Section 3 - AASHTO LRFD Bridge Design Specifications with NJDOT Stipulations

3.1 Load and Resistance Factor Design (LRFD) Philosophy

The design of new structures and new elements of rehabilitated bridge structures in New Jersey shall be completed with the use of the *AASHTO LRFD Bridge Design Specifications*. Guidance for the Reconstruction or Rehabilitation of existing bridge structures is provided in Section 8 of this Manual.

The LRFD bridge design philosophy is based on the premise that four Limit States are stipulated to achieve the basic design objectives of constructability, safety and serviceability. All Limit States are given equal importance.

The four Limit States are:

Service Limit State: Stress, deformation and crack width are limited under service conditions.

Fatigue and Fracture Limit State: Fatigue stress range is limited for the expected number of stress cycles due to a single design truck in order to control crack initiation and propagation, and to prevent fracture during the design life of the bridge.

Strength Limit State: Strength and stability are provided to resist the significant load combinations that a bridge is expected to experience in its design life.

Extreme Event Limit States: Structures are proportioned to resist collapse due to extreme events, such as, major earthquake, flood, ice flow, collision by a vessel, etc.

Equation 1.3.2.1-1 of the *AASHTO LRFD Bridge Design Specifications*, unless otherwise specified, must be satisfied for each Limit State:

Where $\eta = \eta_D \eta_R \eta_I \geq 0.95$

η = A factor relating to ductility, redundancy and operational importance.
η_D = A factor relating to ductility
η_R = A factor relating to redundancy
η_I = A factor relating to importance
γ_I = Load factor: A statistically based multiplier
ϕ = Resistance Factor: A statistically based multiplier
Q_I = Force Effect
R_n = Nominal Resistance
R_r = Factored Resistance: ϕR_n

Subsection 1.3 of the LRFD Specifications may be referred to for additional commentary concerning the philosophy of the Specifications' development.

3.2 Vehicular Bridge Structures

The current Edition of the *AASHTO LRFD Bridge Design Specifications* (with current Interims), with the following stipulations to the respective AASHTO LRFD Sections, shall govern the design of bridge structures in New Jersey.

Note: The following Section numbers refer to the Section numbering of the *AASHTO LRFD Bridge Design Specifications*.

Section 1 - Introduction

1.3.5 Operational Importance

The following is added:

The Operational Importance strength limit state classification shall be as follows:

NHS Structures - $n_I = 1.05$

NON-NHS Structures - $n_I = 1.00$

Section 2 - General Design and Location Features

2.3.2 Bridge Site Arrangement

2.3.2.2 Traffic Safety

2.2.2.1 Protection of Structures

The following is added:

The *NJDOT Design Manual Roadway* shall be referred to for additional guidance concerning lateral clearance requirements.

2.3.3 Clearances

2.3.3.1 Navigational

The following is added:

The guidance provided in Section 42 of this Manual shall be followed in procuring U.S. Coast Guard permits.

3.3.2 Highway Vertical

The following is added:

The minimum vertical underclearances that are tabulated in the following Table are based on the provisions of the *AASHTO Geometric Design of Highways and Streets Manual*. The specified clearances shall control the design of bridge structures in New Jersey.

Table 3.3.2 - Minimum Vertical Underclearances for Bridges & Structures

Roadway Functional Classification Facility Type	Vehicular and Railroad Over Crossings	Pedestrian and Bikeway Over Crossings	Overhead Sign Structures	Tunnels	Remarks *
Interstates Freeways Expressways	16’–6”	17’–6”	17’–9”	16’–6”	Notes 1,3,9
Rural Arterials	16’-6”	17’-6”	17’-9”	16’-6”	Notes 2,3,9
Urban Arterials	16’-6”	17’-6”	17’-9”	16’-6”	Notes 2,3,9
Local Roads and Streets and Collector Roads and Streets	14’-6”	17’-6”	17’-9”	14’-6”	Note 8
Railroads	23’-0”	23’-0”	--	23’-0”	Note 4
Electrical Tracks	24’-6”	24’-6”	--	24’-6”	Note 4
Inter-Coastal Waterway	55’-0”	--	--	--	Note 5
Navigable Waterways	Varies	--	--	--	Note 6
Other Waterways	Varies	--	--	--	Note 7
Existing Bridges and Structures	--	--	--	--	Note 9

* The following notes correspond to the numbers in this column.

