

---

## **Chapter 1 General Information**

---

<b>1.1</b>	<b>Manual Description</b>	1.1-1
1.1.1	Purpose	1.1-1
1.1.2	Design Specifications	1.1-2
1.1.3	Design Methods	1.1-2
1.1.4	Revisions	1.1-2
<b>1.2</b>	<b>Bridge Office Organization</b>	1.2-1
1.2.1	Bridge Design Mission Statement	1.2-1
1.2.2	Organizational Elements and Design Responsibilities	1.2-1
1.2.3	Training/Mentor Program	1.2-4
1.2.4	Procedure for Project and Public Meetings	1.2-4
1.2.5	Contract Procedures	1.2-5
<b>1.3</b>	<b>Quality Control/Quality Assurance (QC/QA) Procedure</b>	1.3-1
1.3.1	General	1.3-1
1.3.2	In-House and Consultant Section Responsibilities	1.3-2
1.3.3	Project File	1.3-8
1.3.4	Contract Plans	1.3-9
1.3.5	Contract Plan Changes (Revisions After Proposal & As-Builts)	1.3-9
1.3.6	Addenda	1.3-10
1.3.7	Shop Plans and Permanent Structure Construction Procedures	1.3-11
1.3.8	Archiving Design Files & Permanent Structure Shop Plans	1.3-15
1.3.9	Public Disclosure Policy Regarding Bridge Plans & Files	1.3-18
1.3.10	Use of Computer Software	1.3-18
<b>1.4</b>	<b>Project Development</b>	1.4-1
1.4.1	General	1.4-1
1.4.2	Project Initiation and Authorization	1.4-1
1.4.3	Project Development Task List	1.4-1
1.4.4	Explanation of Project Development Task List	1.4-5
<b>1.5</b>	<b>Bridge Design Scheduling</b>	1.5-1
1.5.1	General	1.5-1
1.5.2	Preliminary Design Schedule	1.5-1
1.5.3	Final Design Schedule	1.5-1
<b>References</b>		1.R-1
<b>Appendix A</b>		
Appendix 1.1-A1	FHWA Memorandum	1.1-A1-1
Appendix 1.1-A2	Sample Design Memorandum	1.1-A2-1
Appendix 1.2-A1	Bridge Design Organization Chart	1.2-A1-1
Appendix 1.2-A2	Project Presentation Outline	1.2-A2-1
Appendix 1.3-A1	Project Turn-in QC/QA Worksheet	1.3-A1-1
Appendix 1.3-A2	Monthly Project Progress Report	1.3-A2-1
Appendix 1.3-A3	Plan File and Tub Location	1.3-A3-1
Appendix 1.3-A4	Incomplete Submittal for Documentation	1.3-A4-1

Appendix 1.3-A5	Bridge Design Software Applications	1.3-A5-1
Appendix 1.3-A6	Bridge Design Software Applications Cover Sheet	1.3-A6-1
Appendix 1.3-A7	Examples of Contract Plan Revisions	1.3-A7-1
Appendix 1.4-A1	Project Development Schedule	1.4-A1-1
Appendix 1.4-A2	Procedure for Project Salvage Credits	1.4-A2-1
Appendix 1.4-A3	Guidelines for Use of 1000 Items	1.4-A3-1
Appendix 1.4-A4	Director Data Sheet Project Explanation Guidelines	1.4-A4-1
Appendix 1.5-A1	Person Hours Project Log	1.5-A1-1
<hr/>		
<b>Appendix C</b>		
Appendix 1.1-C1	Record of Manual Revisions	1.1-C1-1

---

## **Chapter 2 Bridge Selection**

---

<b>2.1</b>	<b>General</b>	2.1-1
2.1.1	General	2.1-1
2.1.2	Bridge Terms	2.1-1
<b>2.2</b>	<b>Guidelines for Bridge Site Visits</b>	2.2-1
2.2.1	General	2.2-1
2.2.2	What to Bring on a Bridge Site Visit	2.2-2
<b>2.3</b>	<b>General Factors for Consideration</b>	2.3-1
<b>2.4</b>	<b>Bridge Geometry</b>	2.4-1
2.4.1	General	2.4-1
2.4.2	Highway Crossings	2.4-4
2.4.3	Railroad Crossings	2.4-7
2.4.4	Water Crossings	2.4-8
2.4.5	Bridge Widening	2.4-10
2.4.6	Detour Structures	2.4-10
2.4.7	Inspection and Maintenance Access	2.4-11
<b>2.5</b>	<b>Bridge Type</b>	2.5-1
2.5.1	General	2.5-1
2.5.2	Handling and Shipping of Members	2.5-1
<b>2.6</b>	<b>Aesthetic Considerations</b>	2.6-1
2.6.1	General Visual Impact	2.6-1
2.6.2	Substructure, Soundwalls, & Slope Protection	2.6-1
2.6.3	Intermediate Piers	2.6-2
2.6.4	Abutment, Pier and Wall Surface Treatments	2.6-2
2.6.5	Superstructure	2.6-3
<b>2.7</b>	<b>Bridge Hydraulic Study</b>	2.7-1
2.7.1	General	2.7-1
2.7.2	Design Procedure	2.7-1
2.7.3	Data Collection	2.7-3
	A. Reconnaissance	2.7-3
	B. Studies by Other Agencies	2.7-3
	C. Environmental Impact	2.7-4
	D. Design Criteria	2.7-4
2.7.4	Project Scope of Work	2.7-4
	A. Level of Assessment	2.7-4
	B. Hydraulic Analysis Method	2.7-5
	C. Additional Survey Information	2.7-5
2.7.5	Hydrologic Analysis	2.7-6
	A. Design Frequency	2.7-6
	B. Tidal Conditions	2.7-8
	C. Temporary Bridges	2.7-9
	D. Deck Drainage	2.7-9
	E. Hydrologic Methods	2.7-9

