrete, it is extremely important that a clear distance from the surface of the finished deck to the near surface of reinforcing bars or trusses be maintained at a minimum of 1-1/2". If the concrete is to be founded on soil, grades must be correct and the soil should be well compacted. When placement is in the winter, the soil must be entirely free of ice. Preparations for protecting the concrete, such as insulating of forms and/or preheating should be made well in advance.

It is imperative that the contractor not postpone these preparatory operations until the first batch of concrete arrives at the site. Quality work requires time for preparation.

Mixing. The ACI Manual covers mixing operations quite thoroughly. Overmixing of concrete can be harmful, particularly in the case of air entrained concrete. Insist that the operator adhere strictly to the mixing time of each batch. The efficient and proper maintenance of mixing equipment is of great importance in the production of concrete of the quality required on the Turnpike--the revolution of the mixer drum should be maintained at its rated speed; water tank valves and gauges and time devices should be in proper working order at all times.

Concrete delivered to the project in transit mixers should not be agitated enroute nor should the water be added to the mix until it reaches the job and is ready to be placed. The inspector determines the amount of mix water to be added from the weight chart and plant inspector's batch data ticket. When directing the operator to start mixing, it is best to state what slump the concrete should be and to initially mix with a little less water than is computed to be required--adjustment for undervatering in a transit type mixer is simple. Adjustment for overwatering is never satisfactory in high quality work.

After completion of the mixing cycle, it is important that the concrete be quickly discharged and placed into the forms. Any appreciable delay in handling and placement will result in over agitation and premature initial set. Prolonged delays are cause for rejection. Tempering concrete, once properly mixed, by adding more water, should not be permitted under any circumstances.

Placing Concrete. Detailed placement instructions can be found in the ACI Manual. Equipment should be in good operating order and be kept clean. Long chutes and tremie pipes should be equipped with baffle plates to prevent segregation. Free fall of concrete from bucket chute or tremie should not exceed five (5) feet and concrete should be deposited in uniform and near level courses of not more than one foot in thickness.

Air entrained concrete handles somewhat differently than non-air entrained concrete; the primary differences being that the air entrained concrete is more tacky, more difficult to finish and appears to have a greater slump than actually exists. The air content of the mix should be checked for each truckload, preferably by the pressure meter method of test as described in ASTM DESIGNATION: C231 ("Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method"); or by the volumetric, or pycnometer procedure set forth in ASTM DESIGNATION: C173 ("Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method").

Concrete used in extruding machines for slip forming, such as on median barriers, is restricted to a 1" slump.

Placing concrete by pumping methods is often the most economical method available to the contractor. The Turnpike specifications do not prohibit pumping, but it is important that proper mix design and placement procedures be followed.

Pipe, chutes, or any other containers made of aluminum must never be used to transport concrete. Aluminum reacts with cement to produce hydrogen gas, thus creating high voids and reduced strength.

Compacting Concrete. Refer to the specifications and the ACI Manual for detailed instructions. Require compaction of plastic concrete with internal vibrators, gasoline or electric powered. The contractor should maintain this equipment in good working order and should have one or more spares as standbys. Vibrators are not designed to move or spread concrete in the forms. Discourage this practice whenever it is noticed.

Finishing Concrete. When finishing concrete, two important points should be kept in mind:

1. The finish should be uniform and planar. (On bridge decks, use a broom finish when the concrete surface is to receive an overlay. Use a rake finish if not.)

2. The surface should not be overworked.

The latter is a prime cause of poor surface durability. The finishers should be made cognizant of this fact and should be closely supervised by the inspector.

Concreting in Cold Weather. The casting of concrete in freezing or near freezing weather requires considerable attention in the field. This is left to the discretion of the resident engineer who should consult with the contractor to work out the necessary details for the protection of the concrete to suit the conditions and specification requirements. ACI 306 entitled "Cold Weather Concreting" is an excellent resource reference.

Concreting in Hot Weather. Provisions for placing concrete and protecting against access heat in hot weather is provided in the ACI-305 reference materials. The engineer should have these specifications readily available and guided by this standard.

Thermo Curing of Massive Concrete Pours. The specifications under Subsection 401.11 (G) provides for themethods required in the event a massive pour may be encountered. The engineer should study these details thoroughly and reviev with the contractor well in advance of the placement of concrete.

Curing Concrete. By no means is the inspector's job complete when the last bucket of concrete is deposited. It must be seen that the concrete is properly protected and cured in accordance with methods outlined in the specifications. Further information regarding the inspection of concrete under cure can be found in the ACI Manual. The inspector should be familiar with these points.

Records and Reports. Complete and concise field records of the entire concreting operation must be kept by the inspectors. From these records, the formal concrete report will be prepared. It is necessary that the inspector submit a formal report for each individual pour. A sample is shown on the next page.

THE NEW JERSEY TURNPIKE
1990 WIDENING PROGRAM
P. C. WHIZZES & ASSOCIATES
NEW BRUNSWICK FIELD OFFICE

CONCRETE RECORD

Structure_____ Contract_____ Contrator_____

Weather_____ Mimimum Temperature_____ Date_____ Report_____

Location in Structure_____ Class Concrete_____

Mixer Type Size-Cu. Ft. Speed RPM Av. Mix Time Method of Placing

Concreting Time
Started Completed Elapsed Lost

Explanation of Time Lost

Materials	Type	Proportions Weight	Proportions Volume	Theoretical Yiel
Cement				
Fine Aggregate				
Coarse Aggregate				
Water				
Admixture				

Batches Mixed	Batches Rejected	Materials per Batch Used	Cement Lbs	Fine Aggregate Lbs	Coarse Aggregate Lbs	Water Gallons	Cubic Yards per Batch	Total Cubic Yards Used

Total Cubic Yards Placed Today_____

Number of Test Cylinders Made	Cubic Yards Sampled	Slump in Inches	Numbers Placed on Test Cyclinders

Remarks:

P. C. WHIZZES & ASSOCIATES

_____
Inspector

_____
Project Engineer

_____
Resident Engineer

Most of the report is self-explanatory and only a few sections which may need clarification will be discussed here.

Materials should be described by type, trade name, source or whatever other information is needed to fully identify it. The section on proportions should list proportions by weight, based on a 94 lb. sack of cement and by volume, based on the cement volume having a value of unity. The only exceptions are water and admixture where it is necessary to note only the quantity, in gallons and ounces respectively, per sack of cement. All entries in the proportion section are theoretical. The theoretical yield is in cubic feet and is based on the quantity shown in the weight proportion column. The yield of an air entraining admixture is the theoretical volume of air created per sack of cement.

All material weight information in the section on batching is obtained from plant inspection tickets. Each line indicates the number of batches supplied at the given batch volume, e.g., a line may read 11 batches mixed (first column) at 8 cubic yards per batch (next to last column). The last column would show a summary for that line, which in this case would be 88 cubic yards. Also, indicate in a convenient place the average free moisture in the aggregate for the day (obtainable from the plant inspector) and the average air content, if any, for the day. The latter will be found by field test. Note any substantial deviations in air content from normal and in what batches they occurred (identify by trip ticket number).

If test cylinders are made, note the pertinent information in the spaces provided at the bottom of the page.

All Daily Concrete Records will be made out in triplicate; one copy for file, one for the Authority and one for the General Consultant. Each report must be signed by the inspector, the resident engineer and the project engineer. All pertinent trip tickets and plant inspection tickets should be attached to each file copy of the report, and the file copy will be stored until the end of the job.

The duties of the concrete inspection team are summarized in the following table:

DUTIES OF CONCRETE CONSTRUCTION INSPECTORS

Batching*	Mixing	Placing
Verify the use of approved materials	Receive batch certif.	Check clearance of reinforcement
Monitor aggregate moisture	Monitor mixing time	Insure adequate vibration
Check batch weights	Add retarders as required	Time finishing to guard against drying
Prepare batch certif.	Conduct tests on slump, air, temperatures	Apply cure at proper time

*This inspection service is usually provided by a testing laboratory.

Part 8 - Steel Erection

General. The steel erection inspector must have final sets of plans, specifications, and copies of the approved contractors' shop drawings and erection drawings.

Both the engineers' and the contractors' drawings will contain numerous erection notes that should be strictly followed. These notes are prepared to cover the conditions of erection, and it is essential that they be followed in order to eliminate any change of damage to the structure. This is especially important in long heavy spans. It is essential that the inspectors become familiar with these notes because superintendents frequently ignore them and not always understand requirements which may be design oriented.

Erection over Traffic. Before the contractor can erect any steelwork over active roadways, a detailed erection schedule must be submitted. The provisions of Subsection 802.03E will generally be used for this work. The erection plan must be submitted by the contractor to the engineer for review ten (10) days prior to the erection.

Because of the exactness of the work and the timing involved, the contractor must plan the operation in every detail, overlooking none. The erection schedule that accompanies the traffic permit should include, but not be limited to, the following:

The date and time of the expected delivery of the steel.

The proposed route of the steel delivery to the job site. This should include the Turnpike Interchange that the steel will enter the Turnpike. A State Police escort is required for large steel beams travelling on the Turnpike.

The equipment to be used for the erection. Be certain that the equipment is of the proper capacity for the job to be done.

Where each piece of equipment to be used for lifting and setting the steel is to be located on the roadway.

Where lane closing will be placed.

By what means the steel will be lifted. Whether or not slings or clamps will be used for the operation.

The contractor's procedure for the actual erection of the steel is usually as follows:

Determine the center of gravity of the steel to be lifted and mark each piece.

Shoes are put in place. Fixed shoes are bolted and movable shoes are snugged-up so they can be moved.

Take care that erection marks do not show in finished work with A588 steel.

Hook on the stringer, be sure tag lines are provided.

Lift into place.

Set stringer.

Brace in place; normally with chain ratchets and diagonal bracing.

~~Movable shoes are set and bolted down.~~

Prepare second stringer for lifting. This means bolting diaphragm to stringer while on the ground. Bolt at least four (4) diaphragms.

For lifting follow same procedure described before.

Set second stringer.

Bolt diaphragms to first stringer in place.

Curved stringers are always set in pairs. Two (2) stringers are bolted together on the ground prior to lifting in place.

The same procedure applies for long, light, flexible stringers. They should be set in pairs.

It is the intent of the Turnpike traffic regulations that the staging of construction be such that the erection of steel over traveled roadways be kept to a minimum; however, when it becomes necessary to erect steel over traveled roadways, all lanes of the roadway shall be closed to traffic by means of a slow down as specified in Subsection 802.03(E) for no longer than a five (5) minute period at any one time, and then not again until the flow of traffic has become normal. Traffic shall be stopped only with the assistance of the State Police.

In order to protect traffic below, substantial planking or other suitable platforms will be placed betweeen the stringers after erection and firmly secured or wedged into position above the bottom flanges before any further operations may proceed over traffic. No work will be permitted over traffic until underbridge sheeting protection is placed.

Erection on Falsework. When steelwork is erected on falsework, it is necessary to see that the proper camber is placed in the span just before bolting is begun. Before swinging the span, the essential joints, except compression joints, should be bolted or completely filled with pins and bolts. Check the Specifications to verify that compression joints should be bolted after the span is swung. Joints which carry little or no dead load, such as lateral members, need not be bolted immediately provided at least 50 percent of the holes are pinned with full size drift pins careful review with the designer is necessary.

Record of Steel Erection. The resident engineer will prepare from the shipping invoices a record of the steel delivered, the steel erected, steel riveted or bolted, and steel painted. This record may be kept in any form or manner suitable to the engineer, but should be such that the quantities of steel in the various stages of erection can be readily determined for purposes of daily and weekly reports and for payment on the monthly estimates.

The inspectors' daily reports shall give the span numbers and panels where steel is being erected. Each member shall be listed by its erection number which is marked at one end in white paint. The general locations where permanent bolts are being placed must be shown and the total daily numbers of each type of fastener will be reported along with the results of tension testing of permanent bolts.

Erection by Cantilever Method. For erection by cantilever methods, the plans or the approved shop and erection drawings will contain various notes that should be strictly followed. The final camber of the span will depend upon the accuracy of the shop work and the avoidance of slip in the joints during erection. Such slip may not be enough to prevent bolts being entered in the holes, but the cumulative effect will be to get structures distorted and out of shape, with humps and kinks. After the work is finished, there is no chance to correct the camber.

Follow the drawings closely. Members which will be in compression after the span is finished, and therefore shortened, may be in tension during erection and therefore stretched and lengthened - so the appearance may be deceiving.

Bolted Structural Joints. In the assembly of structural members, the use of high strength bolts as permanent fasteners is incorporated in most designs for Turnpike bridges. In some instances, a combination of rivets and bolts will be permitted by the designer, rivets being used in the shop and bolts in the field.