Notes

1. Bridge structures over Interstate routes shall meet the minimum underclearance stated in the Table. Exceptions to this are the portions of existing Interstate routes where existing controls make the 16’-6” standard impractical or when, due to unusual conditions, the cost of the higher standard becomes excessive. In such cases, any exceptions to the vertical clearance shall be as approved by the Federal Highway Administration and as recommended by the Department.
2. Exceptions to the specified clearances are the portions of existing State Highway System routes where existing controls make the 16’-6” clearance impractical or when, due to unusual conditions, the cost of the higher clearance becomes excessive. In such cases, any exceptions to the clearances shall be as approved by the Department.
3. Bridge structures to be replaced, widened or are to have their superstructures replaced shall meet the clearances of Table 3.3.2 in this manual. In highly urbanized areas where a 16’-6” underclearance is required, a minimum clearance of 14’-6” may be provided if there is one route, within the approximate location of the bridge in question, that provides an existing 16’-6”

minimum underclearance. In such instances, signing to the alternate route should be called for in the Contract Plans.

Under no circumstances will a concurrence to a vertical underclearance of less than 14’-6” be granted for the listed roadway classification.

4. The 23’-0” clearance above the top of rails (24’-6” for electrified tracks) includes an allowance of 1’-0” for future ballasting of the railroad tracks and minor structure encroachment during construction or maintenance operations. Exceptions to the clearances may be approved when ordered by the State regulatory agency having jurisdiction over such matters. A greater vertical clearance may be required at individual locations where necessary and when justified on the basis of extraordinary site conditions.
5. Exceptions to the standard 55’-0” clearance (above M.H.W.) may be approved if justified by marine traffic and cost studies or ordered by the U.S. Coast Guard.
6. Clearance contingent on marine traffic and cost studies. Clearance subject to approval by the U.S. Coast Guard.
7. Freeboard clearance contingent on hydraulic and hydrologic studies. Subject to approval by N.J. Division of Water Resources.
8. The clearance shall apply over the entire roadway width including any contiguous auxiliary lanes and shoulders.
9. State Laws, N.J.S.A. 27:5G-1 through 27:5G-4, require that every bridge or overpass carrying municipal, county, or state roads, including railroads, with a vertical clearance of less than 14’-6” from the roadway beneath shall have a minimum clearance marked or posted thereon in accordance with the current standards prescribed by the "Manual of Uniform Traffic Control Devices for Streets and Highways".

   Signs warning persons operating motor vehicles that they are approaching a bridge or overpass with less than 14’-6” clearance shall be placed at the last safe exit or detour preceding the bridge or overpass. The minimum clearance of the bridge or overpass shall be indicated on these signs.

   The signs required by this section shall be maintained by the appropriate government entity which has jurisdiction over the roadway underneath the bridge or overpass. The above provisions do not apply to toll road authorities.

General Vertical Underclearance Provisions

If it is anticipated that future lanes will be required for the lower roadway, the clearance stipulated in this policy shall be applied to the future lane.

The clearance for ramps shall be that of the connecting highway. In the case where a ramp connects highways with different vertical clearance criteria, the higher clearance shall be used.

The clearances tabulated in Table 3.3.2 in this manual include a 6 inch allowance for future resurfacing.

For spans between 120’–0” and 150’-0”, the need for a bolted splice (located near one quarter-point) should be anticipated in calculating the minimum vertical clearance. An allowance of ¾ inch (fastener head) plus thickness of bottom flange splice plate shall be considered.

