

SECTION 6 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

6.1 Quality Control Guidelines for Designers

Requirements and submissions do not apply to every project but are to be used as guidelines for development of the project design. The guidelines for each project shall be customized by including only those submission procedures and requirements necessary to assure the quality of the final contract plans, while incorporating constructibility and good engineering practice and including all criteria required to comply with funding and environmental regulations and commitments.

Unique Projects are excluded from these guidelines. They are defined as, but not limited to, the following types of specialized projects:

- Traffic/Electrical
- Utility (Railroad Grade Crossings)
- Landscape
- Highway Lighting
- Bridge Painting
- Fencing
- Minor Deck Patching
- Truck Weigh Stations
- OSHA/PEOSHA
- Fender Repair
- Signing/Striping
- Demolition
- Maintenance Work Orders
- Intelligent Transportation Systems

These guidelines can be customized for each project and used by the Designer and the Project Manager to verify that the indicated items and details have been included on the plans. These guidelines supplement the current NJDOT Sample Plans.

During the preparation of the Consultant's proposal, the Project Manager shall review the Design Submission Guidelines with the Designer and shall use flexibility in their application to the project scope. Additions and deletions to the guidelines shall be clearly identified. Innovative procedures for reducing plan development and review time may be used provided that all applicable federal and state requirements are met.

6.1.1 Submission Guidelines

The Project Manager will, in consultation with Design Coordination, determine the distribution list of those offices that will receive plans for review and comment in accordance with the Scope Team, as defined in scoping. The distribution may also include Non-Scope Team units, such as Jurisdiction and Value Engineering. If a railroad is involved, railroad review will be required.

The Designer shall consult with the Project Manager regarding the number of sets of plans required for each submission. Project Managers are advised to modify distribution lists to include only the offices responsible for reviewing plans. Those units wanting to see plans only for informational purposes can do so at the appropriate design or construction office. This will reduce the number of sets of plans required.

The need for Bureau of Environmental Services (BES) review for those projects will be determined by BES at the scoping stage. If the Project Manager believes that the expertise of BES is needed for an individual project, a written request for review should be submitted to BES.

Transmittal Letter

Each design submission shall include a Transmittal Letter, identifying all items included in the submission, and indicating the most recent construction cost estimate.

Review Comments

Written comments or marked plans shall be submitted to the Design Coordinator not later than the date specified in the transmittal. All major comments shall be brought to the attention of the Project Manager as soon as possible rather than waiting for the meeting. The Design Coordinator is responsible for compiling and reviewing all comments. The Project Manager is responsible for resolving all comments.

All comments will be discussed by the Design Coordinator with the Project Manager, the Designer, and those who made the comments. The Project Manager shall resolve as many comments as possible in the most cost efficient manner (see Section 4.3 and 4.4). If additional information is required to resolve comments, the unit involved will respond to the Project Manager within one week after presentation.

All submissions shall contain the previous submissions comment sets of plan sheets and the written response to each office's comments, stating how the Designer has complied with the comments or giving reasons for non-compliance. Each comment must be addressed either on the plan sheets or in writing.

A Comment Resolution Summary must be approved by the Project Manager prior to further design advancement.

6.1.2 Guidelines For Roadway Plan Development - Initial Submission

These items shall be completed prior to or included in the Initial Design Submission:

Establishment of the Contract Number.

An Electrical Services Inquiry (ESI) shall be submitted to the Bureau of Traffic Signal and Safety Engineering in accordance with Section 11 of the NJDOT Design Manual Roadway.

Calculations on signal loading, conduit fills, signal circuit and minimum roadway overhead clearance shall be submitted to the Bureau of Traffic Signal and Safety Engineering.

If requested, CADD compatible base sheet information shall be submitted to the Bureau of Landscape and Urban Design for their use in completing the landscape design plans.

Six sets of construction plan sheets and specifications depicting railroad involvement shall be sent to the Utilities Unit for submission to the Railroad for comments.

The Jurisdictional Limit Map shall be sent to the Bureau of Research and Engineering Standards.

Environmental Plan Sheet in accordance with Section 8.1.8.

The final draft of any permits shall be submitted for review to the Hydrology and Hydraulics Unit (Stream Encroachment) or the Bureau of Environmental Services (wetlands, waterfront, etc.).

For projects which involve new traffic signals and/or modifications to existing traffic signals, one set of plans shall be sent to the Bureau of Signal and Safety Engineering to identify the above ground clearance of electrical facilities and the locations of utility poles within 30 meters of all existing and proposed signalized intersections.

These plans shall indicate the vertical clearance from existing ground to electrical facility at each utility pole, at each existing traffic signal pole and at the sag point between poles. In addition, the plans must identify all existing and proposed sidewalk and curb, existing underground utilities, existing and proposed guiderail, existing signs, existing and proposed drainage and existing and proposed right of way.

This submission shall occur one month prior to a meeting which will be attended by the designer (the Bureau of Traffic Signal and Safety Engineering for in-house projects), the utility company and the Utility Unit. These plans are specifically for identifying any conflicts which might exist relating to traffic signal and highway lighting design at intersections and all conflicts shall be addressed in the Utility Checklist.

One set of plans, which shall include 1:300 scale staging of signalized intersections, shall be sent to the Regional Traffic Engineer for temporary signal design.

At least two months prior to the Initial Submission, Electrical Plans prepared on CADD Intergraph with diskette, and computer generated lighting calculations (Average Point Method) shall be sent to the Electrical Engineering Unit.

A construction bar chart or Primavera schedule in accordance with Section 4.3.1.

A construction cost estimate shall be submitted in accordance with the current All Design Unit Memorandum, entitled, "Construction Cost Estimates".

Approval shall be provided from the Bureau of Traffic Signal and Safety Engineering for all signal installations.

A report of the lighting and signal system design shall be submitted.

Roadway plans for the initial design submission shall include the following items, as revised for the project:

One set of plans (CADD) shall be submitted to ITS Engineering Unit.

KEY SHEET

1. Key Map:
 - a) north arrow (basis of meridian)
 - b) delineation of proposed project indicated by a solid dark line
 - c) primary and secondary roadways
 - d) waterways
 - e) corporate lines and names
 - f) route, contract number, and description
 - g) beginning and end of project (state/federal), mileposts/stations, stops and resumes and equations
2. Utility list (upper left corner - check for completeness)
3. Design data (lower left corner)
4. Scales (graphic only)
5. Control Section (right corner over Key Map)
6. List of all structures in contract
7. Name of Designer (lower left hand border)
8. Project Category (left corner over Key Map)
9. Right of Way Section (right corner under Key Map)
10. Horizontal Datum
11. Vertical Datum
12. Index of sheets (upper right corner)
13. Federal lengths and state lengths (linear meters and kilometers)
14. Type of highway (left corner under Key Map)
15. Split circle for sheet number (lower right corner)
16. Federal block (15 by 115 millimeter - upper right corner)
17. Signature block (75 by 200 millimeters - lower right corner)

TYPICAL SECTION SHEETS

1. Profile control indicated, base or centerline labeled
2. Percent grade slopes indicated
3. Typical Sections shown for each section change
 - a) for widenings and resurfacings, show the existing conditions including pavement thicknesses, subbases, curbs, lane widths, etc.
 - b) proposed widenings and/or resurfacings should be shown over the existing conditions
 - c) proposed lane, shoulder and auxiliary lane widths shown and labeled (including median)
 - d) existing and proposed right of way lines shown and labeled
 - e) existing and proposed curb and barrier curb shown and labeled
4. Slope limits
5. Slopes for various heights of fill
6. Scales (graphic)

7. Guiderail locations (existing and proposed)
8. Existing pavements and dimensions
9. Typical of channels, ditches, overload placement etc.
10. Types of proposed pavement, bases, curbs
11. Topsoil, fertilizing and seeding, types shown
12. Slopes rounded, tops only
13. Limits in rock cuts, wet excavation, unusable materials, limits for Zone 2 backfill
14. Non-vegetative surface under guiderail
15. Noise barriers

TIE SHEETS

1. Horizontal data, control ties to all PC's, PI's and PT's on the project baseline furnished, and where a field survey line differs from the project baseline (show both)
2. North arrow
 - a) New Jersey State Plane Coordinate System (NAD27) or
 - b) New Jersey State Plane Coordinate System (NAD83)
 - c) true north
 - d) assumed meridian
 - e) meridian taken from previous plans
3. Scales (graphic)
4. List of existing horizontal and vertical control monuments used for project
5. Sufficient information for horizontal and vertical construction layout
6. List of all original right of way and baseline and control line monuments, with notation which were found and/or not found.

CONSTRUCTION PLAN SHEETS

1. The following existing topographic features are shown:
 - a) roadway locations, type of pavement, shoulders, etc.
 - b) drainage, including structures, inverts, ditches, channels, other waterways, outfall locations, basins and flow directions
 - c) existing topography to include 150 meters on either side of the project limits
 - d) bench marks, approximately 120 meter spacing
2. North arrow
 - a) NJ State Plane Coordinate System (NAD27) or
 - b) NJ State Plane Coordinate System (NAD83)
 Vertical Datum
 - a) North American Vertical Datum 1988 (NAVD88) or National Geodetic Vertical Datum 1929 (NGVD29).
3. Scales (graphic)
4. Baseline (construction), right of way lines, existing and proposed, and/or limits of no access lines
5. All roadway dimensions compatible with the typical section, including limits of cut and fill
6. Match lines and stations
7. Equations shown and stationed
8. Begin and end limits of various size curbs and transitions lengths including barrier curb.
9. Standard Legend on first construction plan only

10. Bridge approach slab layout
11. Joint layout shown on concrete pavement construction
12. Beginning and end of project (state/federal), stations and federal nos. shown, stops and resumes shown
13. Inverts and top of grate elevations of proposed and existing drainage structures
14. On projects where rock will be encountered with rock excavation, are combination drains shown
15. Existing and proposed sign structures shown (overhead and ground mounted)
16. Existing utilities
17. Structure numbers
18. Identify wooded areas, swamps, grass, driveway types, etc.

PROFILE SHEETS

1. Existing profile to include 150 meters on each side of the project limits
2. Existing ground line and station elevations
3. Proposed profile
4. Datum reference, vertical control NAVD88 or NGVD29
5. Structure footings and various types of special excavations
6. Scales (graphic)
7. Vertical curve limits
8. Vertical curve design data
9. Existing and proposed structural clearances
10. Proposed design speed for all ramp profiles (if applicable)
11. Begin and end of project limits
12. All railroad crossings

GRADE SHEETS

1. Pavement cross slopes and superelevation rates including transition areas
2. Proposed grades for cross slopes at 7.5 meter intervals where plans deviate from Typical Sections
3. Scales (graphic)
4. Proposed at grade drainage features with elevations
5. Grate and/or rim elevations
6. Detention and retention basins (contoured)
7. Contours for infield areas that are not fully covered by cross sections
8. Proposed lane and shoulder widths
9. North arrow
10. Township and county

TRAFFIC CONTROL AND STAGING PLANS

1. Show all required lane widths for each staging plan
2. Show and grade temporary roadways and cross-overs
3. Show all detours with respective detour signing
4. Show all pay items for temporary work
5. Show any temporary drainage associated with traffic staging
6. Show any temporary traffic signals and associated signal phasing design

7. Show all signing respective of each staging plan
8. Show all traffic control and safety devices that are necessary for each stage of construction.
9. Indicate township and county
10. North arrow
11. Scales (graphic)
12. Indicate allowable working hours

TRAFFIC CONTROL AND LIGHTING PLANS

1. Traffic Signals
 - a) 1:250 scale plans
 - b) proposed traffic signal plans
 - c) anticipated temporary traffic signals
 - d) existing traffic signals to be revised
 - e) location of electrical services and utility lines
 - f) wire elevation layout plan
 - g) utility clearances plan with all signal and lighting standards
2. Highway Lighting
 - a) separate sheets showing all symbols and legends for projects which have two or more load centers
 - b) key sheets showing locations of load centers and areas they serve, locations of the existing and proposed lighting units and locations of sign structures with sign panels
 - c) construction plans showing location of load center, each highway lighting unit (including station and offset), existing highway lighting units (indicating type and wattage of the luminaries with different symbols for existing and proposed) and sign structures and sign panels

CROSS SECTIONS

1. Existing ground line plotted
2. Proposed section template plus baseline plotted correctly
3. Proposed and existing profile grade elevation
4. Datum for each section (horizontal and vertical)
5. Legend
6. Limits of wet excavation
7. Retaining walls, crib walls, abutments, piers and buildings (foundations)
8. Limits of zone 2 backfill with apparent firm bottom
9. Ditch sections
10. Channel sections
11. Limits of excavation and embankment indicated (end sections, equations, bridge sites, etc.)
12. Porous fill, bridge foundation borrow excavation, Zone 1 and Zone 2 materials, or any select embankments clearly indicated
13. Lower right above title block, the location (mainline, ramp Z, etc.) and station to station of the sheet
14. Common line limit for alternate wall designs
15. Match line for overlapping cross sections

EARTHWORK SUMMARY

The earthwork cannot be standardized due to many conditions encountered on various projects. Designers should use the current sample plans for guidance.

