

Table of Contents

1.0	Introduction	1-1
1.1	General	
1.2	Reference Publications	
2.0	Bridge Terms	2-1
3.0	AASHTO LRFD Bridge Design Specifications, NJDOT Stipulations	3-1
3.1	Load And Resistance Factor Design (LRFD) Design Philosophy	
3.2	Vehicular Bridge Structures	
3.3	Overhead And Cantilever Sign Support Structures	
3.4	Pedestrian/Bicycle Traffic Bridge Structures	
3.5	Movable Bridge Structures	
3.6	Alternate Design Criteria for Non-NHS Roadways	
4.0	Railroads	4-1
4.1	Design Criteria	
4.2	Vertical Underclearances	
4.3	Lateral Clearances	
4.4	Protective Shield	
4.5	Railroad Utility Agreement Plans	
5.0	Bridge Type Selection and Geometrics	5-1
5.1	Bridge Type Selection	
5.2	Geometrics On Bridges	5-2
5.3	Alternate Designs	
5.4	Life Cycle Cost Analysis	
5.5	Value Engineering	
5.6	Retaining Walls	
5.7	Context Sensitive Design	
6.0	Preliminary Bridge Plans	6-1
6.1	General	
6.2	Alternate Retaining Wall System	
6.3	General Notes	
7.0	Final Bridge Plans	7-1
7.1	General	
7.2	Plan Submission Criteria	
7.3	Alternate Retaining Wall Submissions	
7.4	Plan Reviews	
8.0	Reconstruction And Rehabilitation Projects	8-1
8.1	Concrete Bridge Decks	
NJDOT Design Manual for Bridges and Structures - 5 th Edition		I-1
Table of Contents		

8.2	Field Condition And Appraisal Survey	
8.3	Deck Slab Reconstruction (Replacement)	
8.4	Special Conditions	
8.5	Closure of Movable Bridges	
8.6	Superstructure Replacements or Bridge Widening Projects	
9.0	Bridge Deck Rehabilitation Projects	9-1
9.1	Requirements	
9.2	Deck Deterioration Quantity	
9.3	NBI Coding	
9.4	Machine Finishing For Concrete Deck Overlay Protective Systems	
9.5	Construction Document Development	
9.6	Safety Upgrades	
9.7	Deck Evaluation Survey	
9.8	Guidelines For Determining Deck Condition and Extent Of Work	
9.9	Recommended Restoration Procedures	
10.0	Estimated Quantities/Design Calculations	10-1
10.1	Plans	
10.2	Calculations	
10.3	Guidance on NJDOT Standard Specifications Pay Item Usage	
10.4	Design Calculations Criteria	
11.0	Submission Guidelines For Plan Reviews	11-1
11.1	Design Development (Preliminary Structural Documents)	
11.2	Design Development (Final Structural Documents)	
12.0	Footprint Program	12-1
12.1	Policy	
12.2	Design Parameters	
12.3	Guidelines	
13.0	Bridge Attachments Permits	13-1
13.1	General	
13.2	Location	
13.3	Installation and Plan Requirements	
14.0	Computer Programs	14-1
14.1	Consultants (Design Calculations)	
14.2	Computer-Aided Drafting (Consultants)	
15.0	Integral Abutment Jointless Bridges	15-1
15.1	Characteristics Of Integral Bridges	
15.2	Criteria For Integral Abutment Bridge Design	