Bolts, nuts and washers most commonly used in bridge construction are manufactured from two basic grades of steel: high strength carbon steel and high strength alloy steel. The plans or specifications will give the grade or grades of bolts that are to be used for the various connections. Each bolt will have an identifying mark (letter and numeral) stamped on its head to indicate the grade. Shipments of bolts should be checked at the job site to make sure that the specified grade or grades are being delivered. Other grades should not be used in the work unless specifically approved by the Authority in writing. The two grades most commonly used are ASTM A-325 high strength carbon steel bolts and ASTM A-490 high strength alloy steel bolts.

An excellent aid to the inspector and complement to the job specification regarding bolted structural joints is a pamphlet entitled "Structural Joints Using ASTM A-325 or A-490 Bolts". This pamphlet is distributed by the Industrial Fasteners Institute. The address is 1517 Terminal Tower, Cleveland, Ohio 44113. No inspectors' kit should be without a copy.

An inspection of bolted joints requires constant diligence and keen awareness of work techniques necessary for a good job. some important points to keep in mind are:

(1) Cleanliness of contact surfaces within the joint, including those next to the elements of the fastening device (bolt head, nut, or washer) is critical. These surfaces must be free of dirt, grit, reamings, burrs, etc. In friction-type joints, the contact surfaces shall also be free of paint, lacquer or galvanizing. In the latter case, the specification will state whether or not the surfaces are to have a protective coating.

(2) The slope of surfaces of bolted parts in contact with the bolt head and nut shall not exceed 1:20 with respect to a plan normal to the bolt axis.

(3) Bolt holes shall be a nominal diameter not more than 1/16" in excess of the nominal diameter of the bolt.

(4) Bolt tension. Each fastener must be tightened to provide the minimum tension required after all bolts in the joint have been completed.

(5) Installation and tightening. Bolts shall enter holes freely and without resort to driving. Be sure that the correct sizes and lengths of bolts are used for the various joint thicknesses. The plans or specifications will state how much of the bolt (threaded section) will extend beyond the nut face; this is generally 1/4" for any size bolt. This is important to insure adequate tension on the one hand and the exclusion of threaded shank from the shear planes on the other. Bolts may be tightened by the use of load indicating washers. Follow the manufacturer's recommendation.

A careful review of the source of all bolts is essential in order to avoid counterfeits.

All erection bolts, of course, must be removed from connections and replaced with the specified bolts.

Location of Shoes. The plans will show the locations of the shoes with respect to the longitudinal and transverse centerlines of piers, pedestals or abutments and will also show the elevations to which the shoes are to be set. These shoe locations are determined on the assumption that the steel work will be fabricated to the exact length required; frequently, particularly on long spans, this does not prove to be the case and the span has a "growth" which is generally provided for in shoe location tolerance. The exact method to be used by the inspector in getting proper location of shoes will depend upon various factors. A few typical cases are given below as a guide.

(a) For columns supporting low spans up to 200 feet apart the centerlines of shoes can be located by direct measurement using the distances given on the drawings and assuming no "growth" in the spans.

(b) For all spans supported on piers or pedestals so high that the distance from pier to pier can not be readily secured by direct measurement and for all long spans it is best to locate the shoes by triangulation. Assuming that the first shoe located is the fixed shoe, the second shoe or expansion shoe should be located so as to be centered under the pin or other bearing centerline for "normal" conditions. The Plans will designate the "normal" condition. The inspector must then find the difference in length of span between that for "normal" conditions and that for the current condition.

The rockers are set vertical under full dead load and normal temperature. The change in length due to temperature is determined by using a coefficient of expansion of 0.0000065[1] per foot per degree F. If the structure is being erected wholly or partially by cantilevering it is quite unlikely that the stresses are known at the time the structure reaches the pier on which the shoe is to be set, consequently no exact location of the shoe can be given the contractor at that time. The exact location will have to be deferred until the cantilevering stresses are eliminated and the span fully set. Then the span must be jacked up and the shoes moved from their temporary location to the final corrected position.

Setting Shoes. The plans or Specifications will describe whether shoes are to be set on bush-hammered concrete surfaces finished to exact elevations, on a mortar packing, or in some other way.

[1] If set on bush-hammered surface, a thin grout or neat cement should be spread over the bearing area and the shoe set in it, the only purpose of the grout or cement being to fill the small pits and crevices in the surface and to give a tight seal between steel and concrete.

If set in mortar packing the shoe should be set in the required position by means of steel shims along the edges or with leveling screws if these are provided. A non-shrink mortar just wet enough to pack well, shall then be forced under the shoe. The best method is to set up wood strips slightly higher than the required height of mortar on three sides of the shoe and about one inch clear from shoe, then force mortar under the shoe from the open side all the way across the shoe area to the wooden strip. Mortar should be added in quantities small enough to permit thorough solid packing as it is placed from far side to near side by means of a thin narrow board or bar used as a ram. Mortar should extend one inch beyond shoe all around. Be careful not to permit any load to be placed on the shoe until the mortar has had time to set.

For bases of columns of viaducts, grout filling may be required by the Plans, in which case there will be a hole or holes through the base plate for grouting. The shoe will be set and adjusted to correct elevation on four or more steel wedges. (Railroad spikes sometimes serve). Strips of wood will then be clamped around the shoe to provide tight dams set dams one inch from edge of shoe all around. Each should have a hole with a plug which can be removed to verify that contact of the grout. Grout should be mixed to the consistency of heavy gravy in sufficient amount to fill at one pouring the space under the shoe and also the enclosed pocket above the shoe so that there is at least one ft. and preferably 1.5 ft. of head on the grout. This will assure full flow and proper contact. Plugs will be pulled and replaced to verify conditions and the wood strips left in place for two days.

Location of Upper Shoes, Rollers and Rockers. For the fixed shoe it is only necessary to set the upper shoe directly over the centerline of base. The upper shoe at the expansion end will invariably be keyed to the lower shoe by means of a tooth bar or dovel attached to a steel masonry plate. Remember that the centerline of pin at the expansion end is directly over the center of the shoe only under normal temperature and dead load. Check all bearing points to make sure they are clean, smooth and true.

Expansion Joints. Particular care should be used to secure proper setting of floor steel at expansion joint so as to avoid interference at maximum expansion and to get a smooth riding joint. The plans give precise information as to the gap to be provided at various temperatures and this must be adhered to in setting the steel joints. use a straight edge to see that both sides of joint, over full width of roadway, lie in the same plane. On fingered joints watch the clearance between teeth; frequently teeth are cast or cut so that there is inadequate side clearance for the teeth at extreme expansion. Do not permit the joints to be permanently bolted in place and the floor slab poured against them until this clearance condition is correct, as it is extremely difficult to correct later.

Curb Alignment. Take care to get good alignment on curb. Poor alignment will be quite noticeable to the traveling public and gives a poor appearance to the completed structure.

Welding Rods. It is extremely important that the correct electrodes be used for all welding. These requirements will be spelled out in the specifications and approved working drawings. The inspector must be certain that only the approved welding rods are used in the work.

Sandblasting & Painting. All A588 steel within a specified distance of an open joint may be painted. Beyond that, the Authority generally requires that only the exposed portions of fascia girders over roadways be sandblasted. However, erection marks may be sandblasted and require that the entire surface be done for uniformity. Any deviation in these requirements should be brought to the attention of the General Consultant.

Where an existing painted structure is to be extended, the contract should contain provision for painting the exposed painted steel to match the color of the new unpainted steel. If no such provision is made, the engineer should advise the General Consultant.

Part 9 - Bridge Decks

Of all the various elements of construction used on the Turnpike, the most troublesome to maintain have been the bridge decks. Extensive, expensive, and disruptive repairs have been almost continually necessary on older bridges. For this reason, the Authority is determined to make a special effort to achieve the highest quality attainable on new bridge decks so as not to repeat this unhappy history.

Principal Cause of Bridge Deck Failure. There is an abundance of evidence to show that the principal cause of concrete bridge deck failure has been the high tensile stresses exerted internally by the expansive products of corrosion in the reinforcing steel; and that the corrosive process is created and accelerated by the presence of chloride ions used in deicing salts.

Understanding this fact will help to explain why many of the requirements for bridge deck concreting are more stringent than for other elements of concrete construction. It is vital that the strictest attention be paid to every aspect of bridge deck work so as to minimize the potential for deck deterioration.

Contributing Factors to Bridge Deck Durability. Anything that inhibits chloride ions from coming into contact with reinforcing steel contributes to bridge deck durability. Thus the following list is meant to be instructive, but is by no means complete:

Quality Concrete. Good concrete is of itself a natural passifier of aggressive agents of corrosion. Among the factors contributing to quality concrete are a sufficiency of cement (at least 600 lbs per cubic yard), a low water/cement ratio (no more than 0.5 by weight), air entrainment (at least 4.5%), and adequate curing. In the absence of other information, slump is frequently an indicator of water content; so high slump is anathema on bridge deck work. Because the top surface -- where the salt is applied -- is so critical, special concrete with no slump, or latex modified concrete, is often specified for the top two inches in the deck.

Protected Reinforcement. Adequate cover over the top reinforcing steel (at least 2"), sufficient temperature steel to minimize shrinkage cracks, the use of epoxy-coated bars, and prohibiting walking on the reinforcing mat during concreting, all help to contribute to the protection of reinforcement steel from chloride intrusion.

Good Construction Practices. Common sense precautions are vital to assure durable results. Plan the deck work so as not to be concreting during temperature extremes. Consolidating (vibrating) the plastic mix in place is essential to achieve density of the mass and to assure a full bond with the reinforcing steel mats. Finishing operations are frequently over done. A mirror-smooth finish is not desired; a true plane will do. Sprinkling water on the screeded surface is prohibited because such a practice raises the water/cement ratio in the top fraction of an inch and reduces the strength and other properties of the concrete at the most critical surface -- where the tire meets the slab.

Check List. Before a deck concreting begins, the resident engineer or inspector should do the following:

1. Verify that all the required reinforcement is in place and is securely tied.

2. Pull the screed over the quarter-points of the span and measure the clearance to the top mat of reinforcement.

3. Check all screed guides for vertical and horizontal alignment. Is the slab as thick as the plans require?

4. Check all screed guide supports for stability.

5. Make sure all screed guide joints are connected so that they will remain firmly in place during concreting and finishing but may easily be disconnected later.

6. Make sure all workers (especially finishers) are qualified and properly equipped.

7. Check to see that the quantity and size of equipment is adequate and that all equipment is in good condition.

8. Be sure that the number of workers is adequate.

9. See that the batching plant provides enough trucks and has the capacity to maintain continuity of delivery during the work.

10. See that all curing materials are on hand and ready for immediate use.

11. Make sure that key contractor's personnel are aware of the sequence in which concrete is to be placed and the manner in which it is to be cured.

12. Make sure that finishing procedures and equipment will be adequate.

13. Know the names and duties of key supervisors so that communications can be effective and contract requirements will be maintained.

14. Make sure that all forms are clean.

15. Make sure that the forms are watertight.

16. See that water is available for curing.

On bridge deck work, it is required that two qualified inspectors be present; one for batch mixing and one for concrete placing.

Nearly all new bridge decks and bridge approach slabs on the Turnpike are given an asphalt overlay before being opened to traffic. So finishing operations need only be minimal; in fact, as a rule, only screeding and planning, preferably by one pass of a finishing machine, should be necessary.

Latex Modified Topping. The manufacture recommendations must be followed thoroughly. Before placing latex concrete the surface must be scrupulously cleaned by sandblasting or some other powerful means. The entire surface must then be thoroughly vetted for at least one hour prior to placing the mix. Specifications generally require 7 sacks of cement and a water/cement ratio of 0.3 to 0.4 by weight and a slump of no more than 6 inches, which is measured four to five minutes after mixing. Mixing operations require the use of specially designed mobile mixers. The topping should not be placed at temperatures lower than 45 degrees F. The resident engineer should insist that a technical representative of the manufacturer of the latex emulsion admixture be on the site for the first full day of operations. Rotating cylinder type finishing machines are required for a proper finish. Surface texturing is performed before a plastic film is formed. Curing is achieved by pre-wetted burlap. The burlap should be covered over with a white polyethylene within one hour of placing the burlap. The entire curing system must remain in place for at least 24 hours. The surface is then air cured for four days.

Lov Slump High Density Concrete Topping. This method as developed in Iowa requires that the specifications be thoroughly understood and followed. This topping also requires a sandblasted surface followed by an air blast cleaning before placement. Unlike the requirements for latex, the surface for low slump topping should be dry. The surface is then brushed with a stiff grout of equal parts of cement and sand. Specifications for the mix frequently require 8.75 sacks of cement, a maximum size aggregate of 1/2", a water/cement ratio of 0.33 by weight, and a slump of 3/4" with a tolerance of plus or minus 1/4". Air content should be on the order of 6%. An alternating screed finishing machine is used. Texturing is done after the surface is firm. A wet burlap cure is required for three days.