INTELLIGENT TRANSPORTATION SYSTEM PLANS

1. Communication conduit layout
2. Key sheet indicating location of all ITS devices
3. System block design
4. Identification of utility conflicts
5. Load center location(s)
6. Location of all traffic signals (proposed and existing)

6.1.3 Guidelines For Structural Plan Development - Initial Submission

Refer to Section 17.3.

6.1.4 Guidelines For Roadway Plan Development - Final Submission

These items shall be completed prior to or included in the Final Design Submission.

The final design submission shall be submitted to the appropriate Quality Assurance units. The submission package shall include:

Environmental Plan Sheet in accordance with Section 8.1.8.

Computer diskette containing Engineer's Estimate data files and two printed copies of the Engineer's Estimate in accordance with the current All Design Unit Memorandum, entitled, "PC Generated Engineer's Estimate".

Computer diskette with the latest Standard Input (SI) and the Designer's Special Provisions, and two sets of the final Special Provisions.

A list of the following:

- Standard Details (Roadway Construction, Traffic Control, Electrical, Bridge) required by sheet number and description.
- Standard Details, as revised or modified, that are included in this submission.
- Non-Standard Details that are included in this submission.

Mylars of all plan sheets, including all standard and non-standard details, consecutively numbered. Indicate the total number of sheets on every sheet. Titles shall be in accordance with the current All Design Unit Memorandum, entitled, "Plan Sheet Titling and Consultant's Signature" and the current Sample Plans.

Roadway plans shall include the following items, as revised for the project:

ESTIMATE - DISTRIBUTION OF QUANTITIES SHEET

1. Proper item nomenclature, no abbreviations
2. Arrangement of items in the order of the standard specifications - insert ten "no items" if there are bridge items; structural items, titled
3. Proper unit designations (linear meters, lump sum, etc.)
4. Provide additional column for cost sharing quantity breakout totals if there are more than one federal project number and/or third party participation
 - a. check if two or more routes are involved, or routes other than NJDOT
 - b) check with the Technical Specification Unit for items participating and non-participating under NJDOT jurisdiction
5. All quantities rounded to whole numbers
6. Suitable amount of "if and where" quantities provided on possible extra work items, not to exceed 10% of the quantity (contact specifications engineer for prior approval)
7. Do not duplicate items, i.e., reset castings vs. reset casting, sanitary sewer
8. Alternate items or groups of items

TYPICAL SECTION SHEETS

1. Finalize typical sections according to initial design review comments.

TIE SHEETS

1. Finalize Tie Sheets according to initial design review comments.

CONSTRUCTION PLAN SHEETS

1. On demolitions
 - a) buildings and tracts defined
 - b) demolition and parcel number
 - c) building described, house number
 - d) cellars, floor slabs
 - e) clearing site area
2. Beginning and end of project (state/federal), stations and federal numbers shown; stops and resumes shown
3. Limits of milling shown
4. Show proposed driveway
5. Limits of removal of concrete base and surface courses, and removal of bituminous concrete overlay clearly shown
6. Complete plan quantities
7. Beam guiderail/impact attenuators

PROFILE SHEETS

1. Finalize according to initial design review comments.

GRADE SHEETS

1. Finalize according to initial design review comments.

TRAFFIC CONTROL AND STAGING PLANS

1. Finalize according to initial design review comments.

TRAFFIC CONTROL AND LIGHTING PLANS

1. Traffic Signals
 - a) all pay items indicated, contract quantities shown on plans and estimate sheets and specified in standard or Special Provisions
 - b) conduit and junction box locations
 - c) block wiring diagrams
 - d) circuitry
 - e) loop detectors and schedule
 - f) signal timing schedule
 - g) load center(s)
 - h) non-standard electrical details
 - i) list of standard electrical details
2. Highway Lighting
 - a) key sheets showing locations of load centers, areas they serve, locations of existing and proposed lighting units (including underdeck lighting units) and the locations of sign structures with sign panels.
 - b) construction plans showing the final location (including station and offset) of each highway lighting unit, revisions to existing lighting systems and temporary highway lighting systems for each stage of construction
 - all pay items with contract quantities shown and specified in standard or Special Provisions
 - conduit and junction box locations
 - foundations
 - wiring diagram
 - circuitry
 - load centers
 - non-standard electrical details
 - list of standard electrical details

CROSS SECTIONS

1. Cut and fill quantities
2. Topsoil quantities and limits
3. Stripping quantities and limits (cuts and fills)
4. Wet excavation and quantities
5. Retaining walls, crib walls, abutments, piers and buildings (foundations)
6. Limits of Zone 2 backfill with apparent firm bottom
7. Ditch sections with quantity, if from sections
8. Channel sections with quantity, if from sections
9. Note describing additional embankment available from project excavation to reduce borrow

10. Check for adequate driveway details and pavement runouts to cover all situations that may be encountered

EARTHWORK SUMMARY

Finalize earthwork summary according to final earthwork quantities.

EARTHWORK CHART SHEET

An earthwork chart should be provided only when the project is a large earth moving project and complex enough to warrant a graphic picture of available embankment sites.

INTELLIGENT TRANSPORTATION SYSTEM PLAN

1. Final device and service locations
2. Fiber optic cable wiring diagrams
3. System block diagrams
4. Traffic signal, CCTV, HAR, and VMS utility conflict corrections
5. Non-standard details
6. Complete plan quantities
7. Signal timing schedule
8. Loop detectors and schedule
9. Load center(s)
10. List of standard electrical details

6.1.5 Guidelines For Structural Plan Development - Final Submission

Refer to Section 17.4.

6.2 Quality Assurance Procedure for Design

Quality Assurance is the process of verifying the effectiveness of quality control measures employed throughout the project delivery process.

All designers are required to develop quality control guidelines. However, as a check to assure that the contract documents are developed in accordance with applicable standards and guidelines, appropriate Department units will utilize Quality Assurance checklists at both the initial and final design submissions. The Department's review does not relieve the designer of the responsibility from submitting quality documents.

The items listed on the Quality Assurance Checklists (Attachments 6.2-1 through 6.2-11) are the major design items that are important to assure accurate development of the project documents. The checklists are intended to focus rather than limit the scope of Department review. The reviewer is encouraged to provide random checks of related design items.

The Department's review units shall provide a memorandum to the Design Coordination Unit at the completion of each review submission stating they have conducted a quality assurance review and shall include any comments in the memorandum. The Design Coordination Unit will compile all quality assurance memorandums and forward the package to the Project Manager for the appropriate action(s).

**QUALITY ASSURANCE CHECKLIST
GEOMETRIC DESIGN UNIT**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
• Lane Width	_____	_____	_____
• Shoulder Width	_____	_____	_____
• Border Width	_____	_____	_____
• Auxiliary Lane Width	_____	_____	_____
• Shoulder Width Adjacent to Auxiliary Lane	_____	_____	_____
• Stopping Sight Distance Vertical Curves	_____	_____	_____
• Stopping Sight Distance Horizontal Curves	_____	_____	_____
• Pavement and Shoulder Cross Slopes	_____	_____	_____
• Superelevation	_____	_____	_____
• Superelevation Transition Length	_____	_____	_____
• Minimum Curve Radius	_____	_____	_____
• Minimum Grade	_____	_____	_____
• Maximum Grade	_____	_____	_____
• Lane Drop Transition Length and Location	_____	_____	_____
• Lane Addition Transition Length	_____	_____	_____
• Auxiliary Lane Length	_____	_____	_____
• Cross Sections (Slopes, Vertical Curve, Berms)	_____	_____	_____
• Typical Sections - All Elements	_____	_____	_____
• Grades- Spot Check	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
HYDRAULIC DESIGN SECTION**

		<u>Yes</u>	<u>N/A</u>	<u>No</u>
<u>Preliminary and Final Drainage Design Report</u>				
A.	Design Criteria			
	1. NJDOT	_____	_____	_____
	2. State	_____	_____	_____
	3. Federal	_____	_____	_____
B.	Drainage area delineation	_____	_____	_____
C.	Pavement spread	_____	_____	_____
D.	Inlet location and spacing	_____	_____	_____
E.	System sizing (including alternate design)	_____	_____	_____
F.	Outfall protection stone size and cutoff wall	_____	_____	_____
<u>Preliminary and Final Plans</u>				
A.	Inlet type and location	_____	_____	_____
B.	Pipe size, type, and inverts (alternate design indicated on plans)	_____	_____	_____
C.	Low point drainage	_____	_____	_____
D.	Outfall protection detail indicated on plan sheet	_____	_____	_____
<u>Stream Encroachment Application Package</u>				
A.	Completed application, data sheet, and administrative checklist	_____	_____	_____
B.	Application report			
	1. Location map and drainage area map	_____	_____	_____
	2. Color photos	_____	_____	_____
	3. Hydrological calculations	_____	_____	_____
	4. Hydraulic calculations (include HEC-2 files on disk)	_____	_____	_____
	5. Net fill calculations or waiver request	_____	_____	_____
	6. Local and/or public notice Environmental report	_____	_____	_____
C.	Application plans, signed and sealed			
	1. Plan view with datum and property lines noted	_____	_____	_____
	2. Soil erosion plan	_____	_____	_____
	3. Encroachment lines	_____	_____	_____
	4. Topographic contours	_____	_____	_____
	5. Profile and cross sections of stream	_____	_____	_____
	6. Detail of all structures	_____	_____	_____
	7. Roadway profile	_____	_____	_____

D. Permit fee calculation

**QUALITY ASSURANCE CHECKLIST
BUREAU OF ENVIRONMENTAL SERVICES**

The following documentation related to environmental work must be available prior to the hand-off from Project Scope Development to Final Design, or prior to advertisement of a design/build:

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
1. Approved environmental document - FONSI, ROD, CE.	_____	_____	_____
2. Documentation showing the completion of Section 106 consultation (absent mitigation steps).	_____	_____	_____
3. Documentation showing completion of Section 4(f) and 6(f) requirements.	_____	_____	_____
4. Documentation showing consistency with the Clean Air Act conformity requirements.	_____	_____	_____
5. A list of environmental commitments for incorporation into Environmental Plan Sheets.	_____	_____	_____
6. Documentation showing compliance with E.O. 215. Even though approval under this executive order is allowed to occur during final design, it should be done during Scope Development, to avoid last minute project changes required by DEP review.	_____	_____	_____
7. Preliminary plans that incorporate the results of the environmental process.	_____	_____	_____
8. Identification of areas where noise barriers are recommended.	_____	_____	_____
9. For Design Build situations, individual wetland permits should be available prior to advertisement.	_____	_____	_____

The following documentation related to environmental work must be available prior to advertisement.