15.3	Design Procedure Guidelines	
15.4	Construction Procedures	
15.5	Semi-Integral Abutment Design	
16.0	Foundations Design Criteria	16-1
16.1	Determination of Soil Properties	
16.2	Loads	
16.3	Foundations	
16.4	Additional Conditions	
16.5	Prestressed Concrete Pile Connections	
17.0	Abutments And Walls, Design Criteria	17-1
17.1	Design Criteria and Guidance	
17.2	Abutments And Walls, Design Parameters	
17.3	Alternate Retaining Wall Systems	
17.4	Alternate or Proprietary Type Abutments	
17.5	Landscape Walls	
18.0	Abutment Types	18-1
18.1	Design Criteria	
18.2	General	
19.0	Piers	19-1
19.1	Types	
19.2	Pier Locations	
19.3	Railroads	
19.4	Anchor Bolts	
19.5	Round Columns	
19.6	Pile Bents	
19.7	Abrasion Protection	
19.8	Fender Pile Systems	
19.9	Vessel Collision	
20.0	Deck and Approach Slabs	20-1
20.1	High Performance Concrete (HPC) Deck Slabs	
20.2	Design Criteria	
20.3	Concrete Deck Overlay Protective System Construction	
20.4	Corrosion Protected Reinforcement In Deck Slabs	
20.5	Deck Slab Design and Construction Detailing	
20.6	Deck Joints	
20.7	Haunches on Stringer Bridges	
20.8	Concrete Placing Sequence	

20.9	Machine Finishing	
20.10	Approach Slabs	
20.11	Medians	
20.12	Parapets, Barriers, and Sidewalks	
20.13	Deck Slab Overlay Protective Systems	
20.14	Alternate Deck Slab Systems	
21.0	Deck Joints	21-1
21.1	General Criteria	
21.2	Preformed Elastomeric Joint Assembly	
21.3	Longitudinal Deck Joints	
21.4	Strip Seal Expansion Joint System	
21.5	Modular Bridge Joint Systems (MBJS)	
22.0	Deck Drainage	22-1
22.1	Hydraulic Criteria	
22.2	Cross Slopes	
22.3	Grades	
22.4	Inlets and Downspouts	
22.5	Catch-Basin System At Bridge Ends	
23.0	Parapets, Railings, and Chain Link Fencing	23-1
23.1	Fencing Warrants	
23.2	Pedestrian Bridge and Ramp Railing Criteria	
23.3	Types Of Bridge Railings	
24.0	Structural Steel	24-1
24.1	Design	
24.2	Type of Steel	
24.3	Span Type Selection	
24.4	Economics of Stringer Design	
24.5	Fracture Critical Members	
24.6	Composite Design	
24.7	Camber	
24.8	Multiple Span Structures	
24.9	Diaphragms and Crossframes	
24.10	Transverse Intermediate Stiffeners	
24.11	Bearing Stiffeners	
24.12	Connector Plates For Interior Diaphragm X-Frames	
24.13	Stability During Transportation And Erection	
24.14	Welded Details	

24.15	Shear Locks	
24.16	Flared Decks	
24.17	Field Splices	
24.18	Paint Coating Systems	
24.19	Weathering Steel	
24.20	Bearing Devices	
25.0	Precast/Prestressed Concrete	25-1
25.1	General Design Considerations	
25.2	Precast/Prestressed Concrete Sections	
25.3	Materials	
25.4	Design/Construction Criteria	
25.5	Adjacent Voided Slab and Box Beam Design	
25.6	Transverse Ties And Keyway Grouting	
25.7	Spread Box Beam Design	
25.8	Bearings	
25.9	Continuity Design For Live Load Concept	
25.10	Epoxy Waterproofing Seal Coat Limits	
26.0	Reinforcement Steel Details	26-1
26.1	Reinforcement Presentation	
26.2	Reinforcement Designation	
27.0	Classes Of Concrete	27-1
27.1	NJDOT Standard Specifications Concrete Class Designations	
28.0	Bridge Lighting	28-1
28.1	General Requirements	
29.0	Culverts And Arches	29-1
29.1	Design Criteria	
29.2	Waterway Openings	
29.3	Hydraulic and Hydrologic Data	
29.4	General Criteria	
29.5	Design Criteria For Precast Reinforced Concrete Box Sections For Culverts	
29.6	Precast Concrete Arch Structures	
29.7	Precast Reinforced Concrete Three-Sided Structures	
30.0	Sign Support Structures (Overhead And Cantilever)	30.1
30.1	General Design Criteria	
30.2	Variable Message Sign (VMS) Support Structures – Design Guidance	
30.3	Truss Chord Bolted Connections/Anchor Bolt Installations	
30.4	Foundations	