Part 10 - Electrical Installations

General. The electrical inspector must have a broad view of the complete project and understand all aspects of electrical construction work. There are three major considerations in inspection of electrical construction work. These are discussed in the following paragraphs under the headings Materials, Installations and Coordination with Other Work.

It is the contractor's responsibility to make all required materials available at the job site at the proper time and to complete all work in accordance with the required completion date for each phase of the construction sequence. A competent inspector, however, will evaluate the work with foresight and guide the contractor as necessary so that scheduled completion dates can be met.

One of the things the inspector must do at the commencement of the project, which is often neglected, is to act as a liaison between the design office and the contractor and assure timely submittal, review and approval of shop drawings. Failure of this very important task generally results in delays in placement of order by the contractor for the purchase or manufacturing equipment or materials. Obviously, the end result is delays in the delivery of equipment and materials, especially those critical items with long lead time; such as lighting standards, luminaires and cables; which often affect the construction schedule of the project.

Materials. The plans, specifications and approved shop drawings are the inspector's guide for all materials. They should be strictly adhered to. No substitutions should be allowed without the approval of the General Consultant. The following categories and check lists of materials that may appear in the contract documents should be of help to the inspector.

Sampling and Testing. Sampling and testing, especially of conductors, should be undertaken by the engineer on a spot check basis. Samples should be obtained by the engineer and forwarded to the assigned testing laboratory to insure compliance with specifications.

Conduits. Underground conduits may be rigid metallic (galvanized steel), rigid non-metallic (PVC-Utility Grade, Schedule 40 or Schedule 80 or cable duct, polyethylene flexible tube extruded over the cable assembly). Schedule 80 PVC conduit is generally used for installations beneath paved areas; such as roadway crossings, toll plazas, parking areas, etc.

Conduits installed on structures, embedded in concrete bases for lighting standards and junction box foundations, and all exposed conduits are generally rigid metallic (galvanized steel) with the following exceptions.

Usage of flexible metallic conduit and rigid aluminum conduit for exposed conduit installations shall conform to the plans and specifications.

Before installing any conduits, check to see if the inside face at each end has been reamed and all burrs removed. This step eliminates a possible source of damage when installing cable or wires.

Cables and Wires. All cables and wires should be checked in accordance with the following list prior to an installation:

1. Are the cables and wires of the specified size?
2. Are they the right type?
3. Do they conform to the specified color coding?
4. Are the conductors solid or stranded? Is stranding of the right class?
5. Are the insulation and outer jacket of the specified type and do they have the required thickness?
6. Have the manufacturer's certifications been checked against the specifications?
7. All ground conductors shall be as required in Subsection 918.02.

Lighting Standard Bases, Concrete Junction Boxes, Junction Box Foundations and Access-holes. The engineer should check the following items regarding all precast concrete bases, junction boxes, junction box foundations and access-holes at the manufacturer's plant. This inspection is generally delegated to a testing laboratory, but this check list will be useful in instructing the laboratory.

1. The specified concrete strength.
2. Reinforcing steel size and placement.
3. The radius of conduit elbows cast in bases.
4. The proper positioning of the elbow in the base so that it projects within the bolt circle at the top and is at the correct elevation at the lower portion of the base.
5. The setting of the anchor bolts at the top of the base or junction box foundation so that they conform to the specified bolt circle and match correctly the holes in the lighting standard transformer base.
6. The placement of the bolt couplings so that they will be flush with the top of the base and foundation portion of the junction box foundation.

7. All inserts for cable racks, grounding studs and other equipment which may be called for on the plans and pulling irons which are to be cast in the junction boxes, junction box foundations and access-holes.

8. The size, spacing and alignment of all knock-outs in junction boxes, junction box foundations and access-holes.

The above check list is also applicable to floodlighting tover foundations and access-holes which may require cast-in-place type construction.

Lighting Standards. The following check list should be used for inspecting lighting standards.

1. Are the lighting standards of the required type?

2. Do the shafts and bracket arms have the specified length and wall thickness?

3. Do the size and spacing of bolt holes on various components conform to the requirements?

4. Check the type and material of hardware.

Luminaires, Ballasts and Lamps. The following check list should be used for these items:

1. Are the luminaires and lamps of the required type and size?

2. Are the ballasts of the required type, size and voltage?

3. Check the seal around the primary and secondary wiring pig-tails of the remote ballasts (used generally for series lighting systems and on limited applications for multiple lighting systems) and assure that they all are visually appeared to be properly water sealed.

4. Check luminaires to see that the hinge, latch, and gasket combination provide a tight and positive fit between the luminaire housing and the refractor holder.

5. Check lamp socket position for the required light distribution.

Other Materials and Equipment. All other materials and equipment such as floodlighting towers, power and control equipment, and cable connector kits shall conform to the plans, specifications, and approved shop drawings.

Installations. It is the inspector's responsibility to see that the contractor complies with the specified installation methods. Deviation from these methods will generally result in inferior work.

Trenching and Backfilling. The bottom of all trenches should be uniformly graded and should have a few inches of compacted material on which to place the conduit. If the bottom is irregular, nonmetallic conduits, especially utility grade PVC, may be damaged during backfilling operations.

Some trenching contractors interpret backfilling as a single operation, a front end loader pushing in a two feet thick lift of material and then riding back and forth over the trench. This procedure is not acceptable. Proper backfilling consists of placing a number of lifts of specified thickness and tamping of each lift. Care should be taken in tamping the first lift because of the proximity of the nonmetallic conduit.

Setting of Lighting Standard Bases, Junction Boxes and Junction Box Foundations. After excavating for the lighting standard bases or junction box foundations, the bottom of the hole should be tamped and leveled. The base should then be set to its proper grade and not more than 2" above finished grade as level as possible in order to avoid shimming of the lighting standard. Excessive shimming will not be tolerated. In setting junction boxes the bottom of the excavation must also be tamped and leveled and the box then set with the top flush with or slightly below the finished grade. Crushed stone should be placed beneath the junction box and junction box foundation drain holes to provide for drainage.

Conduits. Conduits shall be connected and terminate at junction boxes. Junction box foundations and access-holes shall be made in conformance with plan and specifications requirements.

Cable ducts shall be a single piece for each run between junction boxes, junction box foundations and access-holes. No cutting and splicing will be permitted.

Exposed metal conduits on structural steel shall be supported at specified intervals by means of specified or otherwise an approved type parallel, right angle or edge type conduit clamp. It is absolutely essential that the conduit clamps used for this application shall be of such design to withstand normal structural vibration without any loosening or other types of failure. Clamps and clampbacks for conduits installed on concrete surfaces should be affixed to the surface by means of approved lead expansion anchors.

All conduits required to be left empty for use by others or for future use should be provided with drag cored.

Cable and Wires. Before installing cables and wires, underground conduits should have a mandrel pulled through to clear any foreign matter that may have entered while making up the lengths of conduit in trenches. After the inspector is certain that all conduits are clear, the contractor may begin pulling in the cables, taking care that no excessive strain is placed on them. An approved pulling compound or soap powder should be used to facilitate this operation.

Installation of cable connector kits shall be in accordance with the manufacturer's instructions. When standard splices are required, approved connectors, rubber insulating tape, and electrical tape should be used. In order to achieve a dependable underground lighting distribution system, all splices, including cable connector kits, should be wrapped as specified to insure positively water-moistureproof and submersible type connections.

All cables shall be color coded for phase identification with surface coating by the manufacturer or by means of colored taping by the contractor, as specified in the contract specifications.

All cables should be provided with full length of slack and supported by means of cable racks in all concrete junction boxes, junction box foundations and access-holes.

Lighting Standards and Luminaires. Most roadway lighting contractors make up the complete pole assembly on the ground and then erect them.

The inspector should check the bolting of the bracket arm to the shaft and make sure that all component parts, such as the ballast, lamp and luminaire have the same rating. All standards must be truly plumb with bracket arms at right angles to the adjacent roadway.

Prior to installation of each luminaire, the proper lamp socket position to produce the specified light distribution, as indicated on the plans and/or specifications shall be checked and verified.

Positioning of most luminaires shall be truly horizontal, whereas the some luminaires may be truly horizontal or slightly tilted toward the street side, as fastened to the end of the bracket arm in accordance with each luminaire manufacturer's installation

instructions. In order to achieve this requirement, a leveling eye should be used resting on the top flat section of each luminaire and level it in two directions, parallel and perpendicular to the roadway.

Before installation of each lamp, the lamp installation code (2 digit number indicating the month and the year of installation), by means of scratching the lamp base should be marked neatly, in order to provide the necessary input data for the Authority's computerized inventory system.

It is important for the construction inspector to check and document this work during the installation stage and to properly fill out the inventory forms which should be submitted to the General Consultant as soon as a completed circuit is energized. This information initiates the manufacturer's warranty dates outlined in the contract documents and enables the Authority's Maintenance forces to obtain replacement parts under the terms of the individual contracts..

A sample form is included on the following page.

The height of floodlighting luminaires as well as the aiming should be carefully checked to assure that the area to be lighted will receive the intended lighting. Where hardware is be stainless steel, a magnet should be used by the inspector to ascertain this requirement.

Grounding. All lighting standards, concrete junction box and access-hole frames, ballast cases, conduits in lighting standard bases and junction boxes, all metal cases of equipment and panels of the electrical system must be properly grounded. The various grounding devices consist of ground rods, grounding terminal lugs, insulated grounding bushings and bare, stranded, tinned wire or grounding straps. The inspector should refer to the plans and specifications for the appropriate use of the above.

Tests. All tests prescribed in the specifications shall be performed by the contractor in the presence of the inspector. Prior to energizing the complete lighting system each circuit cable should be tested to see that there are no shorts in the system.

Coordination with Other Work. There are often some electrical items which are installed prior to the start of work by the electrical contractor. These are usually underground conduits installed beneath roadways, ramps, and toll plaza areas, conduits and junction boxes in safetywalks of structures, and anchor bolts for lighting standards on parapet walls. The inspector must check these items before the electrical contractor begins work. The following list will be helpful in making this check:

1. Proper drainage in bridge junction boxes.

CONTY. CODES

N = NEW RECORD
C = CHANGE TO EXISTING RECORD
D = DELETE RECORD
R = RESTORE RECORD
T = DEPT. OF TRANS.

RECORD C 35

LAMP DATA 01 THRU 10
BALLAST DATA 01 THRU 05
LUMINAIRE DATA 01 THRU 05

} USED ONLY TO CHANGE A SPECIFIC PART OF RECORD.

POLE KEY NO.	CNTY	ACC.	POLE TYPE	1 LAMP SIZE	BATCH NO	1 BALLAST SIZE	1 LUMINAIRE SIZE	LUM. TYPE	INSTALL. DATE	OLD LAMP DATA SIZE	BATCH NO.	10 CARD	SEQ. NO.
1 2 3 4	5 6	7 8	9 10 11 12	13 14 15 16 17	18 19 20 21	22	23	24 25 26 27	28	29	30 31 32 33	34 35 36	37	38 39 40 41 42 43	44 45 46 47 48	49 50 51 52	53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	78	79 80

2. Correct size of ballast recess in junction box, where required.

3. Where conduits in safetyvalks pass through expansion joints, provide proper expansion couplings with grounding straps.

4. Correct spacing, alignment, and projection of anchor bolts in parapet walls for lighting standards.

5. Conduits placed under ramps and roadways may be a major trouble spot. These conduits normally terminate in a junction box which is to be installed under the roadway lighting contract. The junction box is usually placed within a few feet of the curb or edge of shoulder; and if the existing conduits do not match the holes in the junction box, time consuming delays and expenses are incurred in making corrections.

All of the above work precedes the roadway lighting contracts. The electrical inspector should also coordinate the work with a thought toward future contracts. Installation of guard rail and delineators, for example, can damage underground conduits if the conduits are not placed to proper lines and grades.

It takes time and money to repair breaks in conduits and cables after guard rail posts have been driven through them. The specifications provide for hand excavation for test pits for guard rail posts where guard rail may interfere with any utility. It is the inspector's job to make certain these holes are dug by hand. The contractor is not permitted to gamble on missing the conduit.

Utilities. The roadway lighting contract may also include providing conduits for the incoming electric service and for telephone facilities. The utility companies involved have certain standards and codes that must be met. Underwriters certificates shall be obtained by the contractor wherever the specifications provide for such inspection. Underwriters approval of roadway lighting circuitry is generally not required.

In addition, a certificate of inspection of the electric service installations, as required by the Utility Company prior to making any service connection, is to be obtained by the Contractor from an Electrical Inspection Agency, approved by the Utility Company. This inspection should be performed a minimum of 15 days in advance of the actual date of scheduled service connection to be made by the Utility Company.

Part 11 - Signs

General. New construction on the Turnpike will require the construction of many new sign installations in three main categories; the common fixed message type, emergency speed warning and speed limit signs, and rotating drum type signs. The latter type utilize heavy mechanized units requiring special design and construction techniques mandated by the dead load weights.