1. Final noise study report if required.	_____	_____	_____
2. Completion of Section 106 mitigation. This includes field work for archaeological data recovery as well as mitigation for standing historic structures.	_____	_____	_____

3. Approved plans and specifications relating to management of contaminated soils. _____
- Attachment 6.2-3

**QUALITY ASSURANCE CHECKLIST
BUREAU OF ENVIRONMENTAL SERVICES (CON'T)**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
4. All environmental permits and approvals, including plans for mitigation.	_____	_____	_____
5. Completed re-evaluation (as required).	_____	_____	_____
6. Completed Environmental Plan Sheet, and final plans/specs that incorporate environmental commitments and permit conditions.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
CONSTRUCTION**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
<u>Estimate and Distribution of Quantities Sheet</u>			
1. If and Where Directed items should have a purpose and realistic quantities.	_____	_____	_____
2. Check to see if bituminous concrete patch is needed.	_____	_____	_____
<u>Typical Sections</u>			
1. Pavement widths and thickness should be constructible within equipment limits and in accordance with the specifications.	_____	_____	_____
2. Instructions for special conditions and/or construction limits stationing should be noted.	_____	_____	_____
3. Verify that proposed milling and paving to new cross slope can be achieved when compared with existing conditions.	_____	_____	_____
<u>Construction Plan Sheets</u>			
Milling, curb and other item limits should be clearly defined. Variable depth milling should have +/- limits. Verify utility test pit info.	_____	_____	_____
<u>Profile Sheets</u>			
Is handling of runoff during and after construction shown?	_____	_____	_____
<u>Cross Sections</u>			
1. Check top and toe of slopes with those on construction plan sheets to ensure no water is trapped on or diverted to private property. Are drainage provision shown?	_____	_____	_____
2. Earthwork sections must correspond with begin and end stations of project (should not end at plus station).	_____	_____	_____
<u>Detail Sheets</u>			
Are specialty item details shown?	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
CONSTRUCTION (CON'T)**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
<u>Traffic Control Plan</u>			
Adequate signing is needed, especially on detours. Can it be constructed? Adequate work zones and transitions should be provided.	_____	_____	_____
<u>Structures</u>			
1. Ensure bridge joint details reflect what is shown on plans.	_____	_____	_____
2. Construction requirements for header should be spelled out, usually after deck pour.	_____	_____	_____
3. Check to see if cofferdam sheeting should be left in place.	_____	_____	_____
4. Location of utility sleeves should be clearly indicated.	_____	_____	_____
5. Are geotechnical and foundations reports available to the contractor and the Resident Engineer? How will piles be driven?	_____	_____	_____
<u>Specifications</u>			
Does the spec have provision for ARAN or rolling straight edge? Check for inclusion of any special item description.	_____	_____	_____
<u>Bar Chart</u>			
1. Check duration, contract start (allow 9 weeks from bid date) and completion date. Look for inclusion of restraints. If project can be completed in one construction season, project should be scheduled early in the year. What do you think is the optimum month to bid this project to reduce CE costs and for construction efficiency (avoid winter layover, etc.)?	_____	_____	_____
2. Check for landscape season, pavement clean up, and long life striping in winter months.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
CONSTRUCTION (CON'T)**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
<u>Permits</u>			
1. The status of the required permits should be provided. Check to see if they are in hand, being obtained, or will expire prior to completion date.	_____	_____	_____
2. Dates must be listed in the specs.	_____	_____	_____
3. Cross reference with Environment commitment.	_____	_____	_____
<u>General</u>			
1. Will any intended work conflict with existing noise ordinances?	_____	_____	_____
2. Check to see if guiderail terminal anchorage is shown.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
STRUCTURES**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Plans conform with Foundation Report, Design Appraisal Statement, Hydraulic and Scour Analysis Reports	_____	_____	_____
Bridge aesthetics considered	_____	_____	_____
Attachment details and location of utilities on the structure approved	_____	_____	_____
Previous comments addressed	_____	_____	_____
Geometrics agree with roadway plans	_____	_____	_____
Safety features provided; parapets, guiderail, impact attenuators, etc.	_____	_____	_____
Value engineering recommendations been incorporated	_____	_____	_____
Seismic design and retrofit details provided	_____	_____	_____
Structure complies with all NJDEP and Coast Guard Permits	_____	_____	_____
Structure designed for the attachment of noise barriers, bridge mounted sign support structures, utilities, etc.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
GEOTECHNICAL ENGINEERING**

	<u>Yes</u>	<u>N/A</u>	<u>No*</u>
Has the Designer addressed structural foundation settlement and stability concerns?	_____	_____	_____
Has the Designer addressed roadway settlement, stability and groundwater concerns?	_____	_____	_____
Has the Designer addressed rock slope stability?	_____	_____	_____
Do the typical sections generally represent the Consultant's Pavement Design Report?	_____	_____	_____
Have the tests boring and geophysical locations been labeled and located on the plans?	_____	_____	_____
Have constructibility issues been addressed?	_____	_____	_____

*NOTE: Any item checked "NO" shall be explained in the space provided below. Attach additional sheets if needed.

**QUALITY ASSURANCE CHECKLIST
BUREAU OF LANDSCAPE AND URBAN DESIGN**

		<u>Yes</u>	<u>N/A</u>	<u>No</u>
<u>Design</u>				
1.	Soil Erosion and Sediment Control report submitted.	_____	_____	_____
2.	All erosion control items included and in conformance with report recommendations and certification requirements.	_____	_____	_____
3.	Necessary landscape items are included in the contract documents.	_____	_____	_____
4.	Non-vegetative surface included under guiderail.	_____	_____	_____
5.	All landscape related commitments are addressed.	_____	_____	_____
6.	Global Warming legislation requirements met.	_____	_____	_____
7.	Federal landscape related requirements and recommendations met.	_____	_____	_____
8.	Noise barrier aesthetics addressed.	_____	_____	_____
9.	Wetland mitigation planting requirements addressed.	_____	_____	_____
<u>Construction Support</u>				
1.	All landscape items have been constructed essentially according to plan.	_____	_____	_____
2.	Soil Erosion and Sediment Control items are installed as required by the Certification.	_____	_____	_____
3.	All public inquiries pertaining to landscape construction issues, including noise barrier aesthetics and environmental mitigation, have been adequately resolved.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
SURVEY SERVICES UNIT**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Horizontal Control was based on published NAD83 monumentation.	_____	_____	_____
Vertical Control was based on published NAVD88 monumentation.	_____	_____	_____
Highway baseline monumentation was found and verified in the field.	_____	_____	_____
Highway baseline monumentation and B.M.'s have been tied into the horizontal and vertical control.	_____	_____	_____
List of horizontal monuments with stations and coordinates has been provided.	_____	_____	_____
List of vertical benchmarks with stations and elevations has been provided.	_____	_____	_____
List of proposed monuments with locations has been provided.	_____	_____	_____
The survey traverse and control network meet 2 nd Order requirements.	_____	_____	_____
The data collected complies with all parts of the survey request.	_____	_____	_____
The Electronic Collection Data is in a format compatible with the requirements of the Department's CADD Unit.	_____	_____	_____
The proper parties have certified to the adequacy of the survey performed.	_____	_____	_____
A detailed survey report addressing all of the above points must be included with the QAC.	_____	_____	_____

NOTE: If any of the above have not been met, a full explanation must be made and approval attached.

**QUALITY ASSURANCE CHECKLIST
UTILITIES DESIGN**

		<u>Yes</u>	<u>N/A</u>	<u>No</u>
1.	Underground Facilities: Conflicts with drainage, structures and other utilities have been addressed.	_____	_____	_____
2.	Overhead Facilities: Aerial facilities are properly located and cleared from overhead structures and work zone equipment.	_____	_____	_____
3.	Grade Changes: No conflicts with utilities or their operations exist because of profile or cross section changes.	_____	_____	_____
4.	Workable Time Frames: Utility schedules have been established in concert with staging of construction and the ability of the Utility Owners to deliver their work, specifications contain the schedules.	_____	_____	_____
5.	Compliance with Scheme of Accommodation: All Utility facilities have been designed and are in conformance with the approved Schemes of Accommodations.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
TRAFFIC SIGNAL AND SAFETY ENGINEERING**

Initial Submission

Traffic Engineering Review

A. Traffic Signals	<u>Yes</u>	<u>N/A</u>	<u>No</u>
The Preliminary Traffic Signal Design conforms to the MUTCD and NJDOT Standard Design practices.	_____	_____	_____
B. Pavement Markings			
Pavement markings conform to the MUTCD.	_____	_____	_____
Revised passing zones are proposed, if yes specify revisions and initiate required regulations.	_____	_____	_____
Crosswalks are aligned with handicapped ramps.	_____	_____	_____
All necessary regulations, ordinances, and resolutions have been requested or initiated.	_____	_____	_____
C. Signs			
Regulatory			
Proposed signs meet the standards of the MUTCD and NJDOT Sign Manual.	_____	_____	_____
All regulations, ordinances or resolutions to establish the proposed prohibitions or restrictions have been requested or initiated.	_____	_____	_____
Warning Signs			
Warning signs meet the standards of the MUTCD and NJDOT Sign Manual.	_____	_____	_____
Guide Signs			
All overhead sign locations have been identified and preliminary sign designs completed.	_____	_____	_____
The proposed locations meet the standards of the MUTCD.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
TRAFFIC SIGNAL AND SAFETY ENGINEERING (CON'T)**

		<u>Yes</u>	<u>N/A</u>	<u>No</u>
	Overhead sign lighting requirements have been reviewed and a recommendation has been made based on the sight distance requirements set by the NJDOT.	_____	_____	_____
Electrical Engineering Review Signals				
A.	Highway Lighting			
	Has the Department Design Policy on highway lighting been satisfied?	_____	_____	_____
	The proposed lighting system hardware conforms to NJDOT Standards.	_____	_____	_____
	All utility conflicts with highway lighting systems have been reviewed and resolved.	_____	_____	_____
	The design meets all local and State Standards and is in accordance with the following codes: NEC; NEMA; ASTM; UL; and ANSI.	_____	_____	_____
	Load centers have been identified.	_____	_____	_____
B.	Traffic Signals			
	All traffic signal agreement requirements have been identified and the approval process initiated.	_____	_____	_____
	The selected traffic signal hardware conforms to NJDOT Standards.	_____	_____	_____
Traffic Control and Stage Construction				
A.	Stage Construction			
	The project requires a detour and the agency having jurisdiction has reviewed and approved the proposed detour route.	_____	_____	_____
	Meets the minimum requirements to carry the volume and type of traffic detoured.	_____	_____	_____

Stage construction is required for the project and the proposed staging is constructible. _____

Attachment 6.2-10

**QUALITY ASSURANCE CHECKLIST
TRAFFIC SIGNAL AND SAFETY ENGINEERING (CON'T)**

	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Diversionary roads are required and the design meets the minimum standards.	_____	_____	_____
All aspects of the staging design meets current NJDOT Design and Construction Standards.	_____	_____	_____
All utility conflicts for the stage construction have been resolved.	_____	_____	_____
B. Traffic Control			
Temporary traffic signals are required and the design meets all MUTCD and State Standards and has been structurally certified by a New Jersey licensed professional engineer.	_____	_____	_____
All work zone traffic control devices meet MUTCD and NJDOT Standards.	_____	_____	_____
Safety Engineering			
The proposed guide rail or barrier curb installations, including transition lengths, meet the minimum design standards of the NJDOT.	_____	_____	_____
The proposed end treatments for barrier curb, guide rail or bridge parapits meet NJDOT Standards.	_____	_____	_____
Delineators and raised pavement markers meet the NJDOT Specifications.	_____	_____	_____
Sign posts proposed meet NJDOT Specifications.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
TRAFFIC SIGNAL AND SAFETY ENGINEERING (CON'T)**

Final Checklist

Traffic Engineering Review

A. Traffic Signals	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Final traffic signal designs conform to MUTCD and NJDOT Standards.	_____	_____	_____
Traffic signal timings have the minimum change, clearance and pedestrian intervals required.	_____	_____	_____
Traffic signal coordination has been provided where applicable.	_____	_____	_____
B. Pavement Markings			
All pavement markings conform to the MUTCD.	_____	_____	_____
All passing zone revisions have been identified and the required regulation has been processed.	_____	_____	_____
All ordinances, regulations, and resolutions have been processed.	_____	_____	_____
C. Signs			
Regulatory			
All signs meet the standards of the MUTCD and NJDOT Sign Manual.	_____	_____	_____
All ordinances, regulations, and resolutions have been processed.	_____	_____	_____
Warning			
All warning signs meet the standards of the MUTCD and NJ Sign Manual.	_____	_____	_____
Guide			
All guide signs meet the standards of the MUTCD and NJ Sign Manual.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
TRAFFIC SIGNAL AND SAFETY ENGINEERING (CON'T)**

Electrical Engineering Review

		<u>Yes</u>	<u>N/A</u>	<u>No</u>
A.	Highway Lighting			
	The Departments Design Policy on Highway Lighting is satisfactory. _____	_____	_____	_____
	All electrical hardware conforms to NJDOT Standards. _____	_____	_____	_____
	All applicable electrical codes are met. _____	_____	_____	_____
B.	Traffic Signals			
	All traffic signal hardware conforms to NJDOT Standards. _____	_____	_____	_____
	All traffic signal agreements have been processed. _____	_____	_____	_____

Traffic Control and Stage Construction Review

A.	Staging			
	All detours have been approved. _____	_____	_____	_____
	All staging designs are constructible. _____	_____	_____	_____
	All staging designs and diversionary roads meet NJDOT Design and Construction Standards. _____	_____	_____	_____
B.	Traffic Control			
	Temporary traffic signals meet MUTCD and NJDOT Standards and the structural design certification processed. _____	_____	_____	_____
	The traffic signal timing has the minimum change, clearance and pedestrian intervals based on the location and approach speed. _____	_____	_____	_____
	All work zone traffic control devices meet MUTCD and NJDOT Standards. _____	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
TRAFFIC SIGNAL AND SAFETY ENGINEERING (CON'T)**

Yes N/A No

Safety Engineering

All guide rail, barrier curb installations, impact attenuators, delineators, and raised pavement markers meet NJDOT Standards.