30.5 Plan Submissions	
30.6 Standard Drawings	
30.7 Structure Numbers	
30.8 General Criteria	
31.0 Bridge Mounted Signs	31-1
31.1 General Criteria	
32.0 Utilities	32-1
32.1 General Criteria	
32.2 Support Systems	
32.3 Plans	
32.4 Department Policy	
32.5 Pipelines on Railroad Bridges and Property	
32.6 Pipeline Expansion Joints (Water Mains)	
33.0 Cofferdams and Sheet Piling	33-1
33.1 General Criteria	
33.2 Temporary Cofferdam Installations	
33.3 Permanent Cofferdam and Permanent Sheeting Installations	
33.4 Temporary Sheeting	
33.5 Material Requirements	
34.0 Geotechnical Engineering	34-1
34.1 General Plan Preparation	
34.2 Subsurface Exploration Program	
34.3 Boring Log Form Sample	
34.4 Geotechnical Engineering Studies and Reports	
34.5 Jetting and Preboring of Piles	
35.0 Structure Numbers and Names	35-1
35.1 Structure Numbers	
35.2 Structure Names	
35.3 Overhead and Cantilever Sign and VMS/DMS Structures	
36.0 Highway Sign, Lighting, Traffic Signal & ITS Structural Support Structures	36-1
36.1 Design Criteria	
36.2 Support Structure Standards	
36.3 ITS Support Structures	
36.4 Foundation	
36.5 General	
37.0 Prefabricated Bridge Elements and Systems (PBES)	37-1

37.1	General Criteria	
37.2	Decision Making Guidance	
37.3	Considerations For Selection of a PBES	
37.4	FHWA Website	
38.0	Seismic Design And Retrofit	38-1
38.1	History of Seismic Activity In New Jersey	
38.2	General Criteria	
38.3	Acceleration Coefficients	
38.4	Methods of Analysis	
38.5	Seismic Retrofit Of Existing Highway Structures	
38.6	Bearings	
38.7	Computer Software	
38.8	Flow Diagram For Retrofit	
39.0	Scour At Bridges	39-1
39.1	General Criteria	
39.2	Preliminary Scour Analysis	
39.3	Performing A Scour Analysis	
39.4	Flow Diagrams For Detailed Scour Evaluation	
39.5	Design Guidance	
39.6	Scour Countermeasure Development Procedures	
39.7	Scour Protection At Culverts	
39.8	Scour Protection Detailing	
40.0	Noise Barriers	40-1
40.1	General Criteria	
40.2	Types of Barriers	
40.3	Materials	
40.4	Foundation Design	
41.0	Bridge Security	44-1
41.1	Vulnerability Assessment	
41.2	Vulnerability Countermeasures	
42.0	Permit Procedures	42-1
42.1	NJDEP Water Quality Certificate	
42.2	NJDEP Stream Encroachment Permit	
42.3	Tidelands, Grants, Lease Or License	
42.4	NJDEP Coastal Area Facilities Review Act Permit (CAFRA)	
42.5	U.S. Coast Guard Section 9 Permit	
42.6	NJDEP Waterfront Development Permit	

42.7	NJDEP Freshwater Wetlands Permit	
42.8	U.S. Army Corps 404 and 10 Permits	
42.9	Pinelands Commission Permit	
42.10	Navigable Waterways In New Jersey	
43.0	Highway Bridge Evaluation Program	43-1
43.1	General	
43.2	Evaluation Criteria	
43.3	Evaluation Survey Report Format - A -	
43.4	Re-Evaluation Survey Report Format - B -	
43.5	Re-Evaluation Survey Report Format - C -	
43.6	Interim Survey Report Format - D -	
43.7	Guidelines for CADD Bridge Evaluation Survey Field Inspection Drawings	
44.0	Railroad Carrying Bridge Evaluation Program	44-1
44.1	Evaluation Survey Report Format - AR -	
44.2	Re-Evaluation Bridge Survey Report Format - BR -	
44.3	Re-Evaluation Survey Report Format - CR -	
44.4	Interim Survey Report Format - DR -	
44.5	Rating of Existing Railroad Structures	
Appendix 1 Overview, Maintenance and Innovation		
Appendix 2 Standard Drawings		
Appendix 3 Guide Plates		