2.7.6	Hydraulic Analysis	2.7-14
	A. NHDOT Design Criteria	2.7-14
	B. Hydraulic Design Factors	2.7-16
	C. Select Hydraulic Method	2.7-17
	D. Single-Section Analysis	2.7-18
	E. Step-Backwater Analysis	2.7-18
2.7.7	Stability Analysis and Countermeasures	2.7-22
	A. Conduct Scour Evaluation	2.7-21
	B. Scour Countermeasures	2.7-23
	C. Channel Protection	2.7-24
2.7.8	Final Hydraulic Report & Contract Drawings	2.7-26
<hr/>		
<b>2.8</b>	<b>Type, Size and Location (TS&amp;L)</b>	<b>2.8-1</b>
2.8.1	General	2.8-1
2.8.2	TS&L Outline	2.8-1
2.8.3	TS&L for Bridge Rehabilitation Projects	2.8-2
<hr/>		
<b>2.9</b>	<b>TS&amp;L Estimate</b>	<b>2.9-1</b>
2.9.1	Cost Estimating Guidelines – Bridge Replacement	2.9-1
2.9.2	Cost Estimating Guidelines – Roadway Construction	2.9-2
<hr/>		
<b>2.10</b>	<b>Boring Request</b>	<b>2.10-1</b>
2.10.1	Boring Request	2.10-1
2.10.2	Check of Boring Logs	2.10-2
<hr/>		
<b>2.11</b>	<b>Survey Request</b>	<b>2.11-1</b>
2.11.1	Survey Request	2.11-1
<hr/>		
<b>References</b>		<b>2.R-1</b>
<hr/>		
<b>Appendix A</b>		
Appendix 2.2-A1	Picture Check List	2.2-A1-1
Appendix 2.2-A2	Bridge Site Visit Check List	2.2-A2-1
Appendix 2.2-A3	Bridge Report	2.2-A3-1
Appendix 2.4-A1	Design Exception Request	2.4-A1-1
Appendix 2.4-A2	Railroad Clearance Guidelines	2.4-A2-1
Appendix 2.4-A3	Bridge Inspection Snooper Truck Reach Limits	2.4-A3-1
Appendix 2.4-A4	Statewide Corridor Maps	2.4-A4-1
Appendix 2.5-A1	Bridge Selection Guide	2.5-A1-1
Appendix 2.6-A1	NHDOT Aesthetic Bridge Details – Surface Treatment	2.6-A1-1
	Concrete Form Liner	2.6-A1-1
	Concrete Coloring Agent	2.6-A1-5
	Architectural Details	2.6-A1-6
	Stone Masonry Facing	2.6-A1-12
Appendix 2.6-A2	NHDOT Aesthetic Bridge Details – Bridge Railing	2.6-A2-1
	T2 Steel Rail	2.6-A2-1
	T3 Steel Rail	2.6-A2-3
	Concrete Rail	2.6-A2-4

---

	Timber Rail	2.6-A2-9
	Pedestrian Rail	2.6-A2-11
Appendix 2.6-A3	NHDOT Aesthetic Bridge Details – Bridge Lighting	2.6-A3-1
Appendix 2.7-A1	FHWA Hydraulic Engineering Circulars	2.7-A1-1
Appendix 2.7-A2	Bridge Hydraulic Design Flow Chart	2.7-A2-1
Appendix 2.7-A3	Data Collection and Field Review Form	2.7-A3-1
Appendix 2.7-A4	Manning Roughness Coefficient	2.7-A4-1
Appendix 2.7-A5	Hydraulic Concept Definitions	2.7-A5-1
Appendix 2.7-A6	StreamStats for NH: Program Information	2.7-A6-1
Appendix 2.7-A7	Developing Models Compatible with FIS	2.7-A7-1
Appendix 2.7-A8	FHWA Technical Advisory T5140.23	2.7-A8-1
Appendix 2.7-A9	Final Hydraulic Design Report Checklist	2.7-A9-1
Appendix 2.7-A10	Sample Final Hydraulic Report Table of Contents	2.7-A10-1
Appendix 2.8-A1	Bridge Design TS&L Checklist	2.8-A1-1
Appendix 2.9-A1	Slope Intercept Method	2.9-A1-1
Appendix 2.9-A2	Slope-Intercept Bridge Costs per Square Foot	2.9-A2-1
Appendix 2.9-A3	Bridge Type Abbreviations	2.9-A3-1
Appendix 2.10-A1	Boring Request – Materials & Research	2.10-A1-1
Appendix 2.10-A2	Boring Request – Design Services	2.10-A2-1