All sign posts meet NJDOT Standards.

**QUALITY ASSURANCE CHECKLIST
I.T.S. ENGINEERING**

Initial Submission

A. Plans	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Existing traffic signals, lighting and ITS facility equipment has been verified by field checks.	_____	_____	_____
System concepts conform to the system definition report.	_____	_____	_____
System block diagrams are provided for the communication equipment.	_____	_____	_____
Design exceptions have been identified.	_____	_____	_____
CADD format (level structure, line weights, etc.) has been approved by NJDOT CADD Design.	_____	_____	_____
Communication plans are shown at 1:1000 scale.	_____	_____	_____
Plans show locations of all traffic signals, proposed and existing ITS facility locations, and the location of electric services.	_____	_____	_____
Plans conform to NJDOT, NEC, AASHTO, ANSI, NEMA and utility company standards.	_____	_____	_____
Traffic signal plans and local ITS facilities are shown at 1:300 scale.	_____	_____	_____
Locations for temporary traffic signals have been identified.	_____	_____	_____
B. Specifications			
Specification development for the ITS communication equipment and local devices has begun.	_____	_____	_____
C. Geotechnical Data			
Locations for borings have been identified by station and offset.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
I.T.S. ENGINEERING (CON'T)**

D. Utilities	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Existing utility conflicts have been identified by field checks and the proposed remedies for each have been included.	_____	_____	_____
All proposed ITS facilities are within the State right of way.	_____	_____	_____
Electric service inquiries for all facilities have been sent to the electric service company.	_____	_____	_____
Draft utility agreements have been forwarded to the utility companies.	_____	_____	_____
Draft agreements for traffic signals and ITS facilities have been forwarded to municipalities and counties.	_____	_____	_____
E. Permits			
Any permits required have been identified.	_____	_____	_____
Permit applications have been completed and forwarded to the relevant parties.	_____	_____	_____
F. Data Collection			
Traffic data collection has begun on specific routes.	_____	_____	_____

Comments/Actions required: _____

**QUALITY ASSURANCE CHECKLIST
I.T.S. ENGINEERING (CON'T)**

Final Submission

A. Plans	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Initial submission comments have been addressed.	_____	_____	_____
Calculations are included for:			
Traffic signal loading	_____	_____	_____
Overhead clearances	_____	_____	_____
Conduit fill	_____	_____	_____
Non-standard details are included	_____	_____	_____
Circuits/load centers	_____	_____	_____
Voltage drop	_____	_____	_____
Structures	_____	_____	_____
B. Geotechnical			
Foundations report is included.	_____	_____	_____
C. Specifications			
Special provisions are complete.	_____	_____	_____
D. Engineer's Estimate			
Engineer's Estimate is complete	_____	_____	_____
E. Utilities			
Electric service inquiries are confirmed.	_____	_____	_____
Final utility agreements are executed.	_____	_____	_____
F. Data Analysis			
Traffic signal timing plans are complete for AM, off peak, and PM periods.	_____	_____	_____

**QUALITY ASSURANCE CHECKLIST
I.T.S. ENGINEERING (CON'T)**

G. Permits	<u>Yes</u>	<u>N/A</u>	<u>No</u>
Permits are secured.	_____	_____	_____

Comments/Actions required: _____

6.3 Capital Program Management Quality Assurance Plan Guidelines

6.3.1 Mission Statement

The New Jersey Department of Transportation, in keeping with the February 3, 1994, NJDOT/Industry Quality Assurance Initiative, has established a Quality Assurance System. Every internal unit, consultant, contractor and supplier providing a service to the NJDOT will examine its role in supporting the Department's goal to efficiently manage the Capital Program, and develop its own specific Quality Control/Quality Assurance Plan. The establishment of a universal Quality Assurance Plan will enable the Department to effectively serve the public as we head into the future.

6.3.2 Definitions

Customer - Any internal NJDOT unit that receives a product or service from the unit whose Quality System is being considered. Customers could also include supervisors, coworkers or management. External customers could include FHWA, other agencies, political officials, communities or permitting agencies.

Non-conforming Product - Any product produced by the unit that does not meet the established specifications or requirements for quality as outlined in the unit's procedures and Quality Assurance plan. Products could include items produced, reports, designs, studies, calculations, letters, memos or services performed for the customer.

Product - The result of a Unit's activities or processes. It may include a service provided to a customer.

Quality Assurance (QA) - The process of checking or reviewing work tasks or processes to ensure quality. This is typically conducted by personnel independent of the organizational unit responsible for the task or process.

All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality. QA includes ensuring that project requirements are developed to meet the needs of all relevant internal and external agencies, planning the processes needed to assure quality of the project, assuring that equipment and personnel are capable of performing tasks related to project quality, ensuring that contractors are capable of meeting and do carry out quality requirements, and documenting the quality efforts.

Quality Control (QC) - The measuring, testing or inspection of a task or process by the personnel who perform the work.

The operational techniques and activities that are used to fulfill requirements for quality. These techniques are used to ensure that a product or service meets

requirements. QC is carried out by the operating forces. Their goal is to do the work and meet the product or service goals. Generally, QC refers to the act of taking measurements, testing and inspecting a process or product to ensure that it meets specifications. Products may be design drawings or specifications, manufactured equipment, or constructed items. QC also refers to the process of documenting such actions.

Quality Oversight (QO) - The administration and review of a Quality Assurance Plan to ensure its success.

Quality oversight is conducted by a unit which is ultimately responsible for project quality where other units have been assigned QA and QC. Quality oversight can range from an informal process of keeping in touch with the QA unit to a second layer of QA activities, depending upon the circumstances. Quality oversight verifies the execution of the quality program.

Unit - Any NJDOT division, bureau, unit or section, under Capital Program Management.

6.3.3 Objectives

The Bureau of Quality Management Services (QMS) was established to provide quality oversight to the Capital Program Management units. QMS will monitor the program, periodically review existing Quality Assurance Plans and conduct Quality Assurance Audits, including frequent job site visits to verify that Quality Control/ Quality Assurance activities are being performed in accordance with the approved Quality Assurance Plans.

QMS will also provide for training of all personnel as needed, promote the use of new technology and products, act as quality assurance representatives in dealing with the FHWA, and recommend improvements as needed. Additionally, QMS will report directly to the Assistant Commissioner of Capital Program Management regarding all quality assurance matters.

The development and utilization of a composite NJDOT Capital Program Management Quality Assurance Plan will enable the Department to continue its commitment toward streamlining the design and Capital Program Management processes. Every unit within NJDOT or that provides a service to the NJDOT is required to make a commitment to the concept of quality assurance so that the Department's goal of producing consistent, high quality work is achieved.

Moreover, in support of the Department's quality assurance mission, all Capital Program Management (CPM) units shall develop and implement a unit Quality Assurance Plan (QAP) for inclusion in a composite NJDOT CPM Quality Assurance Manual. This quality assurance plan guideline shall be followed by all NJDOT CPM

units when developing their QA plans.

6.3.4 Quality Assurance Plan Requirements

In addition to the general unit QAP, a Project Specific Quality Assurance Plan is required for each design project. The procedure is outlined in Section 6.5, Project Specific Requirements. Failure to comply with the approved Quality Assurance Plan, or PSQAP, may result in the issuance of Non-Conformance Reports and Corrective Action Requests (Section 6.6).

6.3.4.1 Management Responsibility

Management shall be responsible for the establishment, oversight, documentation and accountability of a Quality Assurance Plan for their unit.

Quality Assurance Policy

The responsibility for and commitment to a quality assurance policy belongs to the highest level of management. Management shall, therefore, declare and document its commitment to quality. Management shall ensure that the quality assurance policy is understood, implemented, and maintained throughout the organization.

Unit

All personnel who have responsibility for quality assurance or quality control within the unit shall be identified and their interrelationships with management defined. These relationships shall be shown on an **organizational chart**. In particular, the personnel shall be identified who have responsibility to initiate action to prevent quality problems, to identify and record quality problems, to initiate solutions through appropriate channels, and to verify implementation of solutions to quality problems. Those personnel responsible for quality assurance must be independent of those having direct responsibility for the work being performed. This can be accomplished satisfactorily if those assuring quality report to a level higher than those having direct responsibility for the work.

Responsibility and Authority

A person shall be designated as the representative of management who has the responsibility and authority to ensure that management's quality policy is implemented and maintained. Maintenance includes documented review of the policy at appropriate intervals to ensure that it remains suitable and effective.

6.3.4.2 Quality System

Each unit shall implement, document and utilize an effective Quality Assurance Plan which ensures that its products and services meet the customers' requirements.

A total Quality Assurance Plan consists of Quality Control, Quality Assurance and Quality Oversight. This Quality Assurance Plan ensures that the Unit's policies, procedures, work instructions and documentation system are functioning as intended to produce quality products or services.

Quality-System Procedures

The unit shall:

- a) prepare documented work procedures consistent with the requirements of these Capital Program Management Quality Assurance Plan Guidelines and the unit's stated quality policy, and
- b) effectively implement the quality system and its documented work procedures.

For the purposes of these Capital Program Management Quality Assurance Plan Guidelines, the range and detail of the procedures that form part of the quality system depend on the complexity of the work, the methods used, and the skills and training needed by personnel involved in carrying out the activity. Work procedures describe **what** the unit does; Work instructions explain **how** the procedure is carried out. Management shall determine the extent to which work procedures and work instructions are required to effectively meet the goals of its Quality Policy. Work procedures and work instructions do not have to be included in the Unit's Quality Assurance Plan, but should be referenced when applicable.

Quality Planning

The unit shall define and document how the requirements for quality will be met. Quality planning shall be consistent with all other requirements of an unit's quality system and shall be documented in a format to suit the unit's method of operation.

6.3.4.3 Contract Review

Each unit shall establish and maintain documented procedures for contract review and for the coordination of all applicable activities, to verify that its product or services meet the customers' requirements.

Review and Amendment to Contract

The unit shall ensure that all contract commitments are reviewed and agreed upon prior to the execution of the contract, in agreement with the terms of the Quality Assurance Plan. The unit shall also establish the responsibilities for coordinating and conducting contract reviews, distribution of documents for review, and the process for identifying and amending discrepancies within the contract.

Records

Records of contract reviews and amendments shall be maintained and made accessible to personnel directly involved in the contract review process.

6.3.4.4 Design Control

Each unit shall establish and maintain procedures to control and verify that every design meets the customers' requirements and conforms with all applicable established standards.

Design Input

A framework for initial design planning activities shall be established. The designer shall compile, record and verify information on field surveys and inspections. All relevant design criteria, including codes and standards, shall be established and made available to design personnel. Design schedules and cost estimates shall be monitored and adhered to, with documentation of any deviations. The communication interfaces between the consultant, subconsultants, NJDOT units and FHWA shall be identified and described.

