

## Section 7 - Final Bridge Plans

These provisions generally govern submissions for the design of new bridges and structures. See Section 8 for guidance on Reconstruction and Rehabilitation Projects.

### 7.1 General

1. Contract drawings shall be on 22 inch by 36 inch sheets.
2. Preferably, plans, sections, and elevations should be drawn to a scale not less than  $\frac{1}{4}" = 1'-0"$  and details to a scale not less than  $\frac{3}{8}" = 1'-0"$  except on the General Plan and Elevation Sheet.
3. Two (2) sets of the Design and Quantity Calculations shall be submitted as part of this submission.

### 7.2 Plan Submission Criteria

#### 7.2.1 Key Plan To Structures

This is usually the first sheet in the bridge plans in contracts that have two or more structures. It usually includes:

1. Relative location of new bridges, culverts, retaining walls, overhead sign structures and bridge mounted signs.
2. Relative locations of existing bridges to be altered or demolished

The plan is intended as a quick reference for all the structure work in the contract plans. A scale of  $1"=100'$  or  $1"=200'$  is desirable. Use of bridge numbers, overhead sign structure numbers, wall numbers, culvert numbers, etc. in addition to names, is required.

#### 7.2.2 General Plan and Elevation

This is usually the first sheet for each structure. It includes:

1. Index of Drawings

This lists the Bridge Sheet titles and numbers for the structure.

2. Summary of Quantities

This lists each item and its estimated Contract Quantity for the structure.

3. General Notes

This lists the criteria used in designing the structure.

Hydraulic and hydrologic data are shown for waterway structures.

4. Profiles

These show proposed profile lines, vertical curve information, tangent grades, original ground line, stationing and proposed finished grade elevations.

5. Plan

This is a plan view of the entire structure. It indicates:

- Relative position of the structure
- Skew of the structure
- Certain dimension, such as:
  - Lane widths
  - Lengths of spans from center to center of bearings

- Sidewalk and parapet widths
- Proposed slope protection location
- Point of minimum vertical clearance
- Location of borings
- Stationing
- Bearings of baselines
- Locations of subsurface and above ground utilities and complete information thereof
- Geometrics
- Working and control points
- Beginning and end of bridge (stationing)
- Temporary sheeting limits

## 6. Elevation

This is a pictorial illustration of the structure. It indicates:

- General appearances of the completed structure
- Approximate original ground line and assumed rock line
- Minimum vertical clearance (actual and required)
- Locations of fixed and expansion bearings
- Approximate clearances (actual and required)
- Temporary construction clearances

## 7. Section

This is usually a section taken through the plan view. It indicates:

- Transverse deck grades (cross-slopes)
- Transverse dimensions of the superstructure
- Number of girders and spacing dimensions
- Approximate original ground line and assumed rock line
- Approximate pile positions
- Location of utilities
- Finished grade line

### 7.2.3 Pile Plan

This is a plan view of footings and piles. It includes:

- Stationing
- Bearings of baselines
- Pile Design Capacity and Ultimate Design Capacity
- Relative position of footings
- Location of test piles and/or load tests
- Pile tip details
- Pile splice details
- Pile tip elevations
- Pile cut-off elevations
- Batter of piles
- All dimensions required to construct piles and footings
- Number of piles in each footing unit and total estimated length of piles in each footing unit
- Numbering system of piles for identification purposes as per Guide Plate 3.4-6.
- Notes indicating types of pile

- Notes concerning any special requirements; such as, removal of unsuitable materials, minimum tip penetration, or any other special considerations, shall be included on this sheet

#### **7.2.4 Abutment**

These sheets include:

##### **1. Plan**

- A plan view of the abutment which includes:
  - Bearing line
  - An outline of the abutment footing
  - Location, spacing and clearances of horizontal reinforcement steel in the footing
  - Footing and abutment dimension
  - An outline of the abutment wall
  - Locations of section view
  - Bearing location

##### **2. Elevation**

A front view of the abutment and walls which includes:

- Pertinent dimensions and elevation
- Typical reinforcement steel locations, spacing and clearance
- Locations of horizontal construction joint
- Relative pile locations in completed foundation
- Batter of walls and pile

##### **3. Section**

Typical sections through abutment walls which include:

- Pertinent dimensions and elevation
- Typical reinforcement steel locations, spacing, cover and clearance
- Locations of horizontal construction joint
- Batter of walls and pile
- Relative pile locations in completed foundation

These sheets also include:

- Estimated quantities of items incorporated on the sheet
- Details of bent reinforcement bars
- Reinforcement bar lists - These are used in computing net theoretical weight.
- Details of foundation and bridge excavation pay limits
- Details of epoxy waterproofing pay limits
- Details of concrete slope protection
- Details of joint and joint sealing

#### **7.2.5 Pier**

These sheets include:

##### **1. Plan**

A top view of the pier which indicates:

- Pertinent dimension
- Bridge seat elevation
- Column spacing
- Bearing location

- Locations of section view
- Bearing line

## 2. Elevation

A side view of the pier which usually indicates:

- Pertinent dimensions and elevation
- Locations of section view
- Reinforcement steel location, spacing, cover and clearance
- Spiral reinforcement pitch
- Relative pile locations in completed foundation

## 3. End Elevation

An end view of the pier. It may indicate:

- Reinforcement steel location, spacing, cover and clearance
- Architectural details (rustication strips, chamfers, etc.)
- Epoxy waterproofing pay limit
- Pertinent dimension
- Relative pile locations in completed foundation

## 4. Section

Sections taken through the columns and cap beams to better indicate dimensions and reinforcement steel locations.

## 5. Estimated Quantities

Estimated quantities of the items incorporated in the pier.

This sheet may also include:

- Detail of foundation excavation pay limits in the pier area
- Details of bent reinforcement bars
- Reinforcement bar lists - These are used in computing net theoretical weight.

## **7.2.6 Superstructure**

### **7.2.6.1 Structural Steel Sheets**

These sheets may include but not be limited to:

#### 1. Framing Plan

A top view of the centerlines of the steel girders. This view may indicate:

- Lengths of stringers from centerline of bearings to centerline of bearings
- Locations of and spacing between diaphragms
- Identification of individual stringers
- Bearing lines
- Angle between centerline of bearings and stringers
- Elevations of the tops of the stringers at the centerline of bearings
- Skew of bridge
- Sizes of diaphragm channels
- Location and identification of utilities

#### 2. Elevations

Side views of the different girders. These views may indicate:

- Shear connector spacing
- Transverse intermediate stiffener spacing
- Flange dimension
- Length of plate
- Depth of web plate
- Splice

3. Shear Connector Detail
4. Diaphragm Detail
5. Sections at pertinent location
6. Schedule of Cambers and Deflection
7. Shear Lock Device Detail
8. Estimated Quantities

Estimated quantities of structural steel and shear connectors.

9. Notes

These might include the size of bolts or rivets, type of steel, weld symbols and sizes, structural steel paint system designation and finish coat color, notes concerning Notch Toughness, Fracture Control Plan, and welding inspection testing symbol requirements.

#### **7.2.6.2 Structural Steel Bearings**

Refer to Section 24 of this Manual for guidance.

#### **7.2.6.3 Precast/Prestressed Concrete Beams**

These sheets may include:

- Framing plan
- Centerline of bearings
- Top view of the centerlines of the beams and diaphragms. This may indicate:
  - Spacing between beams and between diaphragm
  - Identification of individual beam
  - Spacing of utility support
- Estimated quantities
- Details of Beams and reinforcement
- Details of diaphragm
- Construction note
- Design criteria
- Location and identification of utilities

#### **7.2.6.4 Deck Slab**

This sheet may include:

1. Plan

A top view of the deck slab. This usually indicates the size and location of reinforcement steel and joints.