Appendix 2 Table of Contents - Standard Drawings

Description	Plate	Note
Pretensioned Prestressed Concrete I Beams		
Notes to Designer	2.1-1	(1)
45" Pretensioned Prestressed Concrete Beams	2.1-2	(1)
54" Pretensioned Prestressed Concrete Beams	2.1-3	(1)
63" Pretensioned Prestressed Concrete Beams	2.1-4	(1)
72" Pretensioned Prestressed Concrete Beams	2.1-5	(1)
Details of Intermediate Steel Diaphragms for Prestressed Concrete Beams	2.1-6	
High Load Multi – Rotational Bearing Assemblies		
Reinforced Elastomeric Bearing	2.2-1	(5)
Pot Bearing	2.2-2	(5)
Seismic Isolation Bearing	2.2-3	(5)
Utility Installations		
P.S.E.G., Typical Hanger Installation of 5" or 6" fiberglass Conduits for Steel Girder Bridges, (Sheet 1 of 2)	2.3-1	(2)
P.S.E.G., Typical Hanger Installation of 5" or 6" fiberglass Conduits for Steel Girder Bridges, (Sheet 2 of 2)	2.3-2	(2)
Bell Atlantic-NJ, Typical Installation of 4" Diameter Fiberglass Ducts on Bridges	2.3-3	(2)
G.P.U. Energy, Standard Installation of 6" Fiberglass Conduit under Highway Bridges	2.3-4	(2)
Noise Wall Barriers		
Precast Concrete Panel Details	2.4-1	(3)
Foundation Details	2.4-3	(3)
Integral Abutments		
Integral Abutments, Construction Details (Sheet 1)	2.5-1	(4)
Integral Abutments, Construction Details (Sheet 2)	2.5-2	(4)
Integral Abutments, Construction Details (Sheet 3)	2.5-3	(4)
Integral Abutments, Construction Details (Sheet 4)	2.5-4	(4)
Integral Abutments, Construction Details (Sheet 5)	2.5-5	(4)
Integral Abutments, Construction Details (Sheet 6)	2.5-6	(4)
Proprietary Retaining Walls		
Sample Control Plan (Sheet 1)	2.6-1	(6)
Sample Control Plan (Sheet 2)	2.6-2	(6)
Strip Seal Expansion Joint Assembly		
Installation Details for Concrete and Steel Superstructures (Sheet 1)	2.7-1	
NJDOT Design Manual for Bridges and Structures - 5 th Edition		I-9
Table of Contents		

Installation Details for Concrete and Steel Superstructures (Sheet 2)	2.7-2
Installation Details for Concrete and Steel Superstructures (Sheet 3)	2.7-3
Installation Details for Concrete and Steel Superstructures (Sheet 3)	2.7-4
Installation Details for Concrete and Steel Superstructures (Sheet 4)	2.7-5
Preformed Elastomeric Joint Assembly	
Installation Details for Concrete and Steel Superstructures (Sheet 1)	2.8-1
Installation Details for Concrete and Steel Superstructures (Sheet 2)	2.8-2

The Standard Drawings have been reduced in this Manual for convenience. Full size reproductions may be downloaded the NJDOT website, CADD page.

Notes

- 1 Also see Subsection 1.25.1 of this Manual.
- 2 These are utility company standard drawings and are intended to be used only as guides in the preparation of Contract Plans.
- 3 Also see Division 1 Section 40 of this Manual.
- 4 Also see Division 1 Section 15 of this Manual.
- 5 Also see Subsection 1.24.20 of this Manual.
- 6 Refer to Subsection 1.6.2 of this Manual.