Design Output

The designer shall establish methods to ensure that completed designs are functional, meet the needs of the user, are safe and conform to established regulatory standards. Reviews shall be implemented to ensure that all designs are constructable and functional. Furthermore, the design unit shall ensure that only the most recent revisions to written procedures, codes, standards and relevant documents are utilized.

Design Changes

All design changes and modifications shall be identified, documented, reviewed and approved by authorized personnel before their implementation.

6.3.4.5 Document Control

Each unit shall establish and maintain an effective document control system that

includes procedures for creating, controlling, reviewing, approving, publishing and changing all documents that are directly related to the quality of the delivered work.

The unit shall ensure that records, contract drawings, specifications, calculations, studies, quality assurance plan, engineering and construction procedures and other quality related documents are controlled when creating, reviewing, approving, using, revising, and distributing these documents. The pertinent issues of appropriate documents shall be made available at all locations where operations essential to the effective functioning of the Quality System are performed. Changes to documents shall be controlled and reviewed by quality assurance personnel within the unit, including the customer, who reviewed the original document for the area undergoing change. Master document lists shall be maintained showing the latest issue, to preclude the use of non-applicable documents. The storage methods for all documents shall be defined, and obsolete documents either destroyed or clearly marked and segregated, if required for archives.

6.3.4.6 Purchasing/Procurement

Each unit shall ensure that all purchased or procured supplies, materials or services conform to established standards and requirements.

Each unit shall ensure that all contractors/sub-contractors/suppliers it uses have an approved, functioning Quality Assurance/Quality Control Plan in place.

Evaluation of Contractors/Sub-contractors/ Suppliers

The unit shall:

- a) Evaluate and select contractors/sub-contractors/suppliers on the basis of their ability to meet contract requirements, including the quality system and any specific quality assurance requirements.
- b) Define the type and extent of control exercised over contractors/sub-contractors/suppliers. This shall be dependent upon the type of project, the impact of the subcontracted product on the quality of the final product, and, where applicable, on the quality audit reports and/or quality records of the previously demonstrated capability and performance of contractors/sub-contractors/suppliers.
- c) Establish and maintain quality records of acceptable contractor/sub-contractors/suppliers.

6.3.4.6.2 Purchasing Data

Purchasing documents shall contain data clearly describing the product ordered,

including where applicable:

- a) The type, class, grade, or other precise identification.
- b) The title or other positive identification, and applicable issues of specifications, drawings, process requirements, inspection instructions and other relevant technical data, including requirements for approval or qualification of product, procedures, process equipment and personnel.
- c) The title, number, and issue of the quality-system standard to be applied. The unit shall review and approve purchasing documents for adequacy of the specified requirements prior to release.

Verification of Purchased Product

Where specified in the contract, the NJDOT or the NJDOT's representative shall be afforded the right to verify at the subcontractor's premises and the supplier's premises that the subcontracted product conforms to specified requirements. Such verification shall not be used by the supplier as evidence of effective quality control by the subcontractor.

Verification by the NJDOT shall not absolve the supplier of the responsibility to provide an acceptable product, nor shall it preclude subsequent rejection by the NJDOT.

6.3.4.7 Product Identification and Traceability (Inventory Control)

Each unit shall establish an identification and traceability system to ensure that all products, materials and equipment are uniquely identified and traceable through all stages of their use.

Implementation

The unit shall develop and implement an inventory control system to identify items (i.e. materials, equipment, documents, etc.) by the use of stamps, tags, labels, or other approved methods. This identification will allow for the item to be traced through all stages of its use. The unit shall establish and document procedures to handle, store, retrieve, package and deliver products to its customer.

6.3.4.8 Process Control

Each unit shall identify and plan all of the processes and procedures that directly affect the quality of the finished product.

Each unit shall ensure that established processes or procedures are performed under controlled conditions.

Standard Work Procedures

The unit shall ensure that accuracy and consistency are achieved by documenting standard work procedures for every process or procedure that is performed that directly affects the quality of the product. The unit shall ensure the use of suitable equipment, a suitable work environment, qualified personnel and compliance with referenced standards, codes and procedures to produce a quality product.

Monitoring

Processes and product characteristics shall be monitored by personnel not directly responsible for the work and controlled to ensure continuous quality compliance. In situations where testing or corrective action after the fact is not feasible or will not reveal the deficiencies, continuous monitoring and/or product compliance with documented procedures is required (e.g., special processes such as welding, nondestructive testing, and heat treatment).

6.3.4.9 Product Reviews, Inspection and Testing

Each unit shall plan and execute review procedures or inspection and testing procedures, as necessary, to verify the quality of its products.

Review, Inspection or Testing Procedures

Procedures shall be specified, implemented, and the results documented for the review, inspection or testing of incoming products, for reviewing, inspecting or testing work in progress and for final inspection, testing and review of finished work, to ensure compliance with contractual requirements. For design projects, for example, review procedures could include evaluating completed projects by examining the number and types of addenda, change orders, changes of plans, cost overruns, the number and severity of accidents during and after construction, the level of service during and after construction, maintenance costs or public reaction.

Review, Inspection and Testing Status

The status and records of all inspection, testing and reviews shall be readily identified and available. Records of inspected, tested or reviewed products shall indicate the conformance or nonconformance of the product, as well as action taken, if applicable.

Inspection and Test Equipment

Where applicable, the unit shall ensure that all inspection, measuring, and test equipment required to carry out inspection and testing is identified, controlled, calibrated, and maintained in order to demonstrate the conformance of work to the

specified requirements.

Product Review Checklists

Units whose products consist of standardized reports, designs or design phase reviews shall establish and maintain standardized review checklists that are to be used to ensure complete, uniform reviews of the product. These checklists shall be kept updated and controlled (see Section 6.3.4.5).

6.3.4.10 Nonconforming Products

Each unit shall establish procedures for controlling and investigating the cause of nonconforming work, including implementing and recording changes in procedures resulting from corrective action.

Control of Nonconforming Products

Documented procedures shall be established by the unit to assess its nonconforming work. Each unit shall create and maintain records of nonconforming findings which shall include information on all relevant discussions, retesting or rechecking, findings and decisions. Procedures shall be implemented to ensure that the product which does not conform to specified requirements is prevented from being used or submitted inadvertently. For Capital Program Management Units, the primary option for the disposition of nonconforming work is to correct the product to meet specified requirements.

All corrected products shall be re-inspected or rechecked in accordance with the specified quality standards.

6.3.4.11 Corrective and Preventive Action

Each unit shall establish, maintain and document its policy for corrective and preventive action measures.

Corrective Action

Each unit's corrective action plan shall consist of the following:

- a) Reporting and documentation of customer or user complaints.
- b) A comprehensive investigation of the cause of the nonconformity.
- c) Selection of an appropriate corrective action to the process or product.
- d) Changing existing procedures to reflect corrective actions, if necessary.
- e) Monitoring of the effectiveness of the corrective action taken.

Preventive Action

Each unit's preventive action plan shall consist of the following:

- a) The identification of potential causes of nonconformities.
- b) The development of a plan to handle potential nonconformities.
- c) The initiation of the preventive action plan, when warranted, with appropriate follow-up.
- d) The recording and reporting of all preventive action measures.

6.3.4.12 Control of Quality Records

Each unit shall establish procedures for the production, collection, identification, storage, maintenance, distribution and use of all applicable Quality Records.

The unit shall maintain quality records to demonstrate conformance to specified requirements. Quality records shall also be maintained for all vendors, consultants, contractors, sub-contractors and suppliers providing services to the unit. These records shall be legible and easily retrievable in files which provide adequate security and protection. The retention time and disposal dates of these records shall be established and adhered to, respectively.

6.3.4.13 Quality Audits

Each unit shall establish a comprehensive, systematic Quality Audit procedure to ensure that its Quality Assurance Plan is functioning as intended.

The unit shall schedule quality audits on the basis of activity status and importance. Quality audits shall be performed by personnel independent of those having direct responsibility for the activity being audited. Personnel conducting the audits shall have the authority to make prompt changes to the process if significant problems are found. The findings of quality audits shall be documented and presented to personnel responsible for the area being audited. Necessary corrective actions shall be performed and documented by management personnel to rectify deficiencies found by the quality audits.

6.3.4.14 Training

Each unit shall have its personnel adequately trained to perform the unit's functions, consistent with the Quality Assurance Plan.

The unit shall establish a method to identify training needs, including a commitment to secure the necessary resources to provide the identified training. The unit shall include the minimum amount of training required for each job description within its system. The effectiveness of the training shall be monitored to ensure that the goals of the Quality Assurance Plan are being achieved. Training records for all personnel

shall be maintained.

6.3.4.15 Servicing

Each unit shall establish and maintain procedures for performing and verifying that servicing, when necessary, meets specified requirements.

The unit shall establish procedures when servicing is required or desirable. An evaluation shall be performed to measure the effectiveness of the servicing in meeting customer requirements and to ensure that the goals of the Quality Assurance Plan are being achieved. Servicing can include maintenance to the unit's equipment, as well as follow-up servicing to the customers that the unit has supplied a product to.

6.3.4.16 Statistical Techniques

Each unit shall identify the need for statistical techniques required for establishing, controlling, verifying and improving the performance of its product or process.

Procedures shall be established to implement and control the use of any applicable statistical techniques to ensure that their application conforms with acceptable recognized industry standards. Appropriate training in the use of selected statistical techniques shall be provided, as deemed necessary, to conform with the established Quality Assurance Plan.

6.4 Consultant Quality Assurance Plan, Guidelines for the Preparation of

This procedure has been prepared to provide a general outline of the Quality Assurance Plan elements required for all Consultants who provide services to NJDOT. The Quality Assurance Plan elements may not be applicable to all Consultant contracts. The required Quality Assurance Plan elements will be appropriate to the nature of the services provided. The format and numbering sequence from Section 6.4.4.1 to 6.4.4.17 of this procedure must be followed, however, to facilitate the review of the Consultant Quality Assurance Plans.

All Consultants will be required to submit general Quality Assurance Plans to NJDOT for approval as part of the pre-qualification process. A Project Specific Quality Assurance Plan (PSQAP) will be required within 30 days after the Notice to Proceed date (See Section 6.5). Failure of the Consultant to comply with the approved Quality Assurance Plan, or PSQAP, may result in the issuance of Non-Conformance Reports, Quality Issue Reports (See Section 6.6), the withholding of project invoices, or the revocation of Prequalification Status, depending on the severity of the problem and the Consultant's efforts at resolution.

6.4.1 Basic Requirements And Scope

This Section defines the requirements of a quality program that the Consultant shall establish, implement and execute before and during the performance of the design contract to furnish the design, specified materials, baseline survey, design processes and studies that are in conformance with the Design Agreement requirements.

- 1) The Consultant shall be responsible for providing a quality product to the Department under this Agreement. To this end, the Consultant shall have planned and established a PSQAP which shall be maintained throughout the term of the Agreement. The elements of the Consultant's PSQAP shall be imposed on all entities within the Consultant's organization.
- 2) All surveys, design calculations and studies shall be in accordance with standard specifications for bridge and highway design. Failure of the Consultant to follow standard design practice, unless deviations are specifically described in the Agreement, shall constitute justification for rejection of the work.
- 3) During the term of the Agreement, the Consultant's designated Quality Assurance Manager shall perform quality assurance functions. These functions shall include random checks of the PSQAP. These quality assurance functions shall be performed independent of and in addition to the Consultant's quality control responsibilities. NJDOT will continue to perform Quality Assurance reviews of the Initial and Final Design Submissions.

Failure of the Consultant to submit the PSQAP or any required revisions thereto within

the stated time limit shall be sufficient cause to withhold approval of the Consultant's invoices for progress payment(s) until such delinquent submittal is made and accepted by the Project Manager and Manager, Quality Management Services.

6.4.2 Definitions

Quality Policy - The overall quality intentions and direction of the Consultant's organization regarding quality, as formally expressed by the Consultant's management.

Quality Management - That aspect of the overall management function that determines and implements the quality policy.

Quality Procedures - Written instructions for implementing various components of the organization's total Quality System.