2. Sections

A typical section through the deck slab may indicate:

- Deck thickness
- Haunch thickness

- Typical reinforcement steel location
  - Location of profile line, transverse grades
  - Pertinent dimensions
  - Utilities location and identification
  - Overlays
  - Sections through deck joints may indicate:
    - Pertinent dimensions
    - Reinforcement locations
    - Notes pertaining to joints and sealers
3. Small scale schematic diagram showing the following minimum information:
- Baseline and other control lines - Stations at 25 feet intervals
  - Cross-slope percentages
  - Elevations at 25 feet intervals
  - Horizontal curve layout information
  - Contours at 10 feet intervals between variable cross-slopes
- This information is used by the Review Engineer and Designer to determine if adverse geometrics precludes the use of machine finishing of the bridge deck.
4. Details
- Copper waterstop
- Preformed joint sealer and installation
5. Reinforcement Steel Bar List - These are used in computing net theoretical weight
6. Estimated quantities
7. Small scale diagram showing concrete placing sequence for continuous spans.

### **7.2.7 Detail Sheets**

There may be one or more sheets under this heading. The details may be typical or specific. These may indicate:

- Parapets
- Chain link fence
- Bridge railings
- Junction boxes
- Abutment form panel arrangement and scoring
- Anchor bolts
- Joints, waterstop, sealing
- Abutment drainage
- Pay limits for epoxy waterproofing and
- Pay limits for foundation and bridge excavation
- Rigid metallic conduit sleeves
- Sidewalk and parapet joint location
- Lighting standard foundations
- Deck joints
- Utilities
- Granite masonry or Stainless Steel Pier Protection
- Scour countermeasures

- Fender systems
- Seismic details
- Navigational lighting and access

Conglomerations of "Typical Details", such as Foundation Excavation, Structural Details, Wall Sections, etc. all on the same sheet, should be avoided. Typical structural details should be shown with the structural steel drawings, foundation excavation payment limits should be shown on the abutment and pier drawings, etc.

### **7.2.8 Standard Drawings/Bridge Construction Details (BCD's)**

The use of Standard Drawings, included in Division 2 of this Manual and BCD's, may be studied for use with bridge plans. BCD's are contained in the "Standard Roadway Construction – Traffic Control – Bridge Construction Details" package of drawings. For contracts that contain more than one bridge, a Standard Drawing detail sheet is to be provided with each structure. BCD's do not have to be reproduced on a project to project basis. They may be referred to for their inclusion as an item of a project's construction.

Reference to the Standard Drawings should be included in the Index of Drawings shown on the General Plan and Elevation Sheet.

### **7.2.9 Culverts**

This is a sheet showing culvert type structures. They may include:

#### **1. Plan**

This is a plan view of the entire structure. It indicates:

- Length of culvert section
- Overall dimension
- Reinforcement steel
- Station
- Skew to base line
- Stage construction

#### **2. Elevation**

This is a front view of the culvert which indicates:

- Pertinent elevation
- Types and locations of wall joint
- Invert elevation
- Reinforcement steel
- Location of section view
- Location of utilities
- Cut-off wall

#### **3. Section**

Typical sections through culvert and retaining walls which indicates:

- Pertinent dimensions and elevation
- Reinforcement steel
- Location of joint
- Batter of wall

These sheets also include:

- Estimated quantities of items incorporated on the sheet

- Details of bent reinforcement bars.
- Reinforcement bar lists.
- Details of foundation and channel excavation payment limits.
- Details of epoxy seal coat payment limits.
- General Notes indicating design criteria and hydrologic data.
- Foundation data, as required.

