South Carolina
Department of Transportation

BRIDGE DESIGN MEMORANDUM – DM0608

TO: RPG Structural Engineers
Design Consultants

DATE: October 14, 2008

RE: *SCDOT Seismic Design Specifications for Highway Bridges*, Version 2.0
Corrections to Equations 9-1 and 9-2

After publication of the *SCDOT Seismic Design Specifications for Highway Bridges*, Version 2.0, errors were noted in Equations 9-1 and 9-2 on page 9-1. The correct equations are shown below:

Equation 9-1

$$N = (4 + \Delta_{ot} + 0.2H_s)(1 + \frac{S^2}{4000}) \geq 12"$$

Equation 9-2

$$N = (4 + \Delta_{ot} + 1.65\Delta_{eq})(1 + \frac{S^2}{4000}) \geq 14"$$

Attached is a revised copy of page 9-1 that can be used to update your copy of the Specifications.

Original Signed by E. S. Eargle on October 14, 2008

E. S. Eargle
Preconstruction Support Engineer

ESE:bwb
Attachment
cc: Bridge Construction Engineer
Bridge Maintenance Engineer
FHWA Structural Engineer
Preconstruction Support Managers
Regional Production Engineers
RPG Design Managers
File: PC/BWB

SECTION 9 – MISCELLANEOUS DETAILING

9.1 MINIMUM SUPPORT LENGTH

The minimum support length at expansion bents and free standing