Quality Assurance Program Plan - A written description of intended actions to achieve quality for the Consultant's organization.

Quality Assurance Program - The coordinated execution of applicable Quality Control Plans and activities for a project.

Quality Control (QC) - The Consultant's operational techniques and activities that are used to fulfill requirements for quality. These techniques are used to provide a product or service that meets requirements. QC is carried out by the operating forces of the Consultant. Their goal is to do the work and meet the design goals. Generally, QC refers to the act of taking measurements and surveys and checking design calculations to meet contract specifications. Products may be design drawings, calculations, studies or surveys. QC also refers to the process of documenting such actions.

Quality Assurance (QA) - All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy NJDOT requirements for quality. QA includes the development of project requirements that meet the needs of all relevant internal and external agencies, planning the processes needed to achieve quality, providing equipment and personnel capable of performing tasks related to project quality, documenting the quality control efforts, and most importantly, performing checks necessary to verify that an adequate product is furnished as specified in the Agreement.

Project Specific Quality Assurance Plan (PSQAP) - A written description of intended actions to achieve quality for a specific project.

Quality Oversight(QO) - Activities conducted by the Department to verify the satisfactory implementation of approved Quality Assurance and Quality Control by organizations authorized to do so. QO can range from an informal process of keeping in touch with the QA organization to a second layer of QA activities, depending upon

the circumstances. QO verifies the execution of the quality program.

6.4.3 Submittal

- 1) Within 30 days after the Notice to Proceed, the Consultant shall submit the PSQAP to the Manager, Quality Management Services, for review and approval, with copy to the Project Manager. The Consultant's PSQAP shall include its Subconsultant's PSQAP as described in Section 6.4.4.6, "Control of Subconsultants."
- 2) Within 15 days after receipt of the State's written comments on the preliminary PSQAP, the Consultant shall furnish for the approval of the Manager, Quality Management Services, the final PSQAP, with copy to the Project Manager.
- 3) Submit a letter with the final PSQAP, signed by an officer of the Consultant's Management Organization, appointing the QA Manager and assigning responsibility for implementing the Quality Assurance Plan.

Acceptance of the PSQAP is conditional and shall be predicated on satisfactory performance during design. As the work progresses the Project Manager or Manager, Quality Management Services, may require the Consultant to make changes to the PSQAP as considered necessary to obtain the quality of design required in the Agreement. Quality Management Services will conduct Quality System audits to verify that the Consultant's PSQAP has been successfully implemented.

6.4.4 Quality Program Requirements

The following 17 elements are required for both the Consultant Quality Assurance Plan and the PSQAP.

6.4.4.1 Management Responsibility

Quality Control Policy

The Consultant's management with executive responsibilities shall define and document its policy for quality, including objectives for quality and its commitment to quality. The quality policy shall be relevant to the Consultant's organizational goals and the expectations and needs of the Department. The Consultant shall provide that this policy is understood, implemented and maintained within the Consultant's organization.

Organization

The Consultant shall include in its PSQAP a project organization chart that includes quality assurance and quality control functions. It shall include relationships between project management, key personnel of Subconsultants, design engineering and quality

control. Resumes and responsibilities of the Consultant's Quality Control staff and its Quality Assurance staff shall be provided.

Responsibility and Authority

The Consultant shall assign an independent Quality Assurance Manager not directly responsible for the work to this project who shall manage quality matters for the project and have the authority to act in all quality matters for the Consultant. The Quality Assurance Manager shall be fully qualified by experience and technical training to perform the quality control activities and implement the Project Specific Quality Assurance Plan. The Quality Assurance Manager's responsibilities shall include a method for verifying the implementation of adequate corrective actions for the non-conforming work and notifying appropriate project management personnel. A specific description of the duties, responsibilities and methods used by the Consultant's Quality Assurance staff to identify and correct non-conformities shall be included. The resume of the Quality Assurance Manager must include a description of his duties, responsibilities, and his record of quality control experience.

The responsibility, authority and interrelation of all personnel who manage, perform and verify work affecting quality shall be defined and documented.

Resource

The Consultant shall identify resource requirements and provide adequate resources, including the assignment of trained personnel (see Section 6.4.4.14), for management, performance of work and verification activities including internal quality audits.

6.4.4.2 Quality System

General

The Consultant shall establish, document and maintain a quality assurance program plan as a means of providing a design product that conforms to specified requirements. The quality assurance program plan shall include or make reference to the work procedures and outline the structure of the documentation used in the quality assurance program.

Quality Plan Procedures

The Consultant shall:

- a) Prepare documented procedures consistent with the requirements of this section and the Consultant's or Subconsultant's stated quality policy. Documented procedures may make reference to work instructions that define how an activity is

performed.

- b) Effectively implement the PSQAP and its documented procedures.

Quality Planning

The Consultant shall define and document how the requirements for quality will be met. Quality planning shall be consistent with all other requirements of a Consultant's Quality Assurance Program and shall be documented in a format to suit the Consultant's methods of operation.

6.4.4.3 Agreement Review

The Consultant shall establish and maintain documented procedures for Agreement reviews and for the coordination of all applicable activities, to verify that the services meet NJDOT requirements.

Review and Amendment to Agreement

The Consultant shall review and concur with all Agreement commitments prior to the execution of the Agreement. The Consultant shall also establish the responsibilities for coordinating and conducting Agreement reviews, distribution of documents for review, and the process for identifying and amending discrepancies within the Agreement.

Records

Records of Agreement reviews and amendments shall be maintained and made accessible to personnel directly involved in the review process, in accordance with the terms of the Agreement.

6.4.4.4 Design Control

General

The Consultant shall establish and maintain documented procedures to control and verify that the design meets the specified requirements.

Design Input

A framework for initial design planning activities shall be established. The designer shall compile, record and verify information on field surveys and inspections. All relevant design criteria, including codes and standards, shall be established and made available to design personnel. Design schedules and design cost estimates shall be monitored and adhered to, with documentation of any deviations. A documented procedure for responding to all comments from NJDOT units, which have been

coordinated by the NJDOT Project Manager, shall be established.

Design Output

The designer shall establish methods and implement reviews to determine that completed designs are constructable, functional, meet the requirements of the NJDOT and conform to established regulatory standards. Furthermore, the Consultant shall establish and implement procedures to determine that only the most recent revisions to written procedures, codes, standards and relevant documents are used.

Design Changes

Before their implementation, all design changes and modifications shall be identified, documented, reviewed and reported to the NJDOT for approval.

Organizational and Technical Interfaces

Organizational and technical communication interfaces between different groups which input into the design process shall be defined and the necessary information documented, transmitted and regularly reviewed. These groups shall include the Consultant, NJDOT, outside agencies and any Subconsultants.

6.4.4.5 Document Control

General

The Consultant shall establish and maintain documented procedures to control all documents and data that relate to the requirements of this section including, to the extent applicable, documents of external origin such as studies, reports, calculations, standards and record drawings. These procedures shall control the generation, distribution and confidentiality of all documents, as well as establish a system to identify, collect, index, file, maintain and dispose of all records. Documents and data can be in the form of any media, such as hard copy or electronic media.

Document and Data Approval and Issue

The documents and data shall be reviewed and approved for adequacy by authorized personnel prior to issue. A master list or equivalent document control procedure identifying the current revision status of documents shall be established and be readily available to preclude the use of invalid and/or obsolete documents.

Document and Data Changes

Changes to documents and data shall be reviewed and approved by the same functions or organizations that performed the original review and approval, unless specifically designated otherwise. The designated functions or organization shall have

access to pertinent background information upon which to base their review and approval.

Where practical, the nature of the change shall be identified in the document or the appropriate attachments.

6.4.4.6 Control Of Subconsultants

General

The Consultant shall establish and maintain documented procedures to provide subcontracted or purchased services that conform to specified requirements.

Evaluation of Subconsultants

The Consultant shall:

- a) Select Subconsultants on the basis of their ability to meet Agreement requirements, including the Consultant's PSQAP, and any specific quality control requirements. The Subconsultant shall be required to accept and implement the Consultant's PSQAP, as it pertains to the contract, or to submit their own for review and approval by the Consultant.
- b) Define the type and extent of control exercised by the Consultant over Subconsultants. Include a description of the system used to review and monitor the activities and submissions of the Subconsultant. This control shall be dependent upon the type of service, the impact of a subcontracted service on the quality of the final design and, where applicable, dependent on the quality audit reports and/or quality records of the Subconsultants;
- c) Review quality records of Subconsultants consisting of quality control and quality assurance data for the project (see Section 6.4.4.12).

6.4.4.7 Design Product Identification And Traceability

Where appropriate, the Consultant shall establish and maintain documented procedures for identifying its design product by suitable means from its inception and during all stages of development, design and delivery.

Where and to the extent that traceability is a specified requirement, the Consultant shall establish and maintain documented procedures for unique identification of individual design products. This identification shall be recorded (see Section 6.4.4.12).

Control of Department Supplied Product

The Consultant shall establish and maintain documented procedures for the control of, verification, storage and maintenance of NJDOT-supplied products, such as record drawings or special equipment, provided for incorporation into the contract or for related activities. Any such product that is lost, damaged or is otherwise unsuitable for use shall be recorded and reported to the NJDOT (See Section 6.4.4.12).

6.4.4.8 Process Control

The Consultant shall identify and plan the design, survey, research or servicing processes which directly affect quality and shall carry out these processes under controlled conditions. Controlled conditions shall include the following:

- a) Documented procedures defining the manner of design, survey, research or servicing, where the absence of such procedures could adversely affect quality;
- b) Use of suitable design, survey, research or servicing equipment, and a suitable working environment;
- c) Compliance with referenced standards/codes, quality plans and/or documented procedures;
- d) Monitoring and control of suitable process parameters and end product characteristics;
- e) The approval of special processes and equipment, if applicable;
- f) Criteria for workmanship, which shall be stipulated in the clearest practical manner (e.g., written standards, representative samples or illustrations);
- g) Suitable maintenance of equipment, if applicable, to provide continuing process capability;
- h) A detailed description of unique or "Project Specific" procedures.

The requirements for any qualification of special survey or research work, including the associated equipment and personnel (see Section 6.4.4.14), shall be specified.

6.4.4.9 Purchasing

Purchasing Orders

Purchasing orders shall contain data clearly describing the product ordered, including where applicable:

- a) The type, class, grade or other precise identification;

- b) The title or other positive identification, and applicable issues of specifications, drawings, process requirements, inspection instructions and other relevant technical data, including requirements for approval or qualification of the product, procedures, process equipment and personnel.
- c) The title, number and issue of the quality plan standard to be applied.

The Consultant shall review and approve purchasing orders for adequacy of the specified requirements prior to release.

Verification of Purchased Product

Consultant Verification at Vendor's Premises

Where the Consultant proposes to verify a purchased product at the vendor's premises, the Consultant shall specify verification arrangements and the method of product release in the purchasing order.

Department Verification of Subcontracted Product

The Department's representative shall be afforded the right to verify at the vendor's premises and the Consultant's premises that the subcontracted product conforms to specified requirements. Such verification shall not be used by the Consultant as evidence of effective control of quality by the vendor.

Verification by the NJDOT shall not absolve the Consultant of the responsibility to provide an acceptable product, nor shall it preclude subsequent rejection by the NJDOT.

6.4.4.10 Control Of Non-Conforming Product

General

The Consultant shall establish and maintain documented procedures to determine that a design product that does not conform to specified requirements is not submitted and is prevented from unintended use. These procedures shall provide for the identification, documentation, evaluation and disposition of the non-conforming work, and for notification to the NJDOT and other agencies having jurisdiction thereof.

Review and Disposition of Non-conforming Design Product

The responsibility for review of design products and the authority for the disposition of a non-conforming design product shall be defined in the Project Specific Quality

Assurance Plan.

A Non-conforming design product may be:

- a) Corrected to meet the specified requirements,
- b) Accepted with or without correction by concession,
- c) Regarded for alternative applications, or
- d) Rejected or scrapped.

Where required by the Consultant Agreement, the proposed use or correction of a design product (see Section 6.4.4.10b) which does not conform to specified requirements may be reported for concession to the NJDOT. The description of the non-conformity that has been accepted, and/or any corrections made shall be recorded (see Section 6.4.4.12).