For spans over 150 feet, two splices located near each quarter-point should be anticipated. An allowance of ¾ inch (fastener head) plus thickness of bottom flange splice plate shall be considered.

2.3 Location Features

Highway Horizontal

The following is added:

Lateral clearances shall conform to Section 5-11 of the *NJDOT Design Manual – Roadway*.

Railroad Overpass

The following is added:

Refer to Table 3.3.2 of this Manual for Minimum Vertical Underclearance requirements.

2.5 Design Objectives

2.5.2.2 Inspectability

The following is added:

For all bridge structures, to assure inspectability access, the design details shall be reviewed and certified by an Engineer who meets NJDOT NBIS requirements for qualification as a team leader.

2.5.2.3 Maintainability

The second sentence of the 1st paragraph is changed to:

When the climatic and/or traffic environment is such that the bridge deck may need to be replaced prior to the required service life, provisions shall be shown on the plans for replacement of the deck and/or bearings.

2.5.2.4 Rideability

The last paragraph is deleted and the following is added:

A thickness of ½ inch shall be provided to compensate for surface wear. The ½ inch of the concrete deck slab thickness shall be considered as a wearing surface. Consequently, it shall be considered as dead load, but shall not be considered effective in carrying secondary dead loads (except future overlay wearing surface) or live loads and impact.

2.5.2.6 Deformations

2.5.2.6.2 Criteria for Deflection

The following is added:

The criterion stated within this Subsection is required for design of New Jersey bridge structures. The structural analysis shall be based on service limit state load combinations and the criteria in Article 2.5.2.6.2. of the AASHTO LRFD Specifications. The following specified deflection limits shall be used for steel, aluminum and/or concrete bridge construction:

- Vehicular load, general — Span/1000
- Vehicular and pedestrian loads — Span/1000
- Vehicular load on cantilever arms — Span/400
- Vehicular load and pedestrian loads on cantilever arms — Span/400

The following additional criteria shall be followed:

Although the design of continuous beams will not consider the combination of the reinforcement steel in the negative moment region, the reinforcement steel contribution will be considered in determining deflections.

2.5.2.6.3 Optional Criteria for Span to Depth Ratios

The following is added:

The use of the optional criteria, including Table 1, studied within this Subsection, should be studied to verify acceptable ranges of bridge deformations for curved girder designs.

2.5.2.7 Consideration of Future Widening

2.5.2.7.2 Substructure

The paragraph is changed to:

When future widening can be anticipated, the substructure shall be designed for the widened condition. The design shall satisfy all widened and un-widened condition design requirements.

Section 3 - Loads and Load Factors

3.4 Load Factors and Combinations

3.4.1 Load Factors and Load Combinations

The last paragraph is changed to:

The load factor for live load in Extreme Event Load Combination I, Y_{EQ} shall be taken as 0.50.

The following is added:

For Integral Abutment Jointless Bridge designs, the maximum Load Combination and Load Factors under the "TU, CR, SH" column of Table 3.4.1-1 shall be used and the maximum permanent load factors listed in Table 3.4.1-2 shall be used.

3.5 Permanent Loads

3.5.1 Dead Loads: DC, DW and EV

The following is added:

Superstructure designs for bridge structures that utilize one course deck slab construction shall include an additional (25 p.s.f.) dead load. The 25 p.s.f. shall be considered as a secondary dead load.

3.6 Live Loads

3.6.1 Gravity Loads: LL and PL

3.6.1.1 Vehicular Live Load

2.6.1.1.2 Multiple Presence of Live Load

The following is added:

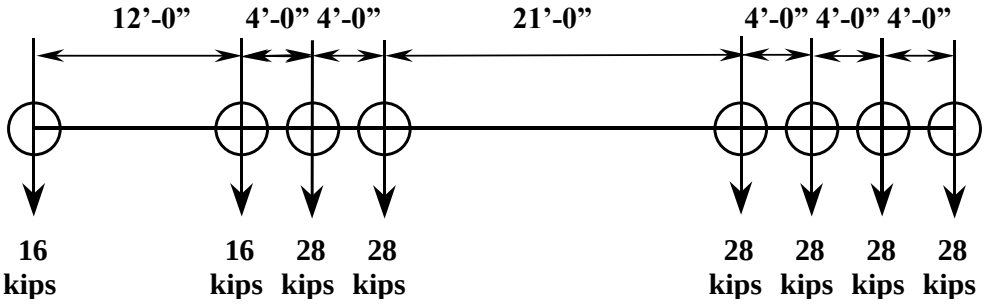
When analyzing for the NJDOT Permit Vehicle configuration, its presence shall only be considered to occur once on a bridge structure. Additional design lanes shall be considered to be occupied by the HL-93 loading.

3.6.1.2 Design Vehicular Live Load

3.6.1.2.1 General

The following is added:

In addition to the HL-93 analysis a Strength II Limit State calculation shall be made for the following permit vehicle configuration:



LRFD Permit Vehicle, NJDOT

Also, when designing for prestressed concrete components, a Service III Limit State calculation shall be made for the above permit vehicle configuration. However, in lieu of the changes stated under Subsection 5.9.4, Table 5.9.4.1.2-1 (in this section), specified Stress Limit limitations stated in the *AASHTO LRFD Bridge Design Specification* shall be accounted for in the permit vehicle check.

For non-NHS (National Highway System) bridge structures, permit vehicle shall not be considered.

3.6.2 Dynamic Load Allowance: IM

3.6.2.1 General

The following is added:

When analyzing the permit vehicle configuration, the IM factor shall be 25% for "All Other Limit States" conditions.

3.10 Earthquake Effects: EQ

3.10.1General

The following is added:

Refer to Section 38 of this Manual for guidance concerning the Seismic analysis of New Jersey bridge structures.

3.11 Earth Pressure: EH, ES, LS, and DD

3.11.5 Earth Pressure: EH

3.11.5.1 Lateral Earth Pressure

The second paragraph is changed to:

Unless otherwise specified, the resultant lateral earth loads due to the weight of the backfill shall be assumed to act at a height of 0.33H above the base of the wall, where "H" is the total wall height measured from the surface of the ground to the bottom of the footing.

3.11.5.5 Equivalent-Fluid Method of Estimating Rankine Lateral Earth Pressures

The first paragraph is changed to:

The equivalent fluid pressure shall not be less than 35 pounds per cubic feet.

3.12 Force Effects Due To Superimposed Deformations: TU, TG, SH, CR, SE

3.12.2 Uniform Temperature

The following is added:

For rigid frame concrete piers on typical highway grade crossings that are on continuous footings, the temperature differential shall be 15 degrees F for rise in temperature and 20 degrees F for fall in temperature. The temperature values established for "cold climate" in Table 3.12.2.1-1 shall be used for all other cases.

3.12.3 Temperature Gradient

The following is added:

The temperature gradient shall be neglected for multi-beam bridge structures.

Section 4 - Structural Analysis and Evaluation

4.6 Static Analysis

4.6.2 Approximate Methods of Analysis

4.6.2.2 Beam Slab Bridges

4.6.2.2.2 Distribution Factor Method for Moment and Shear

The following is added:

The distribution factor for the HL-93 loading shall also be used for the permit vehicle in performing Strength II calculations. However, the guidance provided under Subsection 3.6.1.2.1 shall be followed.

Section 5 - Concrete Structures

5.4 Material Properties

5.4.1 General

The first paragraph is changed to:

Designs shall be based on the use of materials and concrete classes that conform to the construction materials as specified in the *NJDOT Standard Specifications for Road and Bridge Construction*.

5.4.2 Normal Weight and Structural Lightweight Concrete

5.4.2.3 Shrinkage and Creep

5.4.2.3.2 Creep and 5.4.2.3.3 Shrinkage

The following is added:

The average relative humidity (percent) (H) should be assumed to be 70% throughout the State.

5.4.3 Reinforcing Steel

The following is added:

Reinforcing steel properties shall conform to the requirements of the *NJDOT Standard Specifications for Road and Bridge Construction*.

5.4.4 Prestressing Steel

5.4.4.1 General

The first paragraph is changed to:

Prestressing steel properties shall conform to the requirements of the *NJDOT Standard Specifications for Road and Bridge Construction*.

The following is added:

Low relaxation strands shall be used and accounted for in the design of prestressed concrete beams.

5.9 Prestressing and Partial Prestressing

5.9.4 Stress Limits for Concrete

The following is added:

Generally, the design strength for prestressed concrete shall be f'c=5,000 psi (Class P concrete). The Engineer may use an optional, higher design strength of f'c = 5,500 psi (Class P-1 concrete) or f'c = 6,000 psi (Class P-2 concrete).

If a Designer wishes to use a higher design strength than stated above, it is permitted. However, the provisions of the *NJDOT Standard Specifications* must be studied and suitably amended to account for the control and acceptance testing requirements in the fabrication of the higher strength concrete.

5.9.4.2 For Stresses at Service Limit State After Losses – Fully Pretensioned Components

5.9.4.2.2 Tension Stresses

Table 5.9.4.2.2-1 is changed to:

Bridge Type	**Location**	**Stress Limit**
Other Than Segmentally Constructed Bridges	Tension in the Precompressed Tensile Zone Bridges, Assuming Uncracked Sections	
	For components with bonded prestressing tendons or reinforcement that are subjected to not worse than moderate corrosion conditions.	No tension *
	For components with bonded prestressing tendons or reinforcement that are subjected to severe corrosive conditions.	No tension *
	For components with unbonded prestressing tendons.	No tension
Segmentally Constructed Bridges	Longitudinal Stresses Through Joints in the Precompressed Tensile Zone	
	Joints with minimum bonded auxiliary reinforcement through the joints sufficient to carry the calculated longitudinal tensile force at a stress of 0.5 f_y; internal tendons.	No tension
	Joints without the minimum bonded auxiliary reinforcement through joints.	No tension
	Transverse Stresses Through Joints	
	Tension in the transverse direction in precompressed tensile zone.	No tension
	Stresses in Other Areas	
	For areas without bonded reinforcement.	No tension
	In areas with bonded reinforcement sufficient to resist the tensile force in the concrete computed assuming an uncracked section where reinforcement is proportional using a stress of 0.5 f_y, not to exceed 30 ksi.	No tension
	Principal Tensile Stresses at Neutral Axis in Web.	
	All types of segmental concrete bridges with internal and/or external tendons.	$0.110\sqrt{f'c}$ (ksi)

* Refer to Subsection 3.6.1.2.1 in this Manual for additional guidance on assessing the permit vehicle effects when designing prestressed concrete components.

5.9.5 Loss of Prestress

5.9.5.4 Refined Estimates of Time-Dependent-Losses

5.9.5.4.2 Losses: Time of Transfer to Time of Deck Replacement

The following is added:

The average ambient relative humidity (percent) (H) should be assumed to be 70% throughout the State.

5.10 Details of Reinforcement

5.10.8 Shrinkage and Temperature Reinforcement

The following is added after the 2nd paragraph:

Concrete deck slab temperature - distribution steel shall not be less than #16 reinforcing bars spaced @ 15 inches.

5.11 Development and Splices Of Reinforcement

5.11.5 Splices of Bar Reinforcement

5.11.5.2 General Requirements

5.11.5.2.1 Lap Splices

The following is added to the first paragraph:

The splice design length shall be based on the use of Grade 60 reinforcement. The dimensions of all laps shall be detailed on the plans.

5.12 Durability

5.12.4 Protective Coatings

The last sentence is deleted and the following is inserted:

Cover to corrosion protected reinforcement steel shall conform to Table 5.12.3-1 denotations. Also, the reinforcement steel cover shall be 2½ inches for riding surface deck slabs on prestressed concrete slab or box beam superstructures.

Also refer to Subsection 20.2 of this Manual for additional deck slab requirements and to Subsection 19.6 of this Manual for requirements concerning pile bents in a marine environment.

5.13 Specific Members

5.13.2 Diaphragms, Deep Beams, Brackets, Corbels and Beam Ledges

5.13.2.2 Diaphragms

The 4th paragraph is deleted and the following is inserted:

Diaphragms shall be provided as stated in the first three paragraphs above.

The following is added:

5.13.5 Mass Concrete

Mass Concrete is defined as any large volume of cast-in-place or precast concrete with dimensions large enough to require that measures be taken to cope with the generation of heat and attendant volume change so as to minimize cracking.

When the minimum dimensions of a concrete component exceed 3 feet and the ratio of volume of concrete to surface area is greater than one foot or 12 inches, then Mass Concrete requirements shall be applied. The surface area will include all of the cumulative area of all surfaces of the concrete component being considered including the full underside (bottom) surface of footings, caps, etc. Volume and surface area calculations shall be in units of feet. Therefore, the volume shall be measured in units of cubic feet and the area in units of square feet.

The Designer shall consider the consequences of Mass Concrete requirements in selecting member sizes and shall avoid Mass Concrete whenever practicable. However, when Mass Concrete is unavoidable, the Designer shall indicate on the plans those portions of the concrete elements in the bridge that are Mass Concrete.

Seal Concrete or concrete deck slabs shall not be considered to be Mass Concrete.

Also, refer to Section 25 of this Manual for additional criteria concerning Precast/Prestressed Concrete.

Section 6 – Steel Structures

6.6 Fatigue and Fracture Considerations

6.6.2 Fracture

The following is added:

Refer to the NJDOT *Standard Specifications for Road and Bridge Construction* for Charpy V-Notch Impact requirements.

6.7 General Dimension And Detail Requirements

6.7.2 Dead Load Camber

The following is added:

An additional 8 p.s.f. shall be included in the camber computations to account for the dead load of permanent stay-in-place forms and 5 p.s.f. shall be included to account for the average 3/8 inches additional thickness of deck concrete which fills the forms. Also, refer to Section 20 of this Manual for additional dead load requirements when S.I.P. forms, in conjunction with the main reinforcement not in alignment, are used.

6.7.3 Minimum Thickness of Steel

The first paragraph is changed to:

Structural Steel shall not be less than 3/8 inches in thickness.

6.7.4 Diaphragms and Cross Frames

6.7.4.1 General

The first sentence is changed to:

Diaphragms or cross frames shall be placed at the end of the structure, across interior supports and intermittently along the spans.

6.10 I Section Flexural Members

6.10.1 General

The following is added:

Compact Sections are desirable throughout a bridge structure.

In continuous spans, the design of the shear connectors in the negative moment portion shall consider the contribution of the longitudinal reinforcement steel.

6.10.10 Shear Connectors

6.10.10.1 General

The following is added:

Welded studs shall be used for shear connectors. Refer to Guide Plate 3.9-2 of this Manual for guidance.

Composite sections shall be designed without consideration of the contribution of the reinforcement steel in the negative moment region of continuous spans. This is except as noted for design of shear connectors and for deflection calculations.

6.10.11 Stiffeners

6.10.11.1 Transverse Stiffeners

6.10.11.1.1 General

The following is added:

Whenever possible, a thicker web should be used to minimize the number of or eliminate the need of transverse stiffeners.

6.10.11.3 Longitudinal Stiffeners

6.10.11.3.1 General

The following is added:

The use of longitudinal stiffeners shall be limited to spans greater than 200 feet.

The following note shall be added to Plans whenever a longitudinal stiffener is used:

A maximum of 2 splices will be permitted for longitudinal stiffeners. Under the requirements for Quality Control Inspection, prior to welding the stiffener to the stringer, the butt welds shall be radiographed.

6.10.12 Cover Plates

6.10.12.1 General

The following is added:

Welded cover plates shall be narrower than the flange to which they are attached. Research indicates that when cover plates are wider than the flange, fatigue strength is significantly reduced. If fatigue strength is reduced edge cracks may occur in the flange.

6.13 Connections and Splices

6.13.3 Welded Connections

6.13.3.1 General

The first paragraph is changed to:

Welding shall conform to the requirements of the current edition of the *ANSI/AASHTO/AWS Bridge Welding Code D1.5*, except that electro-slag weldments on main structural tension and reversal stress members will not be permitted.

Also, refer to Section 24 of this Manual for additional criteria concerning Structural Steel.

Section 9 - Decks and Deck Systems

9.4 General Design Requirements

9.4.3 Concrete Appurtenances

The following is added:

The guidance of Subsection 20.12 of this Manual concerning provision of open deflection and contraction type joints in parapets, barriers and sidewalks shall be followed.

9.7 Concrete Deck Slabs

9.7.1 General

9.7.1.5 Design of Cantilever Slabs

The following is added:

The maximum effective deck overhang shall be maintained at 4'-6". The effective slab section, in maintaining this distance, shall be based on the following limits:

For prestressed concrete girders, whose top flange width is greater than its bottom flange width, and for structural steel members, the effective slab section shall be the distance that is from ¼ the flange width to the edge of the deck slab.

For other prestressed concrete girders, Concrete T beams and prestressed slab and box beams, the effective slab section shall be the distance that is from the edge of the flange to the edge of the deck slab.

9.7.2 Empirical Design

9.7.2.1 General

The following is added:

The provisions of 9.7.3 - Traditional Design shall primarily be followed for concrete deck slab designs. The Tables provided in Section 20 of this Manual may be referred to for uniformity of reinforcement detailing. If the bridge structure configuration entails straight longitudinal superstructure members, then the Empirical Method may be used.

Also, refer to Section 20 of this Manual for additional criteria concerning concrete deck slabs.

Section 10 - Foundations

10.6 Spread Footings

10.6.3 Strength Limit State Design

10.6.3.1 Bearing Resistance of Soils

10.6.3.1.1 General

The following is added:

The criteria under 10.6.3.1.3 – Semi-empirical Procedures shall be followed in the design of spread footings.

Also, refer to Section 16 of this Manual for additional criteria concerning Foundation designs.

Section 11 - Abutments, Piers And Walls

11.10 Mechanically Stabilized Earth Walls

11.10.1General

The following is added:

The use of extensible reinforcement in MSE wall systems is permitted. However, such wall systems are restricted to locations where the maximum wall height is 20 feet.

Section 13 - Railings

13.4 General

The last sentence of the third paragraph is changed to:

On high speed urban expressways where a pedestrian walkway is provided, the walkway area may be separated from the adjacent roadway by a traffic railing or combination railing.

13.7 Traffic Railing

13.7.1 Railing System

13.7.1.1 General

The following is added:

Railing system dimensions shall preferably conform to those systems detailed in Section 23 of this Manual. The *NJDOT Roadway Design Manual* should also be referred to so that proper geometry between the roadway and bridge section is maintained. Bridge curb heights should be the same as roadway curb heights.

13.7.2 Test Level Selection Criteria

The following is added:

Refer to Section 23 of this Manual for guidance in determining bridge railing crash tested level selection.

13.11 Curbs and Sidewalks

13.11.2 Sidewalks

The existing text is changed to:

When curb and gutter sections are used on the approach roadways to a bridge, the curb height on the bridge shall match the curb height of the approach roadway.

Section 14 - Joints and Bearings

14.7 Special Design Provisions For Bearings

14.7.10 Other Bearing Systems

The following is added:

Only those bearing systems that are discussed in Section 24 of this Manual are permitted.

Note: End reference to AASHTO LRFD Section Number Designations

3.3 Overhead and Cantilever Sign Support Structures

The 2007 Edition of the *NJDOT Sign Support Structure Standard Drawing* designs are in accordance with the 2001 (4th Edition) of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. Instructions and overall notations provided on these drawings should be referred to for use of the drawings.

For additional information and for structural design criteria concerning Variable/ Dynamic Message Sign (VMS/DMS) structures, refer to Section 30 of this Manual for guidance.

Also, refer to Section 31 for criteria on bridge mounted sign support structures.

3.4 Pedestrian/Bicycle Traffic Bridge Structures

A. *The AASHTO LRFD Bridge Design Specifications* (with current Interims) and as modified throughout this Manual shall govern the design of bridge structures for use specifically by pedestrian or bicycle traffic. Also, the *AASHTO Guide Specifications for Design of Pedestrian Bridges* and the *AASHTO Guide for the Development of Bicycle Facilities* may be referred to for additional guidance.

   Additionally, NJDOT has issued a publication titled "*Bicycle and Pedestrian Planning and Facilities Design*" that may also be referred to for guidance.

B. In accordance with the provisions of Subpart 3.6.1.6 of the *AASHTO LRFD Bridge Design Specifications*, bridges that only carry pedestrian and/or bicycle traffic shall be designed for a live load of 0.085 kips per sq. ft.

C. When vehicular access is not physically restricted, the potential for the use of a pedestrian bridge by an occasional maintenance vehicle should be considered in the design of the bridge. According to the provisions of Subsection 3.6.1.6 of the *AASHTO LRFD Bridge Design Specifications*, the following vehicular loads should be used for the indicated lane widths:

   Clear deck width: 6 ft. to 10 ft. – 10,000 lbs (H-5 Truck)

   Clear deck width: over 10 ft. – 20,000 lbs (H-10 Truck)

D. Vertical underclearances shall be as established in Subsection 3.2 of this Manual.

E. Ramp type approaches together with auxiliary stairways and fencing shall be used. Ramps shall be a minimum of 8'-0" wide with a maximum grade of 8.33 percent. Stairway width shall be 6'-0", with 11 inch treads and 7 inch risers. Non-slip nosing shall be provided on stairs. Intermediate level platforms shall be provided in all cases.

F. Walkway width on the span(s) shall equal the width of the approach that includes graded shoulders but, shall not be less than 8'-0".

G. Chain link fence (enclosed type) shall be provided on the portion of the bridge which spans the roadway, including shoulders. Use of chain link fence on ramps and/or stairways of the pedestrian bridges will be determined on a project to project basis. See the Type 7 Clearance Diagrams in Section 23. Also, refer to Section 23 for additional fencing provision criteria.

H. Simple or continuous spans members shall be designed so that the deflection due to service live load shall not exceed the limits that are specified in Subsection 2.5.2.6.2 of the *AASHTO LRFD Bridge Design Specifications*.

3.5 Movable Bridge Structures

The design of movable bridge structures shall be in accordance with the *AASHTO LRFD Movable Highway Bridge Design Specifications*. (It is intended that these specifications be used in conjunction with the requirements of Subsection 3.1 of this Manual).

When the design of a Movable Bridge involves the design of approach bridge sections, the approach bridge sections shall be designed in accordance with the *AASHTO LRFD Bridge Design Specifications* and as modified within this Manual.

The inspection, evaluation and maintenance of movable bridge structures shall conform to the requirements of the current *AASHTO Movable Bridge Inspection, Evaluation and Maintenance Manual*.

3.6 Alternate Design Criteria of Non-NHS Roadways

A. Bridge geometry shall conform to the guidance of the *AASHTO Policy on Geometric Design of Highways and Streets*, Chapter 5, Local Roads and Streets.

B. Design live load of the Permit Truck shall not be applied to Non-NHS bridge structures.

C. The operational importance factor specified in *AASHTO LRFD Specifications* Article 1.3.5 may be reduced to 0.95 for strength limit state upon approval of the Manager, Structural Engineering.