---

**Appendix B**

Appendix 2.10-B1	Boring Request Sample Plan	2.10-B1-1
------------------	----------------------------	-----------

---

## **Chapter 3 Preliminary Design**

---

<b>3.1</b>	<b>Preliminary Design Requirements</b>	3.1-1
3.1.1	Design Requirements	3.1-1
3.1.2	Preliminary Costs Estimate	3.1-1
3.1.3	Approvals	3.1-2
3.1.4	Preliminary Geotechnical Design Recommendations	3.1-2
3.1.5	Preliminary Maintenance of Traffic Plan	3.1-3
<hr/>		
<b>3.2</b>	<b>Preliminary Plans</b>	3.2-1
3.2.1	Format	3.2-1
<hr/>		
<b>3.3</b>	<b>Permits</b>	3.3-1
3.3.1	Environmental Permits	3.3-1
3.3.2	Wetlands Permit Plan and Application	3.3-3
<hr/>		
<b>3.4</b>	<b>Roadway Design Guidelines</b>	3.4-1
<hr/>		
<b>3.5</b>	<b>Right-of-Way Purchase Plans</b>	3.5-1
<hr/>		
<b>References</b>		3.R-1
<hr/>		
<b>Appendix A</b>		
Appendix 3.2-A1	Preliminary Plan Checklist	3.2-A1-1
Appendix 3.3-A1	NHDOT Permit Flowchart	3.3-A1-1
Appendix 3.3-A2	Introduction to Coast Guard Bridge Permitting	3.3-A2-1
<hr/>		
<b>Appendix B</b>		
Appendix 3.2-B1	Sample Preliminary Plans	3.2-B1-1
Appendix 3.3-B1	Sample Bridge Wetland Impact Plan	3.3-B1-1

---

## **Chapter 4 Loads and Load Factors**

---

<b>4.1</b>	<b>Design Criteria</b>	4.1-1
<b>4.2</b>	<b>General</b>	4.2-1
4.2.1	Limit States	4.2-1
4.2.2	Load Modifiers	4.2-2
4.2.3	Load Factors	4.2-2
<b>4.3</b>	<b>Loads</b>	4.3-1
4.3.1	General	4.3-1
4.3.2	Dead Loads	4.3-1
	A. Distribution to Superstructure	4.3-2
4.3.3	Earth Loads	4.3-3
	A. Lateral Earth Pressure	4.3-3
	B. At-Rest Lateral Earth Pressure Coefficient	4.3-3
	C. Active Lateral Earth Pressure Coefficient	4.3-3
	D. Cantilever Retaining Walls and Abutments	4.3-5
	E. Passive Lateral Earth Pressure Coefficient	4.3-8
	F. Select Backfill and Prepared Foundation Material Properties	4.3-8
4.3.4	Surcharge Loads	4.3-8
4.3.5	Live Loads	4.3-9
	A. Traffic Live Load	4.3-9
	B. Load Factor	4.3-10
	C. Dynamic Load Allowance	4.3-10
	D. Live Load Deflection	4.3-10
	E. Live Load Distribution to Substructure	4.3-11
4.3.6	Vehicular Braking Force	4.3-12
4.3.7	Superimposed Deformation Loads	4.3-12
	A. Thermal Effects (TU)	4.3-13
	B. Shrinkage Effects (SH)	4.3-14
	C. Load Factors	4.3-14
4.3.8	Friction Forces	4.3-15
4.3.9	Ice Forces	4.3-16
	A. Dynamic Ice Load	4.3-17
	B. Static Ice Load	4.3-17
4.3.10	Water Loads	4.3-17
	A. Scour	4.3-17
	B. Buoyancy	4.3-18
4.3.11	Wind Loads	4.3-18
	A. Wind Velocity	4.3-18
	B. Wind Load to Superstructure	4.3-18
	C. Wind Load to Substructure	4.3-19
	D. Wind Load on Live Load	4.3-19
	E. Vertical Wind Load	4.3-19
	F. Wind Load on Soundwalls	4.3-19
4.3.12	Construction Loads	4.3-20
4.3.13	Earthquake Loads	4.3-21
4.3.14	Vehicular Collision Force	4.3.21

---

**References**

4.R-1



---

## **Chapter 5 Seismic Design and Retrofit**

---

<b>5.1</b>	<b>Design Criteria</b>	5.1-1
5.1.1	Design Approach and Considerations	5.1-1
5.1.2	Bridge Classification and Performance Objectives	5.1-1
<b>5.2</b>	<b>Seismic Analysis and Design Procedure</b>	5.2-1
5.2.1	Peak Ground Acceleration Coefficient (PGA)	5.2-1
5.2.2	Short-Term Spectral Acceleration Coefficient ( $S_S$ )	5.2-1
5.2.3	Long-Term Spectral Acceleration Coefficient ( $S_1$ )	5.2-2
5.2.4	Site Classifications	5.2-2
5.2.5	Site Factors	5.2-2
5.2.6	Design Response Spectrum	5.2-3
5.2.7	Seismic Performance Zones	5.2-3
5.2.8	Calculation of Design Forces	5.2-4
5.2.9	Minimum Support Length Requirements	5.2-4
5.2.10	Forces Transferred from Superstructure to Substructure	5.2-4
<b>5.3</b>	<b>Rehabilitation of Existing Bridges</b>	5.3-1
5.3.1	General	5.3-1
<b>5.4</b>	<b>Seismic Isolation Bearings</b>	5.4-1
5.4.1	General	5.4-1
<b>5.5</b>	<b>Seismic Design Requirements for Retaining Walls</b>	5.5-1
5.5.1	General	5.5-1
<b>References</b>		5.R-1
<b>Appendix A</b>		
Appendix 5.1-A1	AASHTO Seismic Design Flowchart	5.1-A1-1