Fixed message signs can be thought of as either ground mounted or overhead signs with the overhead units being categorized as span, cantilever and butterfly type. Special consideration must be given to the inspection of fabrication for these structures. Instructions for inspection should be revieved by the General Consultant prior to issuance to the assigned testing laboratory.

The engineer shall follow the standard drawings when revieving shop drawings for the signs and other traffic control devices required. Sign installations on bridges or viaducts or in roadway areas having height limitations will require special consideration on the part of the engineer.

Traffic control devices may be required on local roadways belonging to other agencies. In such instances, the engineer shall coordinate all placement and installation details with the agency having control over the roadway.

Structures support signs in an overhead position for better visibility and positive lane designation. These basic purposes must be kept in mind when changes during construction necessitate relocation of a sign structure.

Where arrows are positioned on signs with respect to certain lanes of the roadway, relocation of a sign may negate the effect that was intended. When a new location or alteration in panel becomes necessary, the General Consultant should be consulted to assure mutually satisfactory changes.

Contractor's Operations. The contractor will usually order the fabrication of sign structures early so that this work can be completed while foundations and conduits are being installed in the field.

The contractor should also be cautious in handling and storing sign panels to avoid abrasion or damage to the reflective surfaces.

Installation of panels can be performed with best results in the fabrication shops and should always be done there if possible. When this work cannot be done in the shop, it can be done on the ground at the job site. Panels can be laid flat for installation and fixtures can easily be bolted into their respective positions. The shop assembly method is particularly advantageous when the sign is to be erected over existing traffic. It results in a minimum of interference with traffic and a maximum of safety for workers and motorists. The choice of methods remains with the contractor, and care must be taken not to interfere with that choice by dictating which method to use.

Prior to delivery, all rotating drum units must be shop inspected and the operating mechanisms shop demonstrated to verify satisfactory performance. Mounting of rotating drum units as mentioned previously requires special consideration and planning.

Fabrication schedules are extremely important to timely completion of sign installations. The engineer should solicit this information as soon as possible from the contractor and keep the General Consultant fully advised on needed delivery schedules especially for sign components which may be supplied to the contractor by the Authority.

Review of Shop Drawings. Before erecting sign structures, the contractor is required to submit fabrication and erection plans to the engineer for review. These drawings show the sign panel dimensions, span lengths, post heights and anchor bolt layouts. The purpose of the review by the engineer is to confirm that these basic measurements conform to the contract plans and any changes that have been made before fabrication begins.

In making this review the engineer should be satisfied that the following dimensions will be maintained:

1. The span length will provide the correct horizontal dimensions.

2. Elevation of the footing pedestal will be correct.

3. Elevations shown will provide the minimum vertical clearance of 17 feet.

4. Materials and techniques of fabrication are in accordance with Authority issued standard drawings. No deviation from these standard requirements is to be permitted without the written consent of the General Consultant.

The contractor is responsible for material furnished and any non-approved material used must be removed and replaced at the contractor's expense. The inspector shall verify that all required certificates of compliance are in the project records. Field inspection should be made for condition of material at time of arrival and for compliance with plans, specifications and shop drawings. Should a question arise in regard to acceptability of a material or finished sign, the inspector shall refer the matter to the project engineer for clarification. Substitution of a similar item will not be permitted unless specifically authorized in writing through the General Consultant.

Substitution for specified painting procedures will not be permitted.

Inspector's Duties. Prior to starting concrete sign base construction, inspectors assigned to the work should carefully study the plans, specifications and supplementary specifications and become familiar with the requirements therein. Layout should be checked in the field as soon as possible to determine any omissions or necessary changes that might require contract change orders.

Foundation locations as shown on the plans may conflict with existing or other proposed underground facilities, and relocations may be necessary. Surface structures, such as curbs or pavement, should be scheduled to follow the sign foundation work.

Before approving placement of concrete, the engineer should be sure that pedestal reinforcing steel and anchor bolts are firmly secured to prevent movement during vibration. In the case of sign bridges, a final check should be made of the distance between bases, assuming no tolerance, and caution used in centering pile type foundations. Always be sure that the service conduit is installed. The tightness of anchor bolt nuts can be tested by holding a finger against the side of the nut and tapping the top of the bolt with a hammer. Both shop and field connections on the entire structure should be given a final check for tightness.

Sign supports to be mounted on structures require coordination with the bridge plans and checking during bridge construction to assure proper placement of anchors and conduits. The slope of the structure is an especially important consideration that is sometimes overlooked.

Special Note. Often different features of construction, such as bridge abutments and lighting structures, are in different contracts and there is no unified overview of critical interrelationships. Before placing permanent roadside signs, the project engineer should carefully examine the proposed location to avoid putting the sign where its visibility will be impaired.

Lighting Requirements. Unlike sign panel fabrication, the sign lighting system is generally installed in the field rather than the shop. The following design requirements should be strictly adhered to by the inspector in the field.

All overhead sign structures on the Turnpike are illuminated. The overhead sign structure lighting shall be attached to luminaire support channels and/or maintenance walkway.

The lighting unit shall be adequately gasketed and have weep holes placed so as to effect maximum drainage.

The electrical conduit used on all overhead sign structures shall be of rigid or flexible aluminum or galvanized steel in conformance with the contract plans and specifications. Generally, all conduits and associated fittings installed on aluminum members shall be aluminum, and all others shall be galvanized steel. The fittings for each type of conduit shall be of cast metal, compatible with the conduit prescribed for that location.

All attachments of conduit to the tubular members shall be by "U" bolts and back-up bars. Drilling and tapping of any overhead sign structure member to install any electrical equipment will not be permitted unless a thorough design analysis has been reviewed by the General Consultant.

Inspection forces should pay careful attention to the handling and storage of sign structures at the job site. The contract documents generally cover methods of handling and close coordination with the designers is required to assure the proper blocking and "pick" points that are necessary to avoid structural damage to the signs. Common sense should be exercised on the various attachments to the signs to avoid damage to sign panels, changeable message signs and other appurtenances.

Part 12 - Fencing and Guard Rail

General. The engineer should review the planned locations of guard rail to make sure that each installation is at the proper location. The review should be made before the contractor orders the rail. It is also well to check on the ordering of curved rails that have to be formed in the shop as it may cause inconvenience and possible delay. Any review of the planned guard rail installation toward the end of the job should be done early enough to permit the contractor to get materials and perform the desired additions without delays.

Two types of fences are generally used on Turnpike construction -- farm field fence and chain link fence. Both are normally located one foot inside the property line on Turnpike property. The arms atop chain link fence are sloped outwards and away from the Turnpike right-of-way. The main purpose of fence is to control access to Turnpike property. Occasionally chain link fence is used near service areas to discourage attempts to cross the Turnpike roadways by vehicular or pedestrian traffic.

It is the Authority's policy to fence all property lines. Offsetting of fence to any location other than the prescribed one foot distance to miss obstacles such as trees or for any other purpose is not permitted without the written consent of the Chief Engineer. Dead-ending a fence without a security closure is also prohibited. Complete security during construction, including temporary fencing as may be required, is the Authority's determined policy.

Inspection Requirements

Guard Rail. The inspector must have full knowledge of the Turnpike Standard Specifications for the guard rail to be constructed. The proposed locations of the guard rail as staked should be reviewed and it should be ascertained that the guard rail is properly placed to prevent the possibility of a vehicle running behind the guard rail. All changes should be approved by the resident engineer.

The pavement centerline should be established in order to align the guard rail posts. Generally steel posts are driven.

Posts should be set plumb, spaced as specified and the top of the posts set to the design elevation. Be sure the rail laps are in the direction of vehicular travel.

The inspector shall record the accepted lengths and locations of the guard rail sections and verify that the required tests and certificates of compliance are available in the project files at the time required.

The finished guard rail must be within reasonably close conformity with the established lines and grades and conform to the tolerances listed in Section XI of this manual.

Specifications clearly hold the guard rail contractor responsible for locating lighting conduit which may be in close proximity to guard rail installations. This detail has been troublesome in the past and is pointed out here so that the engineer will take every precaution to see that roadway lighting is not damaged during subsequent guard rail installation.

When rails are to be fastened to bridges with bolts, the engineer shall make sure that they are not overlooked and are properly positioned. Measurements for assembly and positioning for final alignment and grade should start at the bolted end. Be sure to check the contract provisions for the method of payment of guard rail on bridges. In some cases, the rail is included as part of a lump sum price for miscellaneous items on the bridge. Other times, the rail is paid on a unit price basis.

The installation should be revieved and checked for effectiveness during all conditions affecting visibility.

Guard rail materials are often stockpiled on a job for a considerable period of time; and unless they are cared for properly, they may become damaged or deteriorated. The engineer should review the materials as to their acceptability immediately before installation.

Fences. The inspector shall become familiar with all specifications and special detail drawings. All locations should be staked well in advance of any work by the contractor so as to avoid delays. All proposed locations should be revieved and, if changes either in location or type of fence are desirable, the approval of the General Consultant should be obtained for such changes the contractor furnished with a revised list.

The inspector should inspect the installation or erection of all items of fencing to verify that the posts are erected true to line, that the wire, fabric and hardware are attached to the posts in the proper manner and at the proper elevation (with the wire installed on the specified side), and make certain the posts are firmly installed. Aluminum coated parts with stainless steel hardware is generally used on chain link fencing. The inspector should use a magnet to check the hardware.

The inspector shall record the accepted quantity for the types of fences and gates installed. Measurement for payment shall be as stated in the specifications. The inspector shall verify that the certificates of compliance have been submitted by the contractor.

Fence construction is often an intermittent operation and may extend from start to finish of a contract. The contractor may wish, for reasons of security, or be required, by environmental considerations, to install fence as a first order of work. Check the contract.

The engineer must provide the contractor the necessary information relative to right-of-way lines, location of corner posts, gates or changes in type of fence. The exact staking requirements for staking right-of-way lines is spelled out in the Standard Specifications.

Before permitting fence construction to start the engineer must be sure the materials entering into its construction have been approved.

Good fence construction practice requires careful attention to line and grade. A string line is used as a guide to maintain alignment and to eliminate minor variations in the grade of the top of the posts as posts are being set in their final position. A carpenter's level is used to assure that posts are vertical.

Careful attention should be paid to connections to existing fences and the location and construction of gates.

Concrete in post holes should be poured to a point slightly above the surrounding ground and rounded on top to shed water.

Wire and fabric should be taut and spaced as shown on the plans with the specified clearance under the fabric to prevent children and small animals from crawling under the fence. In this respect in order to provide this clearance, filling of areas should not be permitted but high spots between posts should be excavated, thereby assuring a stable surface.

Fences should not be located so as to obstruct flow in streams or drainage areas. In most cases it is possible to return the fence to the headwall, either placing it in or immediately behind the headwall, thereby leaving the channel free of any encumbrance.

It is also possible that fences must be constructed on the top of retaining walls and wing walls. Wherever this type of construction is necessary the engineer should check the location of post holes and be sure provision is made in the forms for the walls for future installation of the posts.

Clear records must be kept as to type of fence installed at each location as well as special details of construction such as removing existing facilities; connection to existing fences; changes in location and reasons therefore; gates and openings; labor and equipment used; and other data pertinent to the finished product. Fences are seldom completed in one operation, so dates are very important and should be noted for each operation.

Care should be taken during the clean-up operations to remove all stakes, strung lines, wire and other debris from the area.

SECTION XVIII
ENVIRONMENT

Part 1 - Existing Features

General Considerations. The environment is important to all of us and no license has been granted to anyone in the construction industry to spoil it. Unsightly building sites, noisy equipment, dust laden air, and muddy streams are unnecessary, often illegal, and intensely annoying. It is the intent of this section to focus on some of the environmental assaults that occur from time to time on construction projects and to recommend ways to avoid or reduce them.

Noise. Loud noise is not only annoying, but can also cause physiological prolems in extreme cases. Among the more likely sources of excessive construction noise are pile drivers, air compressors, excavating and loading equipment, and the banging of tail gates. The contractor is required to control noise under Subsection 104.11, and the inspector should be thoroughly familiar with and enforce these provisions.

Because pile drivers operate at a point source rather than a moving source, it may be possible and desirable to erect noise shields between the pile driver and the public. These shields can be portable walls of pre-cast concrete, timber, or any other material that will serve to deflect the sound waves away from hearing groups (schools, shops, offices, apartments, etc.). Remember that sound intensity varies with the square root of the distance. So deflectors can be effective intensity reducers -- particularly where close proximity is involved.

Noise from air compressors and earth-moving equipment can and should be controlled by efficient mufflers. It is a rude and destructive disservice to allow defective mufflers to offend neighbors, irritate co-workers and, worst of all, possibly damage the hearing of equipment operators. Engineers and inspectors at the site should have no patience with such arrogance.