Appendix 3 Table of Contents - Guide Plates

Description	Plate
Title Blocks On Plans	
Federal Aid and Structure Identification Block	3.1 1
Credit Block (Consultants)	3.1 2
Credit Block (In House)	3.1 3
Title Block (In House)	3.1 4
Title Block (Consultant)	3.1 5
Revisions To Plans	
Plan Revisions	3.2 1
Abutments	
Abutment Section for Structures with Approach Slabs	3.3 1
Abutment Section for Structures without Approach Slabs	3.3 2
Footings on Embankments	3.3 3
Bridge Seat Details	3.3 4
Walls	
Retaining Wall Section	3.4 1
U Type Wingwall with Sidewalk	3.4 2
U Type Wingwall with Barrier Curb	3.4 3
Alternate Dowel Detail	3.4 4
Wing Stem Details	3.4 5
Footings on Piles	3.4 6
Mechanically Stabilized Earth Wall - Typical Cut Section	3.4-7
Mechanically Stabilized Earth Wall - Typical Fill Section	3.4.8
Prefabricated Modular Wall - Typical Cut Section	3.4-9
Prefabricated Modular Wall - Typical Fill Section	3.4-10
Proprietary Walls Coping Details	3.4-11
T-Wall Typical Section	3.4-12
Piers	
Pier Cap	3.5 1
Round Column Reinforcement	3.5 2
Pier Cap Section	3.5 3
Anchor Bolt Layout	3.5 4
Deck Slabs	
Deck Slab: One Course Construction	
Reinforcement Details	3.6 1
Haunch for Deck Slab	3.6 2
Decked over Median	3.6 3
Deck Slab Reinforcement, Details at Fascia	3.6 4
NJDOT Design Manual for Bridges and Structures - 5 th Edition	I-11
Table of Contents	

Parapets

6'-8" High Parapet with Barrier Curb	3.7-1
Temporary Barrier, Bridge	3.7-2

Deck Joints

Longitudinal Joints in Deck Slab (One Course Construction)	3.8-1
Joint Sealer Seat Depth Detail (Sheet 1)	3.8-2
Joint Sealer Seat Depth Detail (Sheet 2)	3.8-3

Structural Steel

Structural Steel General Notes	3.9-1
Stud Shear Connectors	3.9-2
Cover Plate Details	3.9-3
Girder Welded Splice Details	3.9-4
Intermediate and Bearing Stiffener Detail (Sheet 1 of 2)	3.9-5
Intermediate and Bearing Stiffener Details (Sheet 2 of 2)	3.9-6
Shop Installed Safety Handrail Details	3.9-7
Tub Girder (Open Box) Details (Sheet 1 of 3) Cross Sectional Geometry	3.9-8
Tub Girder (Open Box) Details (Sheet 2 of 3) Interior Crossframe	3.9-9
Tub Girder (Open Box) Details (Sheet 3 of 3) Transverse Stiffener	3.9-10
Crossframe Details (Sheet 1 of 3) Intermediate Diaphragm	3.9-11
Crossframe Details (Sheet 2 of 3) End Diaphragm	3.9-12
Crossframe Details (Sheet 3 of 3) Alternate End Diaphragm	3.9-13
Connection Plate Details (Sheet 1 of 2) Connection Plate for Girder	3.9-14
Crossframe Details (Sheet 2 of 2) Connection Plate for Stringer	3.9-15
Lateral Bracing Details	3.9-16
Rolled Beam Intermediate Diaphragm Details (Sheet 1 of 2)	3.9-17
Rolled Beam Intermediate Diaphragm Details (Sheet 2 of 2)	3.9-18
Longitudinal/Transverse Stiffener Intersection Details	3.9-19
Main Member Edge Distance	3.9-20
Toughness Requirements Charpy V-Notch Tests	3.9-21
Fascia Beam End Clearance	3.9-22
Drip Plate Detail for Weathering Steel	3.9-23
Bolted Field Splice Details (Sheet 1 of 2)	3.9-24
Bolted Field Splice Details (Sheet 2 of 2)	3.9-25
Structural Steel Notes to be Shown on Contract Plans	3.9-26
Shear Lock at Longitudinal Open Joints in Deck Slab	3.9-27