---

## Chapter 6 Substructure

---

<b>6.1</b>	<b>General Substructure Considerations</b>	6.1-1
6.1.1	Geotechnical Report	6.1-1
6.1.2	Substructure and Foundation Loads	6.1-1
6.1.3	Constructability	6.1-4
6.1.4	Foundation Type Selection	6.1-4
<hr/>		
<b>6.2</b>	<b>Spread Footing</b>	6.2-1
6.2.1	Footing Design Considerations	6.2-1
6.2.2	Minimum Footing Depth	6.2-1
6.2.3	Spread Footing Design	6.2-2
<hr/>		
<b>6.3</b>	<b>Deep Foundations</b>	6.3-1
6.3.1	General	6.3-1
6.3.2	Pile Types	6.3-1
6.3.3	Selection of Pile Types	6.3-2
6.3.4	Pile Spacing	6.3-3
6.3.5	Battered Piles	6.3-4
6.3.6	Pile Splices	6.3-4
6.3.7	Pile Corrosion Loss	6.3-4
6.3.8	Pile Points	6.3-5
6.3.9	Pile Preboring	6.3-5
6.3.10	Contract Plan Pile Information	6.3-5
6.3.11	Pile Design Considerations	6.3-6
6.3.12	Loads and Load Factors for Pile Design	6.3-7
6.3.13	Pile Supported Footing Design	6.3-9
6.3.14	Concrete Piles	6.3-10
6.3.15	Steel Piles	6.3-12
6.3.16	Timber Piles	6.3-13
6.3.17	Drilled Shafts	6.3-13
6.3.18	Micropiles	6.3-16
<hr/>		
<b>6.4</b>	<b>Abutments</b>	6.4-1
6.4.1	General	6.4-1
6.4.2	Abutment Type and Considerations	6.4-1
6.4.3	Loads and Load Application for Abutment Design	6.4-5
6.4.4	Design/Analysis for Cantilever and Stub Abutments	6.4-7
6.4.5	Details for Cantilever and Stub Abutments	6.4-10
6.4.6	Design/Analysis for Integral Abutments	6.4-13
6.4.7	Details for Integral Abutments	6.4-18
6.4.8	Design/Analysis for Semi-Integral Abutments	6.4-19
6.4.9	Details for Semi-Integral Abutments	6.4-20
<hr/>		
<b>6.5</b>	<b>Retaining Walls</b>	6.5-1
6.5.1	General	6.5-1
6.5.2	Abutment Wingwalls	6.5-1
6.5.3	Retaining Wall Types	6.5-4
6.5.4	General Design Concepts	6.5-9
6.5.5	Cast-In-Place Concrete Cantilever Walls	6.5-9

	6.5.6 Mechanically Stabilized Earth Retaining Walls	6.5-13
	6.5.7 Precast Concrete Modular Walls	6.5-21
	6.5.8 Sheet Pile Walls	6.5-24
<hr/>		
<b>6.6</b>	<b>Piers</b>	6.6-1
	6.6.1 General	6.6-1
	6.6.2 Pier Type and Considerations	6.6-1
	6.6.3 Loads and Load Application/Design and Analysis	6.6-3
	6.6.4 Details for Piers	6.6-5
	6.6.5 Vehicular Collision Pier Protection	6.6-8
<hr/>		
<b>6.7</b>	<b>Approach Slabs</b>	6.7-1
	6.7-1 General	6.7-1
	6.7-2 Design Criteria	6.7-1
	6.7-3 Details for Approach Slabs	6.7-1
<hr/>		
	<b>References</b>	6.R-1
<hr/>		
	<b>Appendix A</b>	
Appendix 6.2-A1	Trieme Seal Design Example	6.3-A1-1
Appendix 6.5-A1	Wall System Selection Tables	6.5-A1-1
Appendix 6.5-A2	Pre-Approved Proprietary Wall Systems	6.5-A2-1
Appendix 6.5-A3	Retaining Wall Types and Facing	6.5-A3-1
Appendix 6.6-A1	Pier Types	6.6-A1-1
<hr/>		
	<b>Appendix B</b>	
Appendix 6.2-B1	Spread Footing Details	6.2-B1-1
Appendix 6.4-B1	Abutment Details	6.4-B1-1
Appendix 6.4-B2	Integral & Semi-Integral Abutment Details	6.4-B2-1
Appendix 6.4-B3	Wall Joints	6.4-B3-1
Appendix 6.5-B1	Wingwall Details	6.5-B1-1
Appendix 6.5-B2	Retaining Wall Details	6.5-B2-1
Appendix 6.6-B1	Pier Details	6.6-B1-1
Appendix 6.6-B2	Pier Protection 54-in. Single Slope Barrier	6.6-B2-1
Appendix 6.7-B1	Approach Slab Details	6.7-B1-1
<hr/>		
	<b>Appendix C</b>	
Appendix 6-C1	Reinforcing Tension Development Lengths	6-C1-1
Appendix 6-C2	Tension Development Lengths of Standard Hooks	6-C2-1
Appendix 6-C3	Reinforcing Bar Properties	6-C3-1
Appendix 6-C4	Prestressing Strand Properties & Development Lengths	6-C4-1
Appendix 6-C5	Standard Hooks	6-C5-1
Appendix 6-C6	Min. Reinf. Clearance & Spacing for Beams & Columns	6-C6-1
Appendix 6-C7	Working Stress Design	6-C7-1