The banging of tail gates to extract the last traces of a load of soil, is a common practice in earthwork construction. In remote areas, the practice may be harmless; but in densely populated areas it is selfish and ought not be tolerated.

Ambient air quality. National Ambient Air Quality Standards are set for various pollutants and may be adversely affected by construction activity. It is far more likely, though, that complaints will be generated primarily by airborne particulates (dust). It is unlikely that national standards for particulates will be exceeded since they are generally based upon 24 hour measurements. However, clouds of dust rolling up behind moving construction equipment creates the perception that excessive pollution is happening. While legal standards may not be violated, common courtesy and good neighborliness are compromised. Watering will ordinarily be sufficient to keep most construction roads form offending. Where excessive watering seems to be necessary, applications of calcium chloride can generally draw enough moisture from the air to keep dust within tolerable levels.

Water pollution. Rain water run-off from construction sites is often a major contributor to local pond and stream silting. The careful placement of hay bales as barriers will help keep intrusions to tolerable levels under most circumstances. In some highly vulnerable locations, special drains and filters may have to be provided.

Aesthetics. It is the responsibility of the engineer to see that the construction site is not allowed to take on the appearance of a scarred and littered battleground. The neat storage of materials, daily removal of construction debris, and smoothly contoured grading at shifts end all help to keep complaints to a minimum -- and improve job morale, too.

Part 2 - Job Safety

General. The Authority is committed to safety and expects the engineer to maintain a close scrutiny of the contractor's methods of construction to maintain the Turnpike's excellent construction safety record. Authority contracts specify that precautions be exercised at all times for the protection of persons and property.

Job safety is the sole responsibility of the contractor. The engineer should remind the contractor whenever it appears that safety has been overlooked. However it is not intended to shift that responsibility to the engineer at anytime.

The safety provisions governing Authority, State and local laws are incorporated by reference into the contract specifications.

The Occupational Safety and Health Administration (OSHA) publishes extensive and detailed criteria on maintaining a safe and healthy workplace. The construction project engineer will be coordinating an owners controlled insurance program with the Authority's Risk Management consultant and the general consultant. The contractor is responsible to provide the engineer with specific reports as outlined in the Safety Manual which must be submitted on a timely basis.

Because both the Federal and State requirements are wide ranging and well detailed, there is no need to emphasize any single part, or group of parts, in this manual. However, the Engineer's duties with regard to traffic safety are reviewed in detail in the following Part of this manual in consideration of the unique nature of the Turnpike. This facet of the work is of great concern to the Authority and in many ways controls almost all construction operations adjacent to Turnpike roadways.

Part 3 - Traffic Safety

General. On occassion an inspector will be assigned by the engineer whose sole assignment will be the coordination and scheduling of lane closings. This inspector will also check to see that the contractor properly installs the traffic protection devices in accordance with the contract plans and specifications.

The whole purpose of a Turnpike widening program is to create an enlarged capacity for enormous volumes of traffic traveling safely at high speed. Yet to construct the widening will sometimes cause certain existing traffic lanes to be closed in order to safely build new acceleration and deceleration lanes and other features which would otherwise be dangerously close to moving vehicles. This paradox of restricting space in order to enlarge it gives rise to special problems not commonly found in highway construction. On the Turnpike, all such problems are treated under the heading of Traffic Protection. In most instances, traffic protection refers to established procedures that must be followed when closing existing lanes or shoulders to the public. It is important to remember that traffic protection is a two-fold obligation -- protection of the travelling public, and protection of the contractor's personnel.

Traffic Permit. At least ten days prior to starting any operations on the Turnpike, the contractor per Subsection 801.03 must apply through the engineer, for a traffic permit.

In applying for a traffic permit, the contractor must submit a detailed plan, including sketches, of the proposed operations. The plans and sketches should indicate the nature and location of the work, any proposed obstructions or other hazards to traffic, the approximate number of people to be engaged, the types and amount of equipment to be employed and the approximate length of time the obstructions will exist. The engineer must review the contractor's application for completeness and acceptability before forvarding it on to the General Consultant.

Maintenance and Protection of Traffic. Traffic on the Turnpike is under the direct supervision and control of the New Jersey State Police.

If the State Police should notify the engineer, the contractor, or superintendent of any abnormal condition or violation of the Turnpike regulations, all operations shall be summarily discontinued and immediate remedial action shall be taken to the satisfaction of the State Police before work is resumed.

Permissible Working Hours. The operations involved in closing a lane or in reopening a closed lane are limited to specific hours for each day of the week. These permissible working hours are given in the specifictions for each contract and must be strictly adhered to.

Lane and Shoulder Closings. Before requesting the closing of any lane, the engineer must find out from the contractor at least the following:

1. - Which lane needs to be closed? (Left, center, right, shoulder, acceleration, ramp, etc.)
   - What are the longitudinal (station) limits needed?
   - What is the anticipated starting and concluding time for the closing?
   - What sort of work will be done behind the closing?
   - Will escorts or other police assistance be needed?

2. Next, the Engineer must notify the General Consultants traffic coordinator to assure that there are no conflicts with adjacent sections.

3. The traffic coordinator must receive a completed form giving the full detils of the lane closings.

4. A weekly coordination meeting for lane closings is scheduled on a Wednesday to reviev all lane closings for the subsequent week.

5. Following this meeting the contractor should be notified whether or not the request can be accommodated through the engineer.

6. Any proposed revisions to the requested closing must be communicated to all parties at once.

Examine locations where the lane is to be closed for hills, curves, structures, or anything else that might obstruct the view of traffic control devices to the traveling public.

Establish and delineate the location of each traffic control device and the beginning of the cone taper prior to installation.

NEW JERSEY TURNPIKE AUTHORITY
LANE CLOSING REQUEST FORM

CONTRACT NO._____ CONTRACTOR _____

DATE _____ SUBMITTED BY _____ ACCEPTED BY (ENGINEER) _____

DAY AND DATE REQUESTED	MP TO MP	ROADWAY	LANE	REQUESTED INSTALLED TIME	PICK UP TIME DAY AND DATE	PURPOSE OF CLOSING

☐ APPROVED

☐ REVISE / AMEND AS NOTED AND RESUBMIT

When closing a left or right lane, place each traffic control device at the proper location behind the guard rail or a minimum of ten feet from the shoulder on the day prior to closing the lane. Sign panels so stored must be located so they are not visible to the Turnpike traffic.

When closing a center lane, load all devices on a truck with the first device to be installed located at the rear of the truck. Two trucks should be used; one to carry the cones and one to carry the signs, stanchions and flashing lights. Each truck must be equipped with two flashing lights on the rear. The State Police will assist in all center lane closing.

Prior to closing any lane, check all flashing lights to be sure they are operating properly.

When a lane is closed, and is to remain closed overnight, a traffic patrol must be used during non-working hours to maintain all traffic control devices. The traffic patrol is an after normal working hours assignment; any questions in this regard should be thoroughgly discussed at the pre-construction meeting.

The traffic protection devices for closing a lane to traffic should always be set up progressively in the direction of traffic.

Whenever a lane is closed to traffic, the clear width of the remaining open lanes shall be not less than ten feet per lane.

Not more than one lane in a roadway (northbound or southbound) may be closed at any one time in any one work area, as a general rule.

One lane in each roadway (northbound and southbound) may be closed simultaneously in any one work area.

Whenever work is to be performed over a complete roadway such as setting structural steel and all traffic is to be momentarily slowed down or stopped, then a special planning meeting and erection details must be submitted before.

Any excavation which constitutes a hazard to traffic, whether it be in a traffic lane, on a shoulder or anywhere within 30' of Turnpike, traffic must be protected as specified in Subsection 802.03.

A uniformed flagger must be stationed in the work area where vehicles enter or leave the flow of traffic.

Whenever personnel, vehicles, or equipment will be occupying any area within 30' from the outside edge of a lane where there is no guard rail, the shoulder must be closed.

Closing two lanes of traffic at one time in one roadway is generally prohibited.

Vehicular and Pedestrian Movements. Vehicles shall always move with and not across or against the flow of Turnpike traffic including vehicles that are traveling in lanes or shoulders that are closed or on temporary roadways.

Whenever oversized equipment is to be transported along Turnpike roadways outside of closed lanes, the traffic engineer of the Authority must be notified twenty-four (24) hours prior to such movement. The traffic engineer will then establish the time and route of the movement. Such notification is made through the General Consultant.

Pedestrians, including engineers and contractors, are prohibited from crossing the roadways.

U-turns on the Turnpike roadways including median crossovers are prohibited. Permits may be obtained, in some cases, for use of grade separated U-turns. Z-turns are never used.

Directional, Protective and Warning Devices. All devices shall conform to the Turnpike standards as described in the specifications and contract plans. For example, there is a wide array of arrow boards available on the market. However, only those specifically approved by the Authority will be allowed on Turnpike construction.

Any device that is damaged by weather, vehicular traffic or any other causes shall be repaired or replaced immediately.

Uniformed Flaggers. Each flagger shall be in accordance with Subsection 801.05, properly trained, instructed and experienced in flagging duties. Each flagger shall wear a police-type uniform with billed cap and carry an orange flag at all times in accordance with Subsection 920.12.

Use of Authority Owned Traffic Devices. The contract may provide that the contractor will obtain all or part of the traffic control devices from Authority stores. A list of the devices to be furnished by the Authority will be contained in the supplementary specifications. The point of pick up and return will also be specified. The Authority must be advised at least forty-eight (48) hours prior to picking up traffic protection devices. A representative of the contractor and the engineer must be present at all such transactions. Receipts will be signed by all parties to these exchanges of property.

The contractor is responsible for the security of all traffic protection devices borrowed from the Authority wherever they may be stored or in use. In the event any traffic protection devices are damaged or missing for any cause whatsoever, the devices shall be replaced by the contractor with devices of comparable quality or repaired as hereinafter specified. If the devices cannot be repaired or replaced, the contractor shall be responsible to the Authority for the cost of replacing the devices.

Upon completion of the work, all of the above devices shall be repainted, re-reflectorized and repaired as necessary to restore them to the condition at the start of the work. The contractor shall secure a written receipt from the supervisor of the sign yard for the satisfactory condition and delivery of these devices; these receipts shall be accepted by the engineer and submitted to the General Consultants before final payment under this contract will be made.

Payment for Traffic Devices. Certain pay items, such as batteries and traffic cones, are generally paid for on a unit basis. As such, the engineer must devise a system of control for payment which will assure correct payment and insure against any possibility of double payment. Cone and sign placement records can and should be cross-referenced to lane closing records. Batteries for flashing lights should be initialed by the engineer's inspector, and broken, before being entered on any pay certificates.

Similar safeguards must be provided for all payments for traffic devices; however, these two items have been of particular concern in the past.

POST CONSTRUCTION PHASE

Division Seven

FINAL ADMINISTRATION

After the physical construction is completed and the road or bridge is opened to traffic, final payments and documents need to be forwarded. These after-the-ribbon-cutting items are discussed in this division of the manual.

SECTION XIX
FINAL INSPECTION

Final Inspection. A final inspection of each contract is required and is normally conducted at the completion of the contract when the engineer is satisfied that all work has been completed in accordance with the contract plans and specifications.

In many instances, the contractor will complete the work and ask that the engineer and a representative of the General Consultant inspect the project informally prior to scheduling the formal final inspection. When such a pre-final inspection is conducted, a preliminary "punch list" is prepared listing all deficiencies noted by the engineer, and the representative of the General Consultant and the contractor is given the list. When these deficiencies are corrected to the satisfaction of the engineer, then and only then should the final inspection be scheduled.

The date of the final inspection is established by the Construction Engineer of the Authority, given to the General Consultant, who in turn informs the engineer. The engineer then informs the contractor in writing of the date, time, and meeting place of the inspecting party.

Following the final inspection, the engineer prepares a final punch list (if any) of all deficiences noted during the inspection and presents it in writing to the contractor with a copy to the General Consultant.

When the contractor has completed each item on the punch list, the contract is again inspected by the engineer. The date the engineer agrees that all items are completed to his satisfaction is known as the <u>date of recommendation for final acceptance</u> and is inserted on a final acceptance form discussed later in this section.

SECTION XX
FINAL PAYMENTS

Notebook. Prior to preparing the final pay certificate for a completed contract the resident engineer is to tabulate all final contract quantities and enter them into a special notebook prepared for that purpose. This book should clearly show all quantity calculations described by detailed notes and sketches indicating precisely the area or part covered by each entry. This book should be so complete that no other document need be referred to in order to verify the correct final quantity of each item.