### **7.2.10 Retaining Walls**

#### **1. Plan – Cast-In-Place Presentation**

A top view of the wall and footing which indicates:

- Pertinent dimensions
- Location of piles (if not shown on the footing and pile location plan)
- Reinforcement steel location, cover and spacing in footings
- Boring locations and identification
- Back of wall drainage details

#### **2. Elevation – Cast-In-Place Presentation**

A side view of the wall which may indicate:

- Pertinent dimensions and elevation
- Location of section view
- Reinforcement steel location, cover and spacing
- Pile locations in the finished structure
- Wall identification number
- Back of wall drainage and flow line elevation

#### **3. Section – Cast-In-Place Presentation**

Sections taken through the wall to better indicate dimensions, reinforcement steel locations, concrete cover for rebars, pile locations, elevation

#### **4. Estimated Quantities – Cast-In-Place Presentation**

Estimated quantities for the items incorporated in the wall

This sheet may also include:

- Detail of foundation excavation pay limit
- Details of bent reinforcement bar
- Reinforcing bar list

#### **5. Alternate Proprietary Wall**

Refer to Subsection 6.2 of this Manual for Control Plan presentation requirements.

### **7.2.11 Demolition of Existing Bridge**

This sheet is a schematic outline with general information necessary to assist bidders in determining the extent of the work

The minimum information is:

- Plan, elevation and typical sections with key dimensions and elevation
- Extent of removal and staging
- Estimate of the quantities of the principal item to be removed
- Route and Section number under which the bridge was built
- Microfilm file reference number (7 digits)



- Any other information which, in the judgment of the engineer, will be of value to all concerned

The following note shall be indicated on this sheet:

The information presented hereon is for informational purposes only and is not guaranteed to be correct. Bidders shall visit the site before submitting bids to ascertain the extent of the work

If the original bridge plans are available, a half-tone reproduction of the General Plan and Elevation sheet, modified to suit, should be considered for inclusion in the above Plans.

### **7.2.12 Sign Support Structures**

1. Refer to Section 30 of this Manual for criteria concerning the design and installation of Variable Message Sign Support Structures.
2. Contract plans for sign support structures shall include, but shall not necessarily be limited to, the following:

- a. Key Plan to Structures:

Location of overhead, cantilever and bridge mounted sign structures will be shown on the Key Plan to Structures sheet.

Boring locations and numbers in conjunction with subsurface and overhead utilities may be shown on this sheet.

- b. Elevation of Structures:

This plan sheet is a single line diagram showing the sign structures in elevation and including the following information:

- Principal dimensions
- Total sign design area limits
- Sign location on structures
- Sign identification
- Stations
- Roadway dimensions
- Vertical and horizontal clearance dimensions
- Guide rail locations
- Bottom of footing elevations
- Borrow excavation, bridge foundation limits, (when required)
- Pile plan (if other pile types used)
- Temporary sheeting (if necessary)
- Utilities adjacent to footings
- Estimated quantities

- c. Plan View of Structures

- Roadway Lane Width
- Roadway Station of Structure
- Boring locations
- Direction of Traffic Flow
- Footing Schematic Outline
- Location of Piles, Temporary Sheeting (if applicable)
- Location of Utilities Adjacent to Footing

- d. Standard Contract Plans:

## **Overhead**

Standard Contract Plan Plates completed in accordance with Standard Design Instruction Drawing Plates.

## **Cantilever**

Standard Contract Plan Plates completed in accordance with Standard Design Instruction Drawing Plates.

- e. Detail plans for other type sign support structures, such as bridge mounted sign structures, developed on an individual structure basis.
- f. Electrical and Lighting Plans (usually included with Roadway Plans).

### **7.2.13 Specialty Sheet**

These sheets can include:

- Fender systems
- Modifications of railroad electrification facilities
- Protective shield over electrified railroad track

### **7.2.14 Temporary Structure**

This sheet is a schematic outline of the temporary bridge to provide bidder with minimum criteria.

The information includes:

#### **1. General Notes**

This identifies the criteria used in designing the structure; such as, applicable specifications (AASHTO, AREMA), minimum design loading and permissible increases in allowable stresses.

Hydraulic and hydrologic data are shown for waterway structures.

#### **2. Profiles**

These show proposed profile lines, vertical curve information, tangent grades, original ground line, stationing, and proposed finished grade elevations.