## Chapter 7 Superstructure

<b>7.1</b>	<b>Types of Superstructures</b>		7.1-1
	A. Concrete Slab – Cast-in-Place		7.1-1
	B. Precast Concrete Rigid Frame/Arch		7.1-2
	C. Prestressed Concrete Deck Beam		7.1-2
	D. Prestressed Concrete NEXT Beam		7.1-3
	E. Prestressed Concrete Girder (NEBT)		7.1-3
	F. Steel Rolled Beams and Welded Plate Girders		7.1-4
	G. Steel Arch, Steel Truss, and Lift Span		7.1-4
	H. Timber Structures		7.1-5
<b>7.2</b>	<b>Steel Structures</b>		7.2-1
7.2.1	General Considerations		7.2-1
7.2.2	Materials	<b>PARTIALLY COMPLETE</b>	7.2-1
	A. Structural Steel		7.2-1
	B. Coatings		7.2-3
	C. Availability		7.2.4
	D. Fasteners		7.2-5
7.2.3	Codes, Specifications, and Standards		7.2-6
7.2.4	Computer Programs		7.2-7
7.2.5	Design Guidelines		7.2-7
	A. Welded Plate Girders		7.2-9
	B. Rolled Beams and Cover Plates		7.2.11
	C. Welding and Fabrication	7.2-11	
	D. Fatigue and Fracture	7.2-13	
	E. Stiffeners and Connection Plates	7.2-14	
	F. Cross Frames and Diaphragms	7.2-15	
	G. Bolted Field Splices	7.2-19	
	H. Composite Design	7.2-21	
	I. Deflections and Camber	7.2-22	
7.2.6	Plan Details	7.2-25	
	A. Structural Steel Notes	7.2-25	
	B. Framing Plan	7.2-25	
	C. Girder Elevation	7.2-26	
	D. Typical Girder Details	7.2-26	
	E. Cross-Frame Details	7.2-26	
	F. Camber Diagram	7.2-27	
7.2.7	Shop Plan Review	7.2-27	
7.2.8	Utilities	7.2-28	
	A. Department Policy	7.2-28	
	B. Utility Design Criteria	7.2-29	
	C. Underground Facilities	7.2-31	
	D. Lighting	7.2-31	
<b>7.3</b>	<b>Bridge Deck</b>		7.3-1
7.3.1	Materials		7.3-1
	A. Concrete		7.3-1
	B. Reinforcing Steel		7.3-1
7.3.2	Deck Protective Systems		7.3-3

7.3.3	Cast-In-Place Concrete Deck Design Guidelines	7.3-8
	A. Design Procedure and Practice	7.3-8
	B. Bare Decks	7.3-11
	C. Detailing Reinforcement	7.3-12
	D. Deck Drainage	7.3-14
	E. Deck Pouring Sequence	7.3-14
	F. Light Poles and ITS Conduits	7.3-15
7.3.4	Partial Depth Precast/Prestressed Deck Panels	7.3-15
	A. Design Criteria	7.3-16
	B. Limitations	7.3-18
<hr/>		
<b>7.4</b>	<b>Expansion Joints</b>	7.4-1
7.4.1	General Considerations	7.4-1
7.4.2	NHDOT Expansion Joint Types	7.4-1
	A. Asphaltic Plug Expansion Joint	7.4-2
	B. Compression Seal Expansion Joint	7.4-3
	C. Strip Seal Expansion Joint	7.4-4
	D. Finger Expansion Joint	7.4-6
	E. Modular Expansion Joint	7.4-7
	F. Preformed Closed Cell Expansion Joint	7.4-9
7.4.3	Design Criteria	7.4-9
	A. Shrinkage Effects	7.4-9
	B. Thermal Effects	7.4-9
	C. Load Factor for Force Effect due to Uniform Temp.	7.4-9
	D. Foundation Movement Effects	7.4-9
7.4.4	Bridge Movements and Fixity	7.4-11
7.4.5	Review of Shop Drawings and Recording	7.4-11
7.4.6	Reinforcement Detailing at Expansion Joints	7.4-12
7.4.7	Angle/Plate Connection Fabrication Detailing at all Breaks-in-Slope	7.4-15
<hr/>		
<b>7.5</b>	<b>Bearings</b>	7.5-1
7.5.1	General Considerations	7.5-1
7.5.2	Forces and Movements	7.5-2
7.5.3	Materials	7.5-4
	A. Steel Plates	7.5-4
	B. Bearing Seat Pad	7.5-4
	C. Sliding Surfaces	7.5-5
	D. Elastomeric Bearing	7.5-5
7.5.4	Bearing Types	7.5-5
	A. Fixed Bearings	7.5-5
	B. Steel Sliding Expansion Bearings	7.5-6
	C. Plain Elastomeric Pads (PEP)	7.5-8
	D. Steel-Reinforced Elastomeric Bearing	7.5-8
	E. High Load Multi-Rotational (HLMR) Bearing	7.5-12
	F. Seismic Isolation Bearing	7.5-15
7.5.5	Miscellaneous Details	7.5-16
	A. Anchor Rods	7.5-16
	B. Guides and Restraints	7.5-18
	C. Integral Bridge	7.5-19
	D. Bearing Replacement/Bridge Widening	7.5-19
7.5.6	Contract Drawings	7.5-19