Reduction in Retained Percentage. The amount of money retained by the Authority on any contract that is beyond the 50% completion level and progressing according to an approved schedule is normally 5% of the total value of the contract including approved change orders. This retained amount may be reduced at the discretion of the engineer, General Consultant, and the Authority by either of the following methods providing that certain conditions are satisfied:

1. Letter requesting reduction in retained percentage.

2. Special final estimate.

Each of the above methods will be discussed in detail below and in the following pages with cited examples and sample letters and forms. Engineers should note that the examples listed are to be used as a guide rather than a hard-and-fast ruling of when to apply for a reduction in retained percentage.

1. When a contract reaches the 95% to 98% completion level and it is apparent that the completion of the contract will be delayed due to some unforeseen reason beyond the responsibility of the contractor, a reduction in retainage is in order. Examples might be: unable to complete contract because of delays by other contractors; or contract completed during winter months except for topsoiling and seeding the area which cannot be accomplished until spring. A reduction in retainage letter is in order.

2. The contract is completed and a final inspection has been conducted. An extensive punchlist exists and some items of extra work have been added to the contract near or at the end of the construction. The contract items have not been adjusted to final as-built quantities but it is known that when they are adjusted, the resultant amount will not result in an overpayment to the contractor. A reduction in retained percentage letter can be initiated under these circumstances.

3. A reduction in retained percentages should be obtained if a contract is completed, a final inspection is held, no punch list or a minor punch list prevails, final quantities have been adjusted, and the contractor has indicated in writing that he has filed notice of a claim against the contract. When this occurs,

the retained percentage should be reduced by either the reduction of retainage letter or by the preparation of a special final estimate.

Letter Requesting Reduction in Retained Percentage. The Authority has no desire to retain abnormally high sums of the contractor's money when the contractor, in good faith, has substantially completed all specified work under the contract. To obtain a large portion of this retainage, the contractor should initiate the action by requesting of the engineer in writing that the amount being retained against his contract is in excess of the amount of work remaining to be accomplished. The engineer in turn writes a letter to the General Consultant recommending a reduction of the retained percentage, giving the reasons why it should be reduced, the amount of the present retainage, and the amount it should be reduced to based on the amount of work remaining to be done. A sample of the engineer's letter can be found on the following page.

The General Consultant reviews the engineer's letter, and if they concur in the request for reduction, will further recommend to the Authority that the retainage be reduced.

The Chief Engineer reviews the recommendation and, if acceptable, also recommends the reduction in retainage to the Executive Director of the Turnpike Authority. Then the recommendation is placed on the agenda for approval by the Commissioners of the Authority.

Following approval by Commission action, the engineer can prepare a regular monthly estimate which would reflect the reduction to the new approved amount.

Under no circumstances will the engineer reduce the retainage below the 5% level unless the reduction is approved by Commission action.

Special Final Estimate. The special final estimate is also used to reduce the retainage below the 5% limitations described above.

When the work on the contract has been satisfactorily carried to completion within the contract time or is substantially completed except for minor clean-up and all contract quantities have been adjusted to final as-built quantities, a special final estimate may be prepared to reduce the retained amount to zero in the event of a protracted claim.

The special final estimate should be used sparingly and not when a reduction in retainage letter can accomplish the same results. Both require the same line of approval up to and including Commission action.

This estimate is normally reserved for reducing the retainage to zero when the contractor has disputed work in his contract that may be resolved by change order or by a claim against the contract.

When a claim is filed, it is the desire of the Authority to pay the contractor all monies due him under the contract including all retainage. This is accomplished by the special final estimate.

P. C. Whizzes & Associates
Consulting Engineers
678 Blank Avenue
New Brunswick, New Jersey 08903

January 15, 1990

Mr. Riley O. Jones
Howard, Needles, Tammen & Bergendoff
330 Passaic Avenue
Fairfield, New Jersey 07006

Re: New Jersey Turnpike - 1990 Widening
Section 4A - Contract W-740
Reduction in Retained Percentage

Dear Mr. Jones:

The Contractor has requested that the amount of monies presently retained on Contract W-2740 be reduced to an amount sufficient to cover the minor items of work yet to be completed under Contract W-2740.

It is our opinion that the amount of $175,242.10 presently retained on the Contract is in excess of the amount of work remaining to be completed to our satisfaction.

All work has been completed on the Contract with the exception of some farm field fence installation, setting concrete monuments, and minor topsoiling and seeding.

Contract quantities have been agreed to and will be adjusted to final as-built quantities by Change Order No. 6 which will reflect an addition to the Contract amount by approximately $8,323.00.

There are presently no known claims by the Contractor.

We therefore recommend a reduction in the retained percentage to $5,000.00 thereby releasing $170,242.10 in retainage to the Contractor.

Very truly yours,

P. C. WHIZZES & ASSOCIATES

By: /s/ Charles J. Smith
Project Engineer

The special final estimate is prepared essentially the same as ordinary pay certificate except that the "Final Certificte for Payment" form is used instead. Line nine of the heading should have the next consecutive number used for the monthly certificate and be labeled "Special Final Estimate".

The body of the estimate continues to list the items as in the monthly estimates and includes all approved change orders. The "Balance Earned" (Columns 12, 13 & 14) reflects the items installed as part of the permanent construction from the period of the last monthly estimate to the period of the special estimate. The "Total Earned" (Columns 15 and 16) shows the quantities and amounts of all items accumulated to date.

The total amounts for Columns 14 and 16 are inserted in the spaces provided opposite "Total Final Period" and "Contract Final." The amount opposite "Contract Final" is also placed in box 22 in space opposite "Total Earned." The amounts previously paid the contractor are then deducted to show the "Total Yet to be Paid" to the contractor.

If liquidated damages and/or liens are assessed against the contractor, those amounts are shown as deductions in space provided in block 22. This amount is then subtracted from the "Total yet to be Paid" and the resultant amount is the "Balance Due Contractor."

When the special final estimate is sent to the contractor for his signature, he must complete the written statement (release clause) on the body of the estimate. The statement on the left should be signed by an officer of the contractor's organization. The statement to the right must be completed if the contractor's organization is a corporation. When the copies are completed and signed, the corporate seal must be affixed to all copies.

If the contractor has a claim on file, the exceptions should be inserted in the release clause by a typewritten statement on the face of the estimate on all copies.

The statement by the contractor should include the nature of the claim and the amount and be inserted above the release clause if space permits or in the blank space immediately below the signature and that of the secretary of the organization. An example of such a statement is found on the sample special final estimate on the following page. This procedure has been accepted by the legal department of the New Jersey Turnpike Authority and serves to alert all parties that a claim is pending and the contract is not final.

The special final estimate is then returned by the contractor to the engineer for signature and then forwarded to the General Consultant for signature by a partner of the firm. The estimate is then forwarded to the Chief Engineer for final processing by the Authority.

NEW JERSEY TURNPIKE AUTHORITY

FINAL CERTIFICATE FOR PAYMENT TO CONTRACTOR

1. DATE: Dec. 7, 1992

2. SHEET 1 OF 1

3. CONTRACTOR AND ADDRESS: 615 South End Avenue
Elizabeth Sign Company, Inc. Elizabeth, New Jersey 07210

4. CONTRACT NO.: W-2738

SECTION NO.: 4A, 5E & 5F

5. DESCRIPTION OF WORK: Furnish and Install Speed Limit Signs

6. PROJECT: New Jersey Turnpike-1990 Widening-All Sections

7. LOCATION: Middlesex County, New Jersey

8. PERIOD COVERED BY THIS CERTIFICATE: FROM Nov. 24, 1992 TO Dec. 25, 1992

9. ESTIMATE NO. 5 Final

ITEM NO. (10)	DESCRIPTION (11)	BALANCE EARNED			TOTAL EARNED	
		QUANTITY & UNIT (12)	UNIT PRICE (13)	AMOUNT (14)	QUANTITY & UNIT (15)	AMOUNT (16)
1.	Maintenance and Protection of Traffic		18,000.00		100% L.S.	18,000.0
2.	Furnishing and Installing Concrete Sign Boxes		340.00		102 Ea.	34,680.0
3.	Furnishing Spare Concrete Sign Bases		300.00		4 Ea.	1,200.0
4.	Furnishing and Erecting Alumimum Posts	1,297.58 Lbs.	3.00	3,892.74	10,997.58 lbs.	32,992.7
5.	Erecting Sign Panel "GRS" Control Cabinets Installation		800.00		51 Ea.	40,800.0
6.	Multi-Conductor Cable Installation		6.00		19,743 L.F.	118,458.0
7.	Power Conductor Installation	30 L.F.	4.00	120.00	1,430 L.F.	5,720.0
8.	Concrete Junction Box		800.00		2 Ea.	1,600.0
9.	Meter Cabinet Installation with Concrete Base		1,000.00		3 Ea.	6,000.0
10.	Electric Control Cabinet Installation		400.00		9 Ea.	3,600.0
11.	Replacing Service Switches		200.00		9 Ea.	1,800.0

Special

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In consideration of the above payment, we hereby release the New Jersey Turnpike Authority, its officers, agents and employees from all claims and demands whatsoever arising under or by virtue of Contract No. W-2738 *, Section* 4A, 5E & 5F *any and all extra or reduction orders issued thereunder, and any agreements supplementary thereto.*

Elizabeth Sign Company, Inc.
CONTRACTOR

Fred T. Doyle, President
BY:

(If the Contractor is a corporation, the following certificate will be executed.)

I, John H. Doyle, *certify that I am Secretary of the Corporation executing this release; that* Fred T. Doyle *who signed this release on behalf of the contractor was then* President *of said corporation; that said release was duly signed for and on behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.*

(CORPORATE SEAL)

/s/ John H. Doyle

* With the exception of claims filed with the New Jersey Trunpike Authority on December 14, 1992 in the total amount of $10,824.00.

TOTAL FINAL PERIOD	$ 4,012.74	CONTRACT FINAL	$ 264,850.74

200

17. *Verified as to quantities and amounts.*

/s/ Harold P. Snow
SIGNATURE

Resident Engineer Dec. 29, 1992
TITLE DATE

18. *I certify that the above final certificate is correct and just; that payment therefor has not been received; and that in connection with work performed or materials furnished under this Contract there are no outstanding liens or obligations.*

Elizabeth Sign Company, Inc.
CONTRACTOR

BY: /s/ Fred T. Doyle

President Dec. 29, 1992
TITLE DATE

19. *I certify that I have checked the quantities covered in this certificate; that the work was actually performed; that the quantities are correct and consistent with all previous computations as actually checked; and that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.*

Final Certificate recommended for payment:

Bailey Bridges & Associates
PROJECT ENGINEER

BY: /s/Kelly Vincent Jan. 5, 1993
DATE

20. *I hereby certify that the above Contract, as amended by extra or reduction orders and supplementary agreements, if any, has been completed to our satisfaction as General Consulting Engineers, as provided by Section 507 of the Bond Resolution of the New Jersey Turnpike Authority as amended Sep. 16, 1952, and Section 707 adopted Sep. 22, 1966.*

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
GENERAL CONSULTING ENGINEER

BY /s/ Edward C. Partner Jan. 6, 1993
PARTNER DATE

21. *Final Certificate approved for payment:*

/s/ Hoywood S. Howard Jan. 13, 1993
CHIEF ENGINEER DATE

NEW JERSEY TURNPIKE AUTHORITY

22.

TOTAL EARNED	$ 264,850.74
DEDUCT: AMOUNTS PREVIOUSLY PAID:	$ 247,796.10
TOTAL YET TO BE PAID	$ 17,054.64
DEDUCT: AMOUNT OF LIQUIDATED DAMAGES, IF ANY	$ 0.00
Balance Due Contractor	$ 17,054.64

Final Certificates for Payment. When the project is completed and accepted by the Authority, a "Final Certificate for Payment to the Contractor" (sample at the end of this section) will be made by the engineer based on the actual quantities of authorized work done under each item scheduled in the proposal and under supplementary agreements, if any, at the unit price or prices stipulated therein. When this final certificate is approved, the balance due to the contractor after deduction of previous monthly payments, special final estimate payment, if any, and liquidated damages, if any, will be paid. However, before such final payment is made, the following requirements must be satisfied:

1. There shall be no outstanding court orders against the contractor filed with the Authority.

2. The contractor shall have delivered a Maintenance Bond.

3. The Certificate of Final Acceptance shall have been forwarded.

4. The Affidavit, as described earlier in this section, will have been completed and submitted by the contractor.

The final certificate is prepared essentially the same as the special final payment and line nine of the heading should have the next consecutive number used for monthly certificate or special final payment if one had been processed.

The final certificate is sent to the contractor who must complete the written statement on the body of the certificate as previously explained for a special final certificate. Since any claim will have been settled prior to the preparation of the final certificate, no exception to the release clause will be accepted on this document.

The final certificate is returned by the contractor to the engineer for signature and forwarded to the General Consultant for signature by a partner of that firm. The estimate is then forwarded to the Chief Engineer for final processing by the Authority.