Prestressed Concrete

Section at Abutment, PC I Beams	3.10-1
Section at Pier, PC I Beams	3.10-2
Cast In Place End Diaphragm for PC I Beams at Bearings	3.10-3

Section at Abutment, PC Adjacent Slab and Box Beams	3.10-4
Section at Fixed Pier, PC Adjacent Slab and Box Beams	3.10-5
Section at Pier, PC Adjacent Slab and Box Beams, Spans < 55 feet	3.10-6
Prestressed Concrete Slab and Box Beams - Deck Overlay Details	3.10-7
Prestressed Concrete Slab and Box Beams - Parapet Details	3.10-8
Elastomeric Bearing Pads for Prestressed Concrete Box Beams	3.10-9
Prestressed Concrete Box Beams Standard Sections	3.10-10
Prestressed Concrete Slab Beams Standard Sections	3.10-11
Prestressed Concrete Slab and Box Beams, Grouted Key Way Details	3.10-12
Prestressed Concrete Voided Slab Beams, Transverse Tie Details	3.10-13
Prestressed Concrete Box Beams, Transverse Tie Details	3.10-14
Continuity Design for Live Load, PC I-Beam Diaphragms	3.10-15
Continuity Design for Live Load, PC I-Beam Diaphragm Reinforcement (Sheet 1 of 2)	3.10-16
Continuity Design for Live Load, PC I-Beam Diaphragm Reinforcement (Sheet 2 of 2)	3.10-17
Continuity Design for Live Load, PC I-Beam Keeper Blocks	3.10-18
P.C. Spread Box Beams Design Details	3.10-19
P.C. Spread Box Beams Diaphragm Details (Sheet 1 of 3)	3.10-20
P.C. Spread Box Beams Diaphragm Details (Sheet 2 of 3)	3.10-21
P.C. Spread Box Beams Diaphragm Details (Sheet 3 of 3)	3.10-22
P.C. Spread Box Beams Utility Details	3.10-23
P.C. Spread Box Beams Reinforcement Details	3.10-24
P.C. Spread Box Beams, End Block Reinforcement Details	3.10-25
New England Bulb-Tee Girders – Standard Sections	3.10-26
PCEF Bulb-Tee Girders – Standard Sections	3.10-27
Piles	
Reinforcement Steel for Cast-in-Place Concrete Piles	3.11-1
Pile Splice for Cast-in-Place Concrete Piles	3.11-2
Steel Pile Splice, Alternate 1	3.11-3
Steel Pile Splice, Alternate 2 (Sheet 1 of 2)	3.11-4
Steel Pile Splice, Alternate 2 (Sheet 2 of 2)	3.11-5
Steel Pile Splice, Alternate 3	3.11-6
Pile Tips (Sheet 1 of 2)	3.11-7
Pile Tips (Sheet 2 of 2)	3.11-8
Culverts	
Single Cell Box Culvert, Cast-in-Place	3.12-1
Twin Cell Box Culvert, Cast-in-Place	3.12-2
Paved Aprons for Box Culverts	3.12-3
NJDOT Design Manual for Bridges and Structures - 5 th Edition	I-13
Table of Contents	

Payment Limits for Excavation at Culvert	3.12-4
Cofferdams	
Details for Sheet Piling Left-in-Place	3.13 1
Railroads	
Railroad Side Clearance, Double Track Under, New Construction	3.14-1
Construction Shield over Electrified Tracks	3.14-2
Standard Specification For Road And Bridge Construction	
Payment Limits for Excavation (Sheet 1 of 5)	3.15-1
Payment Limits for Excavation (Sheet 2 of 5)	3.15-2
Payment Limits for Excavation (Sheet 3 of 5)	3.15-3
Payment Limits for Excavation (Sheet 4 of 5)	3.15-4
Payment Limits for Excavation (Sheet 5 of 5)	3.15-5
Bridge Design Loadings For NHS-Highways	
HL-93 Loading	3.16-1
Drafting	
Graphic Bar Scales	3.17-1