**PARTIALLY  
COMPLETE**

7.5.7	Shop Drawing Review	7.5-20
<b>7.6</b>	<b>Railings and Barriers</b>	7.6-1
7.6.1	Traffic Railing and Barrier	7.6-1
	A. General Requirements	7.6-1
	B. Code Requirements	7.6-1
	C. Test Levels	7.6-1
	D. Traffic Railing and Barrier Types	7.6-4
	E. Bridge Rail Selection	7.6-7
	F. Median Barrier	7.6-8
	G. Deck Overhang Design	7.6-9
	H. Mounted on Retaining Walls	7.6-9
	I. Soundwalls on Barriers	7.6-9
	J. Integral Bridges	7.6-9
	K. Box Culverts	7.6-9
	L. Aesthetics	7.6-10
	M. Approach Railing/Transitions	7.6-11
	N. Retrofit	7.6-12
7.6.2	Pedestrian Railing	7.6-14
7.6.3	Pier Protection Barrier	7.6-14
7.6.4	Fencing	7.6-14
7.6.5	Temporary Barrier	7.6-16
<b>7.7</b>	<b>Preservation and Rehabilitation of Structures</b>	7.7-1
7.7.1	General	7.7-1
7.7.2	Field Review/Evaluation	7.7-3
7.7.3	Code Requirements	7.7-3
7.7.4	Phasing	7.7-3
	A. Phasing Layout	7.7-4
	B. Structural Considerations	7.7-5
	C. Temporary Barrier	7.7-x
7.7.5	Scoping	7.7-x
	A. Assessing Condition of Elements	7.7-x
	B. Deck Evaluation	7.7-x
	C. Safety Consideration	7.7-x
	D. Compare Alternative, Summarize, Select Preferred Alternative	7.7-x
7.7.6	Preservation	7.7-x
	A. Concrete Deck Patch/Repair	7.7-x
	B. Deck Removal	7.7-x
	C. Expansion Joints	7.7-x
	D. Painting	7.7-x
	E. Bearing Replacement	7.7-x
	F. Scour Critical	7.7-x
7.7.7	Rehabilitation	7.7-x
	A. Widening	7.7-x
	B. Seismic	7.7-x
	C. Deck Replacement	7.7-x
	D. Railing/Curb	7.7-x
	E. Substructure	7.7-x
7.7.8	Rating	7.7-x
7.7.9	Design Documents	7.7-x

**PARTIALLY  
COMPLETE**

	A. Proposal	7.7-x
	B. Drawings/Plan Details	7.7-x
	C. Specifications	7.7-x
	D. Bridge Capacity Summary Sheet	7.7-x
<b>References</b>		7.R-1
<b>Appendix A</b>		
Appendix 7.2-A1	Steel Beam Parabolic Haunch Equations	7.2-A1-1
Appendix 7.2-A2	Camber Tolerances	7.2-A2-1
Appendix 7.3-A1	Deck Design Tables	7.3-A1-1
Appendix 7.3-A2	Bridge Deck Reinforcing	7.3-A2-1
Appendix 7.3-A3	Deck Overhang Design Example	7.3-A3-1
Appendix 7.4-A1	Preliminary Expansion Joint Selection Diagram	7.4-A1-1
Appendix 7.4-A2	Asphaltic Plug Expansion Joint	7.4-A2-1
Appendix 7.4-A3	Compression Seal Expansion Joint	7.4-A3-1
Appendix 7.4-A4	Strip Seal Expansion Joint	7.4-A4-1
Appendix 7.4-A5	Finger Expansion Joint	7.4-A5-1
Appendix 7.4-A6	Modular Expansion Joint	7.4-A6-1
Appendix 7.4-A7	Preformed Closed Cell Expansion Joint	7.4-A7-1
Appendix 7.4-A8	Plow Protection Plate	7.4-A8-1
Appendix 7.4-A9	NHDOT Temperature Expansion Tables	7.4-A9-1
Appendix 7.5-A1	Elastomeric Bearing Design	7.5-A1-1
Appendix 7.5-A2	Three Bearing Concept	7.5-A2-1
Appendix 7.6-A1	Timeline History of Bridge Railing Development	7.6-A1-1
Appendix 7.6-A2	Pictures of NHDOT Temporary Barrier	7.6-A2-1
<b>Appendix B</b>		
Appendix 7.2-B1	Typical Structural Steel Details	7.2-B1-1
Appendix 7.2-B2	Typical Utility Support Details	7.2-B2-1
Appendix 7.2-B3	Abutment Utility Blockout Details	7.2-B3-1
Appendix 7.2-B4	Bridge Lighting Utility Details	7.2-B4-1
Appendix 7.2-B5	Bridge Curb Utility Details	7.2-B5-1
Appendix 7.3-B1	Concrete Deck Details	7.3-B1-1
Appendix 7.3-B2	Deck Scupper Details	7.3-B2-1
Appendix 7.3-B3	Partial-Depth Precast Panel Details	7.3-B3-1
Appendix 7.3-B4	Partial-Depth Precast Panel Detail Sheets	7.3-B4-1
Appendix 7.4-B1	Asphaltic Plug for Crack Control Details	7.4-B1-1
Appendix 7.4-B2	Asphaltic Plug Expansion Joint Details	7.4-B2-1
Appendix 7.4-B3	Compression Seal Exp. Jt. Detail	7.4-B3-1
Appendix 7.4-B4	Strip Seal Exp. Jt. Detail	7.4-B4-1
Appendix 7.4-B5	Finger Expansion Joint Sample Plan	7.4-B5-1
Appendix 7.4-B6	Finger Expansion Joint Phase Constr. Sample Plan	7.4-B6-1