NEW JERSEY TURNPIKE AUTHORITY

FINAL CERTIFICATE FOR PAYMENT TO CONTRACTOR

1. DATE: Nov. 16, 1992 — SHEET 1 OF

3. CONTRACTOR AND ADDRESS: 505 Ninth Avenue, General Contracting Company Inc. New Brunswick, NJ

4. CONTRACT NO.: W-2740 — SECTION NO.: 4A

5. DESCRIPTION OF WORK: Grading, Drainage, Paving and Structures

6. PROJECT: New Jersey Turnpike - 1990 Widening

7. LOCATION: Middlesex County, New Jersey

8. PERIOD COVERED BY THIS CERTIFICATE: FROM Oct. 1, 1992 TO Nov. 2, 1992

9. ESTIMATE NO.: 10 and Final

ITEM NO. (10)	DESCRIPTION (11)	BALANCE EARNED QUANTITY & UNIT (12)	BALANCE EARNED UNIT PRICE (13)	BALANCE EARNED AMOUNT (14)	TOTAL EARNED QUANTITY & UNIT (15)	TOTAL EARNED AMOUNT (16)
1.	Furnish and Install Traffic Protection		50,000.00		100% L.S.	50,000.
2.	Uniformed Flagmen		2.00		2,050 M.H.	4,100.
3.	Embankment	4,060 C.Y.	2.45		101,246 C.Y.	248,052.
4.	Storm Drain, R.C.P., 24" Dia.		14.00	9,947.00	600 L.F.	8,400.
5.	Drop Inlets, Type D-2	2 Ea.	450.00	900.0	4 Ea.	1,800.
6.	Asphaltic Concrete Pavement, Type A		6.00		20,120 S.Y.	120,720.
7.	Bridge Approach Slabs		32.00		267 S.Y	8,544.
8.	Shoulders		2.90		11,300 S.Y.	32,770.
9.	Granite Curb on Bridge		7.60		400 L.F.	3,040.
10.	Underbridge Slope Paving	125 S.Y.	9.50	1,187.50	386 S.Y.	3,667.
11.	Open Foundation Excavation		5.20		1,041 C.Y.	5,413.
12.	Permanent Timber Sheeting		2.90		1,976 S.F.	5,730.
13.	Furnishing 12BP74 Steel Bearing Piles		7.70		5,218 L.F.	40,178.
14.	Driving 12BP74 Steel Bearing Piles		1.70		4,622 L.F.	7,857.
15.	Cut-Offs of Steel Bearing Piles		2.00		596 L.F.	1,192.
16.	Concrete in Footings For Abutments, Piers and Columns		65.00		1,340 C.Y.	22,100.
17.	Concrete in Abutments, Piers & Columns above Footings		90.00		470 C.Y.	42,300.
18.	Concrete in Superstructure		100.00		412 C.Y.	41,200.
19.	Reinforcement Steel		0.19		105,212 Lbs.	19,990.
20.	Welded Bar Trusses		0.28		63,164 Lbs.	17,685.
21.	Grey Epoxy Resin Waterproofing		0.85		1,427 S.F.	1,212.
22.	Structural Steel		0.23		480,100 Lbs.	110,423.
23.	Metal Work for Bridge Drainage System		0.95		6,260 Lbs.	5,947.
24.	New Alumimum Railing on Parapets		11.00		506 L.F.	5,566.
25.	Asphaltic Concrete Bridge Surfacing	250 tons	21.00	5,250.00	525 Tons	11,025.
26.	Top Soil and Seeding		0.60		22,200 S.Y.	13,320.
27.	New Guard Rail	1,000 L.F.	2.70		3,575 L.F.	9,652.
28X	Relocate Existing Water Line.		1,220.00		100% L.S.	1,220.
29X	Install 2,700 L.F. of Temporary Lighting on Ramp T.		2,500.00		100% L.S.	2,500.
	Sub-Total "A"			19,984.50		845,607.

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5.	Drop Inlet Type D-2	-4 Ea.	450.00	-900.00	0 Ea.	0.0
27.	New Guard Rail	-1,000 L.F.	2.70	-2,700.00	0 L.F.	0.0
	Sub Total "B"			-3,600.00		0.0

In consideration of the above payment, we hereby release the New Jersey Turnpike Authority, its officers, agents and employees from all claims and demands whatsoever arising under or by virtue of Contract No. W-2740 4A *Section* _____ *any and all extra or reduction orders issued thereunder, and any agreements supplementary thereto.*

General Contracting Company, Inc.
CONTRACTOR

BY: /s/ Joseph P. Doaks

(If the Contractor is a corporation, the following certificate will be executed.)

Donald J. Samson ..... *, certify that I am Secretary of the Corporation executing this release; that* Joseph P. Doaks ..... *who signed this release on behalf of the contractor was then* Vice President ..... *of said corporation; that said release was duly signed for and on behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.*

(CORPORATE SEAL)

/s/ Donald J. Samson
SECRETARY

TOTAL FINAL PERIOD	$16,384.50	CONTRACT FINAL	$845,607.95

17. *Verified as to quantities and amounts.*

/s/ James M. Monroe
SIGNATURE

Resident Engineer Nov. 16 92
TITLE DATE , 19

18. *I certify that the above final certificate is correct and just, that payment therefor has not been received; and that in connection with work performed or materials furnished under this Contract there are no outstanding liens or obligations.*

General Contracting Co., Inc.
CONTRACTOR

/s/ Joseph P. Doaks
BY:

Vice President Nov. 17 92
TITLE DATE , 19

19. *I certify that I have checked the quantities covered in this certificate; that the work was actually performed; that the quantities are correct and consistent with all previous computations as actually checked; and that the quantities and amounts are wholly consistent with the requirements of the contract or other instrument involved.*

Final Certificate recommended for payment:

P. C. Whizzes & Associates
PROJECT ENGINEER

BY: /s/ Charles J. Smith Nov. 23 92
DATE , 19

20. *I hereby certify that the above Contract, as amended by extra or reduction orders and supplementary agreements, if any, has been completed to our satisfaction as General Consulting Engineers, as provided by Section 507 of the Bond Resolution of the New Jersey Turnpike Authority as amended Sep. 16, 1952, and Section 707 adopted Sep. 22, 1966.*

HOWARD, NEEDLES, TAMMEN & BERGENDOFF
GENERAL CONSULTING ENGINEER

BY: /s/ Edward C. Partner Nov. 23 92
PARTNER DATE , 19

21. *Final Certificate approved for payment:*

/s/ Heywood S. Howard Nov. 30 92
CHIEF ENGINEER DATE , 19

NEW JERSEY TURNPIKE AUTHORITY

22.

TOTAL EARNED	$ 845,607.9
DEDUCT: AMOUNTS PREVIOUSLY PAID:	$ 787,762.28
TOTAL YET TO BE PAID	$ 57,845.67
DEDUCT: AMOUNT OF LIQUIDATED DAMAGES, IF ANY	$ 0.0
Balance Due Contractor	$ 57,845.67

SECTION XXI
FINAL DOCUMENTATION

Other Requirements. Whenever a special final certificate is processed for payment, as discussed in the previous section, it must be accompanied by other documents of equal importance. These documents establish that the contract has been satisfactorily carried to completion, that a final inspection has been conducted, and the contract is acceptable by the Authority. Even though a claim is pending, the contract has been completed and the contractor is entitled to full pay for all work accomplished. The other requirements are:

1. Certificate of Final Acceptance
2. Maintenance Bond (Surety Bond)
3. Affidavit
4. Roofing and flashing guarantees (where required)

Certificate of Final Acceptance. This certificate is prepared by the engineer to indicate that the contract is substantially complete and is ready for final acceptance by the Authority.

The certificate contains three endorsements: the engineer, the General Consultant, and the Chief Engineer. The engineer should complete all blank spaces in the first endorsement, all blanks in the second endorsement except for the date and signature line for the General Consultant, and blank spaces in the third endorsement except the date and signature line for the Chief Engineer. The date that the Chief Engineer signs the Certificate of Final Acceptance will be the date the contract is considered accepted.

The forms are available at the Authority or the General Consultant and may be reproduced by the engineer.

The completed form is submitted by the engineer to the General Consultant in five (5) copies (original plus four copies). (See sample on the following page.)

Maintenance Bond (Surety Bond). The contractor must furnish a Surety Bond in a sum equal to 5% of the contract price (which shall include all change orders).

The acceptance date of the contract is filled in by the Authority at the time the contract is finally accepted. The final acceptance date is determined by the Chief Engineer.

The bond forms are available at the Authority or the General Consultant and can be reproduced by the engineer.

TITLE: Bridge Repairs

CONTRACTOR: Bitts & Peeces

FROM: PROJECT CONSULTING ENGINEER

TO: GENERAL CONSULTANTS

Based upon the results of a final inspection for this project conducted on October 7, 1990 and further inspections of the site to assure that all deficiencies have been corrected, I certify that the contractor named above has satisfactorily completed the work to be performed under the subject Contract, as titled above. The above project, as amended by change orders and supplementary agreements, if any, is in full and entire conformity with the plans and specifications on file at the office of the New Jersey Turnpike Authority.

P. C. Whizzes & Associates
Name of Firm

October 8, 1990
Date

By: Elmer Armstrong
Project Consulting Engineer

October 9, 1990
Date

Spruce Knoll
Construction Engineer

* *

FROM: GENERAL CONSULTANTS

Date: October 22, 1990

TO: CHIEF ENGINEER

Based upon a knowledge of the provisions of the Contract and inspection of the project site, it is hereby certified that the contractor named above has completed the work to be performed under the subject Contract, as titled above, as amended by change orders and supplementary agreements, if any, to the satisfaction of the General Consulting Engineer, as provided by Section 719 of the Bond Resolution of the New Jersey Turnpike Authority dated August 16, 1984.

Howard, Needles, Tammen & Bergendoff

By: Edward C. Partner

* *

FROM: CHIEF ENGINEER

Date: October 29, 1990

TO: EXECUTIVE DIRECTOR

Based upon the attached Certificate of the General Consulting Engineer, the recommendations of the Project Consulting Engineer and the recommendation of the Authority's Construction Engineer, it is hereby certified that the contractor named above has satisfactorily completed the work to be performed under the subject Contract, as titled above, as amended by change orders and supplementary agreements, if any, and the Contract is in full and entire conformity with plans and specifications on file in this office. I am further advised by the Legal Department that there are no liens against the Contractor arising under this Contract on file with the Authority.

It is therefore recommended that the work performed under this Contract be formally accepted by the New Jersey Turnpike Authority.

Heywood S. Howard
Chief Engineer

Form "A"
1-10-85

The completed forms and bond is submitted by the contractor to the engineer for transmitting to the General Consultant in three (3) copies (original plus two copies). Sample on following page.

Affidavit. By this form, the contractor certifies that the contract was governed by the New Jersey Prevailing Wage Act and what amounts of money, if any, are due his employees.

This form is available at the Authority or the General Consultant and can be reproduced by the engineer.

When completed, the affidavit is notorized and submitted by the contractor to the engineer for transmitting to the General Consultant in five (5) copies (original plus four copies). (See sample)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____

_____ (Contractor), as PRINCIPAL, and _____

_____, a corporation organized and existing under the laws of the State of _____ and duly authorized to do business in the State of New Jersey, as SURETY, are held and firmly bound unto the New Jersey Turnpike Authority, its successor or successors, in the penal sum of _____

_____ Dollars ($), for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, A. D. Nineteen Hundred and _____.

WHEREAS, the above bounden _____ (Contractor) did on the _____ day of _____, A. D. Nineteen Hundred and _____, enter into a contract with the New Jersey Turnpike Authority for _____

_____

_____

known as Contract No. _____, Section _____, of the New Jersey Turnpike Authority, which Contract is incorporated herein by reference; and

WHEREAS, the Contractor has represented that (he, it) has completed the said Contract in strict and entire conformity with the plans and specifications therefore on file at the office of the New Jersey Turnpike Authority;

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if, within one year from the date of final written acceptance of the work by the New Jersey Turnpike Authority, no faulty workmanship shall be disclosed in the performance of said Contract No. _____, including any Change Orders or Agreements Supplemental thereto, and if it shall appear that no defective materials were furnished thereunder, and if it shall appear that all work was performed, and all materials were furnished thereunder in strict and entire conformity with the terms of the Contract, including any Change Orders and Agreements Supplemental thereto, and the plans and specifications therefore, then this obligation shall be void and for nothing holden: otherwise, the same shall remain in full force and effect.

If, within said period of one-year, beginning on_____ (final acceptance date), faulty workmanship is disclosed, or it appears that defective materials were furnished, or it appears that the work was not performed or the materials were not furnished in strict and entire conformity with the terms of the Contract, and the plans and specifications therefor, the Authority shall so notify the Contractor in writing. In such event, if the Contractor shall refuse or neglect to repair, replace, or make good such work or materials within five (5) days from the receipt of such notice, the Authority will have the necessary work done by others, and the Contractor and Surety hereunder shall jointly and severally be liable to pay the cost thereof.