#### **3. Plan**

This is a plan view of the entire structure. It indicates:

- Skew of the structure.
- Certain dimensions; such as,
  - Lane Width
  - Sidewalk Width
  - Location and identification of boring
  - Location of subsurface and above ground utilities

#### **4. Elevation**

A schematic elevation to illustrate the following:

- Original groundline and assumed rockline
- Minimum vertical clearance
- Minimum lateral clearance

All of the documents and procedures required shall apply to temporary structures. All certificates and permits required shall be obtained during the design phases. Any

changes in the plan during advertising or construction will necessitate application for amendments to the permit.

Approach roadways for temporary structures shall be detailed in the roadway plan portion of the Contract Plans.

### **7.2.15 High Tower Lighting**

Contract Plans for tower lighting footing details shall include, but not necessarily be limited to, the following:

#### **1. Key Plan to Tower Lighting Footings**

If the contract is exclusively a lighting contract, a Key Plan Sheet shall be provided.

#### **2. Tower Lighting Footing Details**

- Plan
- Elevation
- Pedestal Section
- Reinforcement Steel Bar List
- Rebar Bending Details
- Existing Ground Line Elevations
- Bottom of Footing Elevations
- Tower Lighting Identification Numbers
- Location by Station and Offsets
- Boring Locations and Identification Numbers
- Estimated Quantities
- Design Criteria
- Wind Pressure Diagram
- Light Tower Diagrams
- General Notes
- Foundation Excavation Details
- Borrow Excavation, Bridge Foundation Placement Limits
- Pile Plan

### **7.3 Alternate Retaining Wall Submissions**

1. When construction of alternate type proprietary walls is planned, Control Plans are required in the final contract documents. Refer to Subsection 6.2 for Control Plan requirements.
  - a. The Contractor shall be responsible for providing the design calculations and construction plans for the alternate retaining wall systems as Working Drawings. Refer to Section 17 of this Manual for design submission criteria. The NJDOT Standard Specifications should be referred to for guidance in the submission of working drawings.
  - b. The Designer will sign and seal the drawings noting that the walls have been checked for external stability and for conformance with the design concept of the project. Also, he will modify the Index of Drawings on the Contract set of plans.
2. When project site conditions limit the wall type system selection (refer to Subsection 5.6 of this Manual) complete proprietary wall designs shall be provided in the Contract set of plans.

- a. All calculations shall be provided. Appropriate information shall be stated on the contract plans.
  - b. Complete information as to the proposed method of fabrication and erection of precast units and related components shall be provided. Working drawings shall be prepared and submitted in accordance with the requirements specified in the Standard Specifications and as modified herein.
3. As per Subsection 6.2 of this Manual, when only one type proprietary wall system manufacturer can be used, a waiver must be obtained from FHWA.
4. The Department reserves the right to reject any alternate wall system or wall systems details which do not conform to the control plans, pre-approved NJDOT Design Manuals or AASHTO Specifications.

#### **7.4 Plan Revisions**

1. No revisions shall be made to contract drawings between the time of advertising and award of contract. During the advertising period, additions, deletions or corrections to contract plans shall be accomplished by addendum. Revisions to plans, in compliance with addenda, shall be made immediately after award of contract.
2. Revisions to contract drawings shall be made in accordance with the illustration shown on Guide Sheet Plate 3.2-1. Erasures are not allowed.
3. Where revisions are necessary on a Consultant's contract plans, the Consultant shall mark, in red, changes in accordance with the illustration shown on Guide Sheet Plate 3.2-1. The same drawing shall be submitted for approval with a transmittal letter detailing the changes. Drafting work shall be done by the Consultant.
4. Where changes are so extensive that new drawings are necessary, the following procedure shall be used:
  - a. Mark original contract drawing:  
"Void - See Supplementary Sheet B\_\_\_\_S"
  - b. Mark new drawing:  
"Supplementary Sheet B\_\_\_\_S"
5. If contract plans have been submitted in an electronic media, a submission should be provided to include the original submission and all changes.