**PARTIALLY  
COMPLETE**

Appendix 7.4-B7	Modular Expansion Joint Sample Plan	7.4-B7-1
Appendix 7.4-B8	Plow Protection Plate Sample Plan	7.4-B8-1
Appendix 7.4-B9	Expansion Joint Behind Backwall Sample Details	7.4-B9-1
Appendix 7.4-B10	Expansion Joint Anchor Details	7.4-B10-1
Appendix 7.4-B11	Expansion Joint Field Splice Weld Details	7.4-B11-1
Appendix 7.4-B12	Expansion Joint Backing Plate Detail	7.4-B12-1
Appendix 7.4-B13	Expansion Joint Plate/Angle/ Connection Detail	7.4-B13-1
Appendix 7.4-B14	Expansion Joint Sec A-A Drawn on Profile	7.4-B14-1
Appendix 7.5-B1	Bearing Details	7.5-B1-1
Appendix 7.6-B1	NHDOT Bridge Railing Detail Sheets	7.6-B1-1
Appendix 7.6-B2	NHDOT Bridge Approach Railing Detail Sheets	7.6-B2-1
Appendix 7.6-B3	Concrete Barrier Steel Cover Plate Details	7.6-B3-1
Appendix 7.6-B4	Bridge Traffic Railing Retrofit Examples	7.6-B4-1
Appendix 7.7-B1	Bridge Widening/Rehabilitation Details	7.7-B1-1

**PARTIALLY  
COMPLETE**



---

## **Chapter 8 Concrete Structures**

---

<b>8.1</b>	<b>Precast Elements</b>	8.1-1
8.1.1	Superstructure Members	8.1-x
8.1.2	Substructure Members	8.1-x
8.1.3	Box Culverts	8.1-x
8.1.4	Frames/3-Sided Boxes	8.1-x
8.1.5	Concrete Arch	8.1-x
<hr/>		
<b>8.2</b>	<b>Concrete Slabs</b>	8.2-1
<hr/>		
<b>8.3</b>	<b>Prestressed Concrete</b>	8.3-1
<hr/>		
	<b>References</b>	8.R-1

---

Appendix

**NOT  
COMPLETED**

**Chapter 9 Miscellaneous Structures**

---

**9.1 Timber Structures**  
9.1-1

---

**9.2 Structural Plate Structures**  
9.2-1

---

**References** 9.R-1

---

**Appendix**

**NOT  
COMPLETED**

---

## **Chapter 10 Non-Bridge Structures**

---

<b>10.1</b>	<b>General</b>	10.1-1
<b>10.2</b>	<b>Loads</b>	10.2-1
<b>10.3</b>	<b>Overhead Sign Structures</b>	10.3-1
10.3.1	General	10.3-1
10.3.2	NHDOT Design Requirements	10.3-1
10.3.3	Installation	10.3-5
10.3.4	Design Guidelines	10.3-5
10.3.5	Design Process and Coordination	10.3-6
10.3.6	Adding New Signs to an Existing Overhead Sign Structure	10.3-9
<b>10.4</b>	<b>Bridge-Mounted Sign Supports</b>	10.4-1
10.4.1	General	10.4-1
10.4.2	Coordination	10.4-1
<b>10.5</b>	<b>Traffic Signal Supports (Mast Arms)</b>	10.5-1
10.5.1	General	10.5-1
10.5.2	Design Process	10.5-1
<b>10.6</b>	<b>Intelligent Transportation Systems (ITS), Dynamic Message Sign (DMS), and Luminaire Support Structures</b>	10.6-1
10.6.1	Intelligent Transportation Systems (ITS) Support Structures	10.6-1
10.6.2	Dynamic Message Sign (DMS) Overhead Structures	10.6-3
10.6.3	Luminaire Support Structures	10.6-3
<b>10.7</b>	<b>Soundwalls</b>	10.7-1
10.7.1	General	10.7-1
10.7.2	Types	10.7-1
<b>10.8</b>	<b>Inspection and Maintenance</b>	10.8-1
10.8.1	Inspection	10.8-1
10.8.2	Maintenance	10.8-1
<b>References</b>		10.R-1
<b>Appendix A</b>		
Appendix 10.2-A1	Basic Wind Speed Map for NH	10.2-A1-1
Appendix 10.3-A1	Sign Structure and Footing Design Guidelines	10.3-A1-1
Appendix 10.3-A2	Sign Structure and Footing Reference Tables	10.3-A2-1
<b>Appendix B</b>		
Appendix 10.3-B1	Sign Footing Sample Plan	10.3-B1-1
Appendix 10.3-B2	Stick Figure Sample Plan	10.3-B2-1
Appendix 10.4-B1	Bridge Mounted Sign Support Detail Sheet	10.4-B1-1
Appendix 10.7-B1	Sound Wall Detail Sheet	10.7-B1-1