Corrected design products shall be re-checked in accordance with the PSQAP.

6.4.4.11 Corrective And Preventive Action

General

The Consultant shall document in the PSQAP procedures to be utilized to implement corrective and preventive action.

Corrective or preventive action taken to eliminate actual or minimize potential design non-conformities shall be to a degree appropriate to the magnitude of problems and commensurate with the risks encountered.

The Consultant shall implement and record in the PSQAP any changes to the documented procedures resulting from corrective and preventive action.

Corrective Action

The corrective action procedures to eliminate actual non-conforming design products shall include:

- a) The effective handling of NJDOT observations and reports of design product non-conformities, including developing interim measures, if warranted, to correct the actual non-conformity;
- b) Conducting an investigation into the root cause of non-conformities relating to the design product, process and quality system, and recording the results of the

investigation (see Section 6.4.4.12);

- c) Determination of the corrective action needed to eliminate the cause of the design non-conformities;
- d) Application of measures to determine that corrective action has been taken and that it is effective.

Preventive Action

The procedures for preventive action to minimize nonconformities shall include:

- a) The use of appropriate sources of information relating to the quality of the design product (such as concessions, audit results, quality records, service reports and NJDOT complaints) to detect, analyze, and eliminate potential causes of nonconformities;
- b) Determination of the steps needed to deal with any problems requiring preventive action;
- c) Initiation of preventive action and appropriate follow-up reviews to determine that it is effective;
- d) Confirmation that relevant information on actions taken is submitted for NJDOT and Consultant management review.

6.4.4.12 Control Of Quality Records

The Consultant shall establish and maintain documented procedures for identification, collection, indexing, access, filing, storage, maintenance, and disposition of quality records. Records may be in the form of any type of media, such as hard copy or electronic media.

Quality records shall be maintained to demonstrate conformance to specified requirements and the effective operation of the quality system. Pertinent quality records from the Subconsultant shall be an element of these data.

All quality records shall be legible and shall be retained in such a way that they are readily retrievable in files that provide a suitable environment to prevent damage, deterioration or loss. Retention times of quality records shall be established in the PSQAP. Where agreed contractually, quality records shall be made available for evaluation by the NJDOT for an agreed period.

6.4.4.13 Internal Quality Audits

The Consultant shall establish and maintain documented procedures for planning and implementing internal quality audits to verify whether quality activities and related results comply with planned arrangements and to determine the effectiveness of the quality system.

Internal quality audits shall be scheduled on the basis of the status and importance of the activity to be audited and shall be carried out by personnel independent of those having direct responsibility for the activity being audited.

The results of the audits shall be recorded (see Section 6.4.4.12) and brought to the attention of the personnel having responsibility in the area audited. The management personnel responsible for the area shall take timely corrective action on deficiencies found during the audit.

Follow-up audit activities shall verify and record the implementation and effectiveness of the corrective action taken (see Section 6.4.4.12).

6.4.4.14 Training

The Consultant shall establish and maintain documented procedures for identifying training needs and provide for the training of all personnel performing activities affecting quality. Personnel performing specific assigned tasks shall be qualified on the basis of appropriate education, training and/or experience, as required. Appropriate records of training shall be maintained (see Section 6.4.4.12).

6.4.4.15 Servicing Of The Design Product

Where servicing of the Consultant's design product is a specified requirement, the Consultant shall establish and maintain documented procedures for performing, verifying, and reporting that the servicing meets the specified requirements. Servicing of a design product, for example, may include providing for field visits to investigate construction problems or providing related engineering support until the project is complete.

6.4.4.16 Statistical Techniques

Identification of Need

The Consultant shall identify the need for statistical techniques required for special survey or research projects, if applicable.

Procedures

The Consultant shall establish and maintain documented procedures to implement and

control the application of the statistical techniques identified in Section 6.4.4.16.

6.4.4.17 Handling, Storage, Packaging, Preservation And Delivery

General

The Consultant shall establish and maintain documented procedures for handling, storage, packaging, and delivery of the final design, survey or research product.

Handling

The Consultant shall provide methods of handling its final design, survey or research product to minimize damage, deterioration, loss or incorrect identification.

Storage

The Consultant shall use designated areas or files to minimize damage or deterioration to documents, plans, studies or reports prior to use or delivery. Appropriate methods for authorizing receipt to and dispatch from such areas shall be stipulated.

Packaging

The Consultant shall control packaging and labeling processes to the extent necessary to conform with specified requirements.

Preservation

The Consultant shall apply appropriate methods for preservation and segregation of the documents, plans, studies or reports when they are under its control.

Delivery

The Consultant shall arrange for the protection of the documents, plans, studies or reports after final checking. Where contractually specified, this protection shall be extended to include delivery to the destination.

6.5 Project Specific Requirements

The Designer's PSQAP must also follow the requirements of the "Guidelines for the Preparation of Consultant Quality Assurance Plan" or for In-house Designers, the "CPMQAP Guidelines." The PSQAP should be an expansion of the previously approved consultant organization or In-House unit QAP, with all project specific requirements addressed. The PSQAP shall be submitted within 30 days of the Notice to Proceed to the Manager, Quality Management Services, for review and approval, with a copy to the Project Manager. In addition to all of the requirements of the appropriate Guidelines, the PSQAP shall address the following items that are directly relevant to a specific project:

1. Key project staff, a project organization chart, the Designer's function related to shop drawing approval and resolving design field problems during construction, and a description of staff responsibilities for both the project and the quality process (to be placed in Section 6.4.4.1 of the Consultant Quality Assurance Plan (CQAP) or Section 6.3.4.1 of the Capital Program Management unit Quality Assurance Plan (CPMQAP)).
2. A project schedule, and a cost control plan (to be placed in Section 6.4.4.2 of the CQAP or Section 6.3.4.2 of the CPMQAP).
3. A list of specific design standards to be used for the project, a description of the design phase reviews required, a description of the communication system for project matters, a description of the process planned to resolve NJDOT and FHWA comments, a list of applicable computer software to be used on the project, and a description of the procedures to be used for design changes (to be placed in Section 6.4.4.4 of the CQAP or Section 6.3.4.4 of the CPMQAP).
4. A description of the process to be used for maintaining all project records, including minutes of meetings, comments received, correspondence, and review forms to be used (to be placed in Section 6.4.4.5 of the CQAP or Section 6.3.4.5 of the CPMQAP). Quality records shall be maintained as per Section 6.3.4.12 of the CPMQAP or Section 6.4.4.12 of the CQAP.
5. A reference to or a description of the procedure to be used to evaluate subconsultants (to be placed in Section 6.4.4.6 of the CQAP or Section 6.3.4.6 of the CPMQAP).
6. A reference to or a description of the procedures to be used for checking work and performing technical reviews, and a procedure for signing off on all project deliverables (to be placed in Section 6.4.4.8 of the CQAP or Section 6.3.4.8 of the CPMQAP).

7. A description of the procedure for correcting internal non-conformances and the identity of the person responsible for reporting non-conformances or quality issues which have occurred in other organizations involved in the project (to be placed in Section 6.4.4.10 of the CQAP or Section 6.3.4.10 of the CPMQAP). See Sections 6.6.1 and 6.6.3 for instructions and forms for the procedure.
8. Identify the person (Unit Manager, Program Manager, or Principal of the firm) responsible for responding to Corrective Action Requests issued by QMS (to be placed in Section 6.4.4.11 of the CQAP or Section 6.3.4.11 of the CPMQAP). See Section 6.6.2 for instructions and form for the procedure.
9. The procedure to be followed for conducting internal quality audits (to be placed in Section 6.4.4.13 of the CQAP or Section 6.3.4.13 of the CPMQAP).
10. Project specific staff training requirements (to be placed in Section 6.4.4.14 of the CQAP or Section 6.3.4.14 of the CPMQAP).
11. The Designer's communication system for construction matters, including a description of the process planned to resolve NJDOT and other Agency comments, a list of any special equipment or processes to be used on the project, and a reference to the procedures to be followed for shop drawings, changes of plans, change orders and claims (to be placed in Section 6.4.4.4 of the CQAP or Section 6.3.4.4 of the CPMQAP).

These items do not address all possible project specific quality assurance plan requirements, but serve as an example of several key items that will be required for most plans. The Project Manager will determine what specific requirements are relevant to the project, with concurrence from the Bureau of Quality Management Services.

6.6 Quality Assurance Reporting

6.6.1 Notice of Non-Conformance Report

6.6.1.1 Background

The purpose of using a formal non-conformance reporting procedure is to standardize the process of recognizing and reporting problems related to the delivery of the Capital Program. The use of this procedure will also serve to notify a central organization, QMS, of all significant problems that are occurring throughout the spectrum of design and construction. This will enable the Department to track and recognize trends, so that corrective action can be taken to prevent future similar problems from reoccurring on other projects.

The Notice of Non-Conformance form is self explanatory, but the writer must be sure to include all specific details of the problem, keeping in mind that people not familiar with the specifics of every project will be working on the problem.

It is important to remember that the purpose of this procedure is to standardize and improve our project delivery system. This method of reporting problems should not be used as a punitive measure, and in most cases problems should be resolved directly between the involved organizations. For the Project Manager's procedure for dealing with Consultant deficiencies, see Section 19.8.

6.6.1.2 Initiation

The Notice of Non-Conformance form (see Attachment 6.6-1) shall be used by all CPM units involved in the project delivery process.

Notice of Non-Conformance forms can be completed by any person when a problem has been identified that is not immediately resolved. The writer of a Non-Conformance Report must send it directly to the Bureau of Quality Management Services with a copy to the Program Manager. These problems can be errors or omissions, delays which affect the project schedule or the originator's ability to meet project deadlines, late submissions, cost overruns, unauthorized changes to projects, schedules, plans, etc., or non-compliance with established policies, procedures, specifications or Project Specific Quality Assurance Plans. In general, any problem related to the project delivery system or a specific project's quality, schedule or budget can be reported in this manner. These forms should not be used to resolve administrative or disciplinary problems. There are existing policies and procedures that govern these matters.

6.6.1.3 Processing

QMS will review the report and contact the appropriate CPM unit manager, Program Manager, Resident Engineer, or Consultant or Contractor principal of the firm whose

organization has been identified as committing a non-conformance. QMS will ensure that the responsible management takes whatever action is appropriate to correct the non-conformance. In all cases the non-conformance reports sent to QMS will be entered into our database, tracked, and responded to with a Corrective Action Request, if warranted (See Section 6.6.2). The writer of a Non-Conformance Report will be notified by QMS of what action has been taken. If a significant quality problem is reported during design, QMS will notify the Project Manager, and if a significant quality problem occurs during construction, QMS will notify both the Resident Engineer and the Project Manager.

All questions or comments regarding the use of this procedure can be directed to the Project Engineer, Quality Assurance and Audits Unit, (609) 530-6363.

6.6.2 Corrective Action Request

6.6.2.1 Background

The Corrective Action Request form (see Attachment 6.6-2) will be used by the Bureau of Quality Management Services as needed to address Non-Conformance Reports or Quality Issue Reports that have been generated by various organizations involved in the project delivery process.

The purpose of using a formal corrective action request is to simplify the process of recognizing and resolving problems throughout the design and construction process, so that everyone will benefit from quality related improvements. The use of this procedure will also serve to keep all organizations informed of current developments, so that the project delivery process can be kept standardized, as much as possible.

6.6.2.2 Initiation

QMS will file and monitor Non-Conformance Reports or Quality Issue Reports that have been issued by various organizations. When a substantial problem or trend is noticed that adversely affects project quality, a Corrective Action Request will be issued to the organization that has been identified as needing improvements to its processes, procedures, policies or conformance to its Quality Assurance Plan

All Corrective Action Requests will be sent to a specific responsible person who has the authority to make the changes needed. The problem will be explained in detail, and a response time will be given. Depending upon the nature of the work required, the recipient of the Corrective Action Request may be able to make quick, immediate changes to his or her policies, procedures, etc., or may have to develop a task force or work with the QMS Quality Review and Development unit to develop solutions as they relate to overall Departmental standards, processes and procedures. At no time should the Corrective Action Request process hold up the project, if it is at a critical point. In

many cases the purpose of Corrective Action will be to provide benefits to future projects.

6.6.2.3 Response

Any Corrective Action Request received must be responded to by the recipient's Unit Manager, Program Manager, or Principal of the firm. The recipient may be required to describe how the organization has corrected the problem, and provide a plan to ensure that the problem does not occur again. It may also require changes to Policies, Procedures or Specifications. For complex problems, the recipient may be required to include with his or her response the following four items: a) An investigation of how or why the problem occurred, b) a short term immediate solution, if required to keep a project on schedule, c) an interim solution, if required to maintain a program for a longer length of time, and d) a permanent solution. Interim steps may be necessary if it is determined that major changes to Policies, Procedures, Specifications, etc. are required that may take a long time to implement.

It is important to remember that the purpose of this procedure is to improve our project delivery system. It is not meant to be a punitive measure.

All questions or comments regarding the use of this process can be directed to the Project Engineer, Quality Assurance and Audits Unit, (609) 530-6363.

6.6.3 Quality Issue Report

6.6.3.1 Consultant Instructions

The attached Quality Issue Report form (see Attachment 6.6-3) shall be used by all Consultants and sub-consultants involved in the project delivery process.

6.6.3.1.2 Background

The purpose of using a formal quality issue reporting procedure is to standardize the process of recognizing and reporting problems related to the delivery of the Capital Program. The use of this procedure will also serve to notify a central organization, QMS, of all significant problems that are occurring throughout the spectrum of design. This will enable the Department to track and recognize trends, so that corrective action can be taken to prevent future similar problems from reoccurring on other projects.

It is important to remember that the purpose of this procedure is to standardize and improve our project delivery system. This method of reporting quality issues should not be used as a punitive measure, and in most cases project specific problems should be resolved directly between the involved organizations.

6.6.3.1.3 Initiation

Quality Issue Report forms can be sent by a Principal of the Consultant or sub-consultant's firm when a problem has been identified that is not immediately resolved. These problems can be errors or omissions, late submissions, cost overruns, unauthorized changes to projects, schedules, plans, etc., or non-compliance with established policies, procedures, specifications or Project Specific Quality Assurance Plans. In general, any problem related to the project delivery system or a specific project's quality, schedule or budget can be reported in this manner. These forms should not be used to replace existing policies and procedures that govern methods of communication. The intent of this Report is to supplement existing reporting procedures when the quality issue has not been resolved or is very general in nature.

6.6.3.1.4 Processing

The writer of a Quality Issue Report must send it through a Principal of the firm directly to the Bureau of Quality Management Services with a copy to the Program Manager. QMS will review the report and contact the appropriate CPM unit manager, Program Manager, or Consultant principal of the firm whose organization is responsible for resolving the issue. QMS will ensure that the appropriate management takes whatever action is necessary to address the quality problem. In all cases the Quality Issue Reports sent to QMS will be entered into our database, tracked, and responded to with a Corrective Action Request, if warranted. If a significant quality problem is reported during design, QMS will copy the Project Manager, and if a significant quality problem is found during construction, QMS will copy both the Resident Engineer and the Project Manager. The Quality Issue Report form is self explanatory, but the writer must be sure to include all specific details of the problem, keeping in mind that people not familiar with the specifics of every project will be working on the problem. QMS will notify the writer of a Quality Issues Report as to what action was taken.

All questions or comments regarding the use of this process can be directed to the Project Engineer, Quality Assurance Audits Unit, of QMS at (609) 530-6363.

6.6.3.2 Contractor/Supplier Instructions

The Quality Issue Report form (see Attachments) shall be used by all Contractors, sub-contractors and Suppliers involved in the project delivery process. The Bureau of Construction Procurement, Division of Procurement will distribute the Quality Reporting Forms with the Award Package.

6.6.3.2.1 Background

The purpose of using a formal quality issue reporting procedure is to standardize the process of recognizing and reporting problems related to the delivery of the Capital Program. The use of this procedure will also serve to notify a central organization, QMS, of all significant problems that are occurring throughout the spectrum of design

and construction. This will enable the Department to track and recognize trends, so that corrective action can be taken to prevent future similar problems from reoccurring on other projects.

It is important to remember that the purpose of this procedure is to standardize and improve our project delivery system. This method of reporting quality issues should not be used as a punitive measure, and in most cases project specific problems should be resolved directly between the involved organizations.

6.6.3.2.2 Initiation

Quality Issue Report forms can be sent by any person from the Contractor's, sub-contractor's or Supplier's firm when a problem has been identified that is not immediately resolved. These problems can be errors or omissions, late submissions, cost overruns, unauthorized changes to projects, schedules, plans, etc., or non-compliance with established policies, procedures, specifications or Project Specific Quality Assurance Plans. In general, any problem related to the project delivery system or a specific project's quality, schedule or budget can be reported in this manner. These forms should not be used to replace policies and procedures that govern methods of communication under existing contracts and any related partnering agreements. The intent of this Report is to supplement existing reporting procedures when the quality issue has not been resolved or is very general in nature.

6.6.3.2.3 Processing

The writer of a Quality Issue Report must send it through a Principal of the firm directly to the Bureau of Quality Management Services with a copy to the Resident Engineer. QMS will review the report and contact the appropriate CPM unit manager, Program Manager, Resident Engineer, or Consultant or Contractor principal of the firm whose organization is responsible for resolving the issue. QMS will ensure that the appropriate management takes whatever action is necessary to address the quality problem. In all cases the Quality Issue Reports sent to QMS will be entered into our database, tracked, and responded to with a Corrective Action Request, if warranted. If a significant quality problem is a result of the design, QMS will copy the Project Manager, and if a significant quality problem is a result of the construction, QMS will copy both the Resident Engineer and the Project Manager. The Quality Issue Report form is self explanatory, but the writer must be sure to include all specific details of the problem, keeping in mind that people not familiar with the specifics of every project will be working on the problem. QMS will notify the writer of a Quality Issues Report as to what action was taken.

All questions or comments regarding the use of this process can be directed to the Project Engineer, Quality Assurance Audits Unit, of QMS at (609) 530-6363.

6.6.4 Process Improvement Recommendation

6.6.4.1 Instructions

The attached Process Improvement Recommendation (PIR) form (see Attachment 6.6-4) is for use by all employees of CPM, Consultants and Contractors involved in the project delivery process.

6.6.4.2 Background

The purpose of this form is to establish a formal method of reporting recommendations for improvement to the project delivery process. The use of this procedure will allow everyone connected with the delivery process, including Consultants, Contractors and the FHWA, to make suggestions of how we all can improve our process. It is important to remember that the purpose of this procedure is to improve the way we do business. It should not be used to recommend changes to anything other than the processes used to deliver the capital program. Administrative, personnel, legal, statutory or other similar processes should not be included on this form.

6.6.4.3 Initiation

The writer of the PIR should fill in all information needed, following these instructions:

<u>Box</u>	<u>Instructions</u>
------------	---------------------

- | | |
|-----|---|
| [1] | Fill out as completely as possible. |
| [2] | Check off the process that is affected. You may check off more than one box. Please add a short description of the process affected if you check "Other" |
| [3] | Identify the problem/area in need of improvement. Be as specific and complete as possible. Discuss the extent and frequency of the problem, the overall effect on the capital program and any other information you feel is important. It is helpful to provide statistics that support the severity of the problem cited, (e.g. occurred on approximately 25% of the projects advertised this fiscal year). Do not discuss the solution in this section. Attach additional sheets if needed. |
| [4] | Suggested improvements should be discussed here. Identify the procedures, forms, processes and/or policies that need to be changed in order to improve the process. If possible, identify what savings (time, cost, rework, etc.) are expected from the solution. The suggestion needs to be specific, however remember that the implemented solution may be different from the suggested improvement. Also, identify the areas of expertise that may be necessary to the makeup of a team to address the identified problem. Attach additional sheets if needed. |

NOTE: Do not fill in any area shaded in gray.


Please return the completed form to the address listed on the form.

6.6.4.4 Processing


The Bureau of Quality Management Services will receive all PIR forms. The office of Quality Review and Development of QMS will then review all suggestions and process them for any additional action. The action taken may range from a short review process to the formation of larger task forces. Regardless of the action taken, all writers will have formal responses sent to them detailing the final result of their recommendation.


If you have any questions at all regarding this process, please contact the Project Engineer, Quality Review and Development Unit at (609) 530-6363.

Attachment 6.6-1

	New Jersey Department of Transportation NOTICE OF NONCONFORMANCE Quality Management Services	<i>For QMS Use Only</i> NON No. _____ Date Received _____
FROM Unit/Company : Title: Writer: Address : Telephone :	TO Mr. Brian Strizki Manager, Quality Management Services Address : 1035 Parkway Avenue P. O. Box 600 Trenton, NJ 08625 Telephone: (609) 530-6363	
Organization Committing Nonconformance Unit/Company : Manager/Principal of Firm/Resident Engineer: Address : Telephone:		
Area of Nonconformance: <input type="checkbox"/> Scope <input type="checkbox"/> Environmental <input type="checkbox"/> Permits <input type="checkbox"/> Design <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities <input type="checkbox"/> Construction <input type="checkbox"/> Project Management <input type="checkbox"/> Program Control <input type="checkbox"/> Survey <input type="checkbox"/> Other _____		
Route & Section: Fed. Proj. No.:	UPC No.: County/Municipality:	
Project Description:		
Description of Nonconformance:		
[page 1 of]		
<i>For QMS Use Only</i> CORRECTIVE ACTION PLAN REQUIRED?: <input type="checkbox"/> YES <input type="checkbox"/> NO		

Attachment 6.6-2

	New Jersey Department of Transportation Corrective Action Request Quality Management Services		<i>For QMS Use Only</i> CAR No. Date Issued:		
	From: Mr. Brian Strizki, Manager Quality Management Services P. O. Box 600 1035 Parkway Avenue Trenton NJ 08625 Telephone: (609) 530-6363	To Unit/Company: Manager/Project Manager: Address: Telephone:			
Area of Nonconformance or Quality Issue: <input type="checkbox"/> Scope <input type="checkbox"/> Environmental <input type="checkbox"/> Permits <input type="checkbox"/> Design <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities <input type="checkbox"/> Construction <input type="checkbox"/> Project Management <input type="checkbox"/> Program Control <input type="checkbox"/> Survey <input type="checkbox"/> Other:					
<u>Problem Statement:</u> 					
<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><u>Response:</u></td> <td style="width: 50%;"><u>Due Date:</u></td> </tr> </table> <p>a) Describe cause of quality problem:</p> <p>b) Describe short term/immediate solution:</p> <p>c) Describe interim solution, if applicable:</p> <p>d) Describe Long Term Action required to prevent recurrence:</p>				<u>Response:</u>	<u>Due Date:</u>
<u>Response:</u>	<u>Due Date:</u>				
Corrective Action Plan Accepted By QMS:					
Approved By:	Title:	Date:			

	<p>New Jersey Department of Transportation PROCESS IMPROVEMENT RECOMMENDATION QUALITY MANAGEMENT SERVICES</p>	<p>QMS USE ONLY PIR No. _____ Received: _____</p>
<p>From: [1] Unit/Company: Writer: Address: Telephone:</p>	<p>To: Frank Palise, Supervising Engineer, II Quality Assurance, Improvements & Research 1035 Parkway Avenue P. O. Box 600 Trenton NJ 08625-0600 Telephone: (609) 530-6363</p>	
<p>Process Affected: [2] <input type="checkbox"/> Scope <input type="checkbox"/> Design <input type="checkbox"/> Right of Way <input type="checkbox"/> Utilities <input type="checkbox"/> Environmental <input type="checkbox"/> Construction <input type="checkbox"/> Survey <input type="checkbox"/> Permits <input type="checkbox"/> Project Management <input type="checkbox"/> Program Control <input type="checkbox"/> Other _____</p>		
<p>Identification of Problem/Area in Need of Improvement: [Page 1 of] [3]</p>		
<p>Suggested Improvement/Areas of Expertise Needed on Team: [Page 1 of] [4]</p>		
<p>Immediate Action taken: <u>For QMS use only</u></p>		
<p>Final Action:</p>		