Signed, sealed and delivered in the presence of

PRINCIPAL

Witness and Attest: _____

_____ By:_____

SURETY

Attest: _____

_____ By:_____

(2)

AFFIDAVIT

STATE OF NEW JERSEY)
ss:
COUNTY OF ESSEX)

Teresa Green, the President of Verdant Landscaping, being first duly sworn, deposes and
Name of Company

says:

1. That the Verdant Landscaping Company has entered into Contract W-1948 with the New Jersey Turnpike
Contract No. or Purchase Order No.

Authority on April 15, 1992.
Date

2. That said Contract was governed by the New Jersey Prevailing Wage Act Chp. 150 of Laws of 1963; that this Company was bound by said Prevailing Wage Act.

3. That in accordance with said Act and as of the date of signing this Affidavit, the following amounts are due the below listed employees on account of the above listed Agreement. (If not, so state)

None

4. That the undersigned, being authorized to act on behalf of Verdant Landscaping Company, certifies that s he is personnally acquainted with, has full knowledge of the contents of this Affidavit and that the same is true to my knowledge.

Verdant Landscaping Company

By: Teresa Green

Sworn and subscribed to
before me this 30thday
of November , 19 92

Frank B. Ernest
Notary Public

Division Eight

FINAL ENGINEERING

Before termination of the engineer's or architect's agreement can be arranged and prior to the release of retainage, there are certain items of work which must be completed. These requirements relate to survey monuments, the submittal of complete as-built drawings and the final disposition of contract records. Each of these subjects is discussed in the following sections.

SECTION XXII
MONUMENTATION

General. The engineer shall have on staff, or separately engage, a licensed land surveyor in responsible charge of setting land boundaries and for physically checking right-of-way monuments and centerline monuments for the widened facility. All monuments are to be coordinated to the New Jersey Plane Coordinate System.

The licensed land surveyor shall sign the title sheet of all contract plans where the contract includes the placement of right-of-way or centerline monuments with a notation to the effect that the monuments were checked under the direction of the licensed surveyor.

All monuments shall be accurately staked to the nearest 0.01 of a foot and the engineer shall see that this same degree of accuracy is maintained when the contractor sets the monument.

Right-of-Way Monuments. Right-of-way monuments shall be set flush with the ground level. Physical swing-tie distances to proximate features of culture such as headwalls, curbs or fence corners shall be taken in the field after the monument is set by the contractor. This information will be incorporated into the as-built drawings under which the monuments were placed.

Centerline Monuments. Centerlines shall be monumented as shown on the contract plans but generally monuments are required to be set at all points of curvature, points of tangency, and points of compound curvature. Additionally, monuments are generally placed on tangents and long curves as a maximum interval of one thousand feet but close enough to be intervisible.

Existing Monuments. Referencing and recording of federal, state, county or municipal government monuments is generally done by the preliminary baseline and right-of-way line surveys long before the construction of project starts. Occasionally, though, the engineer will come across such monuments during the course of construction which, if not referenced or reset, could be lost. Therefore, all existing monuments encountered shall be referenced by project baseline stationing and offset right or left and also tied to physical features which will not be disturbed by construction. Such references shall be noted in field notebooks and on the as-built plans. Monuments reset in the field shall be referenced and tied in their new locations.

SECTION XXIII
RECORD DRAWINGS

BLACK INK

At the end of each job, the engineer is required to prepare record drawings. These are generally made as reprints of corrected contract plans. The requirements and method of preparing these as-built plans are discusssed in detail in this Section of the manual.

General. At the end of each job the engineer or architect is required to prepare record drawings. These are generally made as reprints of corrected contract plans. Record drawings should clearly show any changes made in the original design such as deeper cuts, wider footings, added signs, revised drainage patterns and the like. They should also show the precise location of all important features such as electrical conduits, culvert headwalls, fence gates and others defined by station, offset and elevation where applicable.

The preparation of record drawings is required of the engineer by the engineering agreement. They are to be delivered to the Authority before termination of the agreement but no later than 90 days after final inspection of the contract. The engineer shall maintain a complete and separate set of contract drawings, together with plan revisions, in the field office for the sole purpose of noting record information as it accumulates during the course of construction.

Record drawings are to provide the Authority with record drawings of the actual construction for each contract. In general, everything shown in the original contract should be shown on the records. Anything added, changed, additionally detailed or refined by working drawings should be put on the drawings or cross referenced in such a way as to be readily available.

Requirements. The specific information and the manner in which it is to be shown on record drawings is fully outlined in the following paragraphs.

Format. The drawings may be the actual contract plan vellums or photographically reproduced copies on permanent drafting film such as mylar. The size is 22" x 36" outside dimensions with a 2" border at left and a 1/2" border on the other three sides. The standard Turnpike title box and revision box are also to be shown. Each drawing shall be plainly stamped "Record Drawings" in bold letters with the additional notation "Record Drawing" together with date in the revision box.

Changes should be made by crossing out the original design and adding the corrected information. In all cases the original and the corrected design should be able to be compared and identified by revision number. The only specific exception to this requirement will be the contoured plans. these may be revised by erasing the old contours and adding the new to reflect the final as-built conditions.

If a new replacement sheet has to be made to show the changes to a contract sheet because of overcrowding, it should be numbered the same as the original except that an "R" is to be added after the sheet number. The original should be crossed out and labeled "superseded" but is to remain in the set.

If a new sheet has to be added to amend an original, the original sheet number should have the letter "A" added to it and the amended portion of the work crossed out. Designate the new sheet with the same number and a letter "B".

In all cases the title sheet "Index of Drawings" should be brought up to date. A note is to be added to the title sheet giving the total number of sheets in the record set and also giving the number and its title of each sheet either superseded or added.

Roadway. The record drawings will show all final alignment data and coordinates together with permanent reference benchmark information. The benchmarks will be fully described and have physical ties shown.

Monuments shall be described as discussed in Section XVI of this manual.

Grading plans are to show the final contours for the completed project at least from right-of-way line to right-of-way line including original contours where unchanged. In special cases where cross sections were used, they shall be corrected to show the constructed configuration. in areas where settlement is still continuing the elevations used for final pay purpose shall be used as final ground. Where overload removed is disposed of on the side slopes, the final contours shall show the final as-built condition.

All physical features such as pavement and shoulders, curbs, fences, gates, delineators, guard rail, lighting standards, etc. are to reflect as-built conditions.

Structures. Actual minimum vertical clearances between Turnpike roadways and each structure and minimum horizontal distance between shoulders and piers shall be measured and shown on the record drawings, at each lane line. Actual driven lengths of piles are to be shown on the pile layout sheets.

Structural drawings should have a reference to the shop or erection drawings numbers submitted for that particular structure or part of the structure.

For the Authority to properly evaluate any future maintenance problems that might develop in new or repaired structures, it is important that the following two items be included in the record drawings:

1. Measurements of the final positions of all shoes or bearing devices. These should be referenced to a true vertical line through centerline of pin for rocker type shoes and as offsets from true centered position for sliding plate type shoes. Clear sketches and tabular readings with temperature recordings are expected for <u>each</u> structure.

2. Measurements of final position (opening) of all expansion joints. Temperature readings at time of measurement and appropriate sketches for <u>each</u> structure are expected.

Measurements should be taken after all concrete is cast.

Drainage. The final working system should be thoroughly and plainly shown including all drainage structure types, elevations, locations, construction details, pipe, culvert, ditch or gutter sizes and inverts, underdrain and bleeder drain locations, and existing drainage incorporated in the system.

The disposition of all existing pipes or drainage structures should be clearly labeled if abandoned or removed. If abandoned in place and plugged, the actual field location of pipes and plugs should be shown.

The drainage area used for sizing cross culverts should be shown on the plans at or near the inlet end of the culvert. A separate computation sheet, 8-1/2" x 11", giving the pertinent design information used to size the cross culvert should be sent to the Authority's highway design engineer for future reference. It should also be noted if the culvert comes under the jurisdiction of the Division of Water Policy and Supply and approvals furnished.

Utilities. As-built revisions to the plans should show in their actual location all utilities within the area encompassed by the contract as of its date of completion.

All utilities should be clearly labeled to indicate what they are, to whom they belong, and under what contract number or utility order number installation or other work was done.

The disposition of <u>all</u> existing utility lines shown should be noted if removed or abandoned. Utility lines abandoned in place should be accurately field located and labeled.

Signs. The following note shall be placed on all record drawings for sign structures:

"Prior to the installation of any future signs on any sign structures, a check must be made of the entire existing installation including details to determine the stress conditions induced by the additional loads."

Division Nine

RESOLUTIONS & DISPOSITIONS

SECTION XXIV
REVIEW OF CONTRACT CLAIMS

Policy on Claims. Formal procedures governing the presentation and determination of a claim have been formulated by the Authority. This section of the manual defines a contract claim and explains the policy for the guidance of all section engineers and architects.

In general, a claim is a petition for reconsideration of a contractor's invoice that has been previously rejected at one of the engineering levels. Thus, an item of extra cost submitted by the contractor which the section engineer feels is not justified may, at the contractor's option, be resubmitted as a claim. Or an item of extra cost recommended by change order from the section engineer and subsequently rejected by the General Consultant or the Turnpike staff may be resubmitted as a claim.

In addition, there are sometimes items of extra costs (such as may be occasioned by delays), which are so complex or so interrelated with the work of others that the engineer may wish to defer judgment before responding to the contractor. Such a situation would also be handled by a claim. For the most part, extraordinary costs of any kind such as "premium time," "loss of efficiency," "increased overhead," and the like would be handled as claims rather than routine change orders.

No more than one claim should be filed on any one contract, although it may include a number of sub-claims or items. Claims should be bound (staples are satisfactory) and submitted by the contractor in quadruplicate to the Chief Engineer.

Each claim should include the following four elements:

1. A covering letter listing each item, a brief description of each item, and total cost of each item, and a grand total amount of the claim.

2. An argument by the contractor setting forth why he believes the Authority is responsible for such costs.

3. A detail cost analysis showing exactly how the cost of each item was arrived at.

4. Complete supporting documents justifying all costs for each item, such as:

   a. payroll records for all labor costs
   b. foreman's or field engineer's reports verifying all delays
   c. rental agreements for all rented equipment
   d. invoices for all materials
   e. copies of correspondence or diary notations.

Description of Claim Review. When a claim is received from a contractor, the Chief Engineer will acknowledge same and send three copies to the General Consultant. The General Consultant will then forward two copies to the engineer with a request for review, comment and recommendation.

The review should be made in detail and include a check of all arithmetic, a comparison of all supporting documents with the engineer's own records and a commentary on the contractor's argument. Engineers are free to meet with the contractor and request further information and documentation but are <u>not</u> authorized to offer any compromise or settlement whatsoever, and should not discuss their recommendation or opinions.

Upon completion, the engineer should send two bound copies of his review to the General Consultant along with a working copy of the contractor's claim. The review should include all of the elements in steps 1, 2 and 3 above along with supporting documents from the engineer's own files such as progress schedules, correspondence, inspector's reports, etc. The engineer should also include a presentation of any and all credits and counter-claims that might be outstanding against the contractor. Counter-claims include failing to work in a prescribed sequence so as to cause delays to other contractors.

Payment for Review. The engineer will also be asked to submit an estimated time schedule to review immediately after receiving the claim. If, in the opinion of the engineer, the cost to review is beyond the scope of the engineering agreement, then this should be so stated along with an estimate of the cost to review for which reimbursement will be sought.

Generally, it is the responsibility of the engineer or architect to review claims submitted within and during the period covered by the agreement of the engineer or architect. The Authority may elect to engage the engineer or architect to review a contract claim submitted subsequent to the termination of agreement.

Form of Release. After the Authority has concluded its review of a claim, any consideration which may be due the contractor is handled by change order and final payment certificate. In addition to the usual line item entry on the change order, a special release is to be included on the face of the change order. The form of this release is as follows:

> "In consideration of the above settlement (and time extension)*, which is hereby granted by the Authority to the Contractor on Contract _____, the Contractor does covenant and agree and by execution of this change order that he hereby releases and discharges the Authority, its agents, servants and employees from any and all liabilities for additional monies for any reason whatsoever under the subject Contract."
>
> *Include only if applicable.

Credit List. It is the responsibility of each engineer or architect to maintain a credit list for each contract under his control. A credit list can best be defined as a daily or weekly compilation of minor revisions to the plans or specifications allowed the contractor to facilitate his construction operations and that may result in savings of time or money to him. Such a list will be of great value to the Authority if it becomes necessary to evaluate a final settlement of contract claims. The list is also of value to the engineer for bargaining purposes when and if the contractor requests payment for minor work performed by him that he feels warrants extra money.

It is necessary to keep this list up to date and to review it periodically with the General Consultants.