---

## Chapter 11 Preparation of Plans

---

<b>11.1</b>	<b>General</b>	11.1-1
<b>11.2</b>	<b>Graphic Guidelines</b>	11.2-1
11.2.1	Line Styles	11.2-1
11.2.2	Character Styles	11.2-1
11.2.3	Dimensioning	11.2-2
11.2.4	Graphic Symbols	11.2-2
11.2.5	Abbreviations	11.2-2
11.2.6	Sheet Layout	11.2-3
11.2.7	Scale	11.2-3
11.2.8	Title Block	11.2-3
11.2.9	Revisions	11.2-4
11.2.10	Miscellaneous	11.2-4
<b>11.3</b>	<b>Plans for Public Meetings</b>	11.3-1
11.3.1	General	11.3-1
<b>11.4</b>	<b>Sequence of Drawings</b>	11.4-1
11.4.1	General	11.4-1
<b>11.5</b>	<b>Quantities</b>	11.5-1
11.5.1	General	11.5-1
11.5.2	Procedure for Computation	11.5-1
11.5.3	Accuracy	11.5-2
11.5.4	Cost Estimating Quantities	11.5-3
<b>11.6</b>	<b>Concrete Drawings</b>	11.6-1
11.6.1	General	11.6-1
<b>11.7</b>	<b>Structural Steel Drawings</b>	11.7-1
11.7.1	General	11.7-1
<b>11.8</b>	<b>Bridge Rehabilitation Drawings</b>	11.8-1
11.8.1	General	11.8-1
<b>11.9</b>	<b>Bridge Detail Sheets, Bridge Details, and Sample Plans &amp; Notes</b>	11.9-1
11.9.1	Bridge Detail Sheets	11.9-1
11.9.2	Bridge Details	11.9-1
11.9.3	Sample Plans & Notes	11.9-1
<b>References</b>		11.R-1
<b>Appendix A</b>		
Appendix 11.2-A1	Dimensioning Examples	11.2-A1-1
Appendix 11.2-A2	Hatching Examples	11.2-A2-1
Appendix 11.2-A3	Abbreviations	11.2-A3-1
Appendix 11.2-A4	Drawing Scales	11.2-A4-1
Appendix 11.3-A1	Color Legend	11.3-A1-1

Appendix 11.5-A1	Quantity Calculation Sheets	11.5-A1-1
Appendix 11.5-A2	Accuracy of Bridge Quantities	11.5-A1-1
Appendix 11.5-A3	Example of Bridge Excavation Limits	11.5-A3-1
Appendix 11.5-A4	Changes in Item No., Description or Method of Payment	11.5-A4-1
Appendix 11.9-A1	List of Bridge Drawings	11.9-A1-1
Appendix 11.9-A2	Bridge Design Final Plan Checklist	11.9-A4-1
Appendix 11.9-A3	Bridge Design Constructability Checklist	11.9-A5-1
<hr/>		
<b>Appendix B</b>		
Appendix 11.2-B1	Survey Layout Sample Plan	11.2-B1-1
<hr/>		
<b>Appendix C</b>		
Appendix 11-C1	Edmund Gunter Measuring Devices	11-C1-1

---

## **Chapter 12      Overview of Existing Bridge Section, Bridge Inspection, and Load Ratings**

---

<b>12.1</b>	<b>Existing Bridge Section Overview</b>	12.1-1
12.1.1	Organization, Roles, and Responsibilities	12.1-1
<b>12.2</b>	<b>Bridge Inspection Program Overview</b>	12.2-1
12.2.1	Background	12.2-1
12.2.2	Purpose	12.2-1
12.2.3	Evaluation of Bridge Condition	12.2-2
12.2.4	Coordination for Bridge Inspections and Providing Bridge Data	12.2-3
12.2.5	Bridge Inspection Reports	12.2-4
12.2.6	Bridge Records (Files)	12.2-5
<b>12.3</b>	<b>Load Ratings Overview</b>	12.3-1
12.3.1	Introduction and Background	12.3-1
<b>References</b>		12.R-1
<hr/>		
<b>Appendix A</b>		
Appendix 12.2-A1	Sample Inspection Report	12.2-A1-1

**Chapter 13 Untitled**

---

13.1	General	13.1-1
13.2	xxxx	13.2-1

---

**NOT  
COMPLETED**

## ***Chapter 14 Municipal Bridge Program***

---

14.1 General

14.1-1

---

**NOT  
COMPLETED**