CHAPTER 9 – DECKS AND DECK SYSTEMS

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9.4—GENERAL DESIGN REQUIREMENTS

9.4.2—Deck Drainage

The following shall supplement *A9.4.2*.

Refer to *D2.3.2.2.4* and *D2.6.6* for additional requirements on cross and longitudinal slopes of deck surface and deck drainage.

9.5—LIMIT STATES

9.5.5—Extreme Event Limit States

The following shall supplement *A9.5.5*.

Approved crash tested concrete bridge railing reinforcement details for the barrier and deck reinforcement may be used for the deck overhang design, if the design fits the crash tested variables.

9.6—ANALYSIS

9.6.1—Methods of Analysis

The following shall replace *A9.6.1*.

Approximate elastic methods of analysis specified in *A4.6.2.1*, refined methods specified in *A4.6.3.2*, or the traditional design method specified in *A9.7.3* may be used for various limit states as permitted in *A9.5*.

The empirical design method for bridge decks in *A9.7.2* is not allowed.

9.7—CONCRETE DECK SLABS

9.7.1—General

9.7.1.1—Minimum Depth and Cover

The following shall replace *A9.7.1.1*.

For all bridge spans except movable bridge spans, the minimum and maximum overall deck thickness shall be 8.0 inches and 9.5 inches, respectively, and shall vary in 0.5 inch increments. The overall deck thickness shall include a 0.5 inch sacrificial thickness, which shall be included in the weight calculations and excluded from the design thickness. The design thickness equals to the overall

C9.7.1.1

The following shall replace *AC9.7.1.1*.

The 0.5 inch sacrificial thickness is provided to account for the construction tolerance surface texturing, grinding, and the expected future wearing of the bridge deck surface due to applied live loads. Sacrificial concrete must be accounted for as an added dead load but cannot be utilized in the calculations of composite section properties.

deck thickness less 0.5 inch sacrificial thickness. The top and bottom concrete covers shall be 2.5 inches (2.0 inches design cover + 0.5 inch sacrificial) and 1.5 inches, respectively.

For movable bridge spans, the minimum and maximum overall deck thickness shall be 7.0 inches and 7.5 inches with top and bottom concrete covers of 2.0 inches (1.5 inches design cover + 0.5 inch sacrificial) and 1.5 inches, respectively.

Unless required by design and approved by the Bridge Design Engineer Administrator, the deck thickness shall conform to the following table.

Bridge Type	**Overall Deck Thickness (in)**	**Girder Spacing, S (ft) (Top Flange Width < 48")**	**Girder Spacing, S (ft) (Top Flange Width ≥ 48")**
Movable Bridges	7 or 7 ½	All	
Fixed Bridges	8	S ≤ 8	S ≤ 9
	8 ½	8 < S ≤ 9.5	9 < S ≤11
	9	9.5 < S ≤11	11 < S ≤13
	9 ½	11 < S ≤ 12.5	13 < S ≤15

9.7.1.3—Skewed Decks

The following shall supplement *A9.7.1.3*.

Deck skew angle shall not exceed 60 degrees unless approved by the Bridge Design Engineer Administrator.

For decks with primary reinforcement placed perpendicular to the main supporting components, minimum three No. 5 bars at 6 inches spacing shall be placed at top mat and parallel to the skew at each end of deck.

9.7.1.5—Design of Cantilever Slabs

Deck cantilevers, for all prestressed girder spans, shall be designed using the deck thickness (excluding the haunch).

C9.7.1.5

Typically, the deck cantilever thickness is equal to the deck thickness plus the haunch. However, the haunch thickness varies along the girder due to possible camber remaining in girders, thus the deck cantilever thickness will vary along the span as well. To account for this, it is conservative to ignore the haunch and use the deck thickness for cantilever design.

9.7.2—Empirical Design

9.7.2.1—General

The following shall replace *A9.7.2.1*.

The empirical design method is not allowed.

9.7.3—Traditional Design

9.7.3.1—General

The following shall supplement *A9.7.3.1*.

All bridge decks shall be designed using the traditional deck design methods and shall use concrete with a minimum design strength f'_c of 4 ksi. All reinforcing steel shall be Grade 60 bars.

Minimum reinforcement bar size shall be No. 4. Reinforcement spacing in both transverse and longitudinal directions in the deck shall not exceed seven (7) inches on centers to minimize cracking width. Concrete deck shall be designed as singly reinforced section, i.e. neglecting compression reinforcement contribution.

LADOTD Deck design tables presented in Part III, Ch 2 may be used to determine the deck reinforcement requirements in the interior regions of the deck, provided that the stated limitations are met.

Deck overhang and the adjacent region to the overhang shall be designed for vehicle collision provisions in accordance with *A13* in addition to wheel load. Refer to *D9.5.5* for deck overhang reinforcement requirement when approved crash tested railings are used.

For bridges composed of simple span precast girders made continuous, additional longitudinal continuity reinforcement shall be provided at the top of deck over continuity diaphragm locations in accordance with *D5.14.1.4*. Refer to *A6.10.1.7* for additional deck reinforcement requirements in negative flexure moment region of continuous steel girder bridges.

A deck placement sequence shall be provided on the bridge plans for all continuous multiple span bridges with a cast in place concrete deck. Refer to *Bridge Design Standard Plans - Miscellaneous Span Details* and *D6.7.2* for requirements on deck placement sequences for continuous multi-span prestressed girder and steel girder bridges.

9.7.3.2—Distribution Reinforcement

The following shall supplement *A9.7.3.2.*

Steel reinforcement shall also be placed in the secondary direction in the top of slabs as a percentage of the primary reinforcement for negative moment using the same equations as for the bottom distribution reinforcement.

C9.7.3.2

The following shall supplement *AC9.7.3.2.*

It has been observed that many new bridges with increased girder spacing exhibited deck cracking due to the decrease of deck mass and hence high vibration. In addition the thermal effects, which are generally ignored in the design, could be significant and lead to excessive cracking. Increasing the top longitudinal reinforcement will help limit the potential for cracking and reduce crack width which in turn should improve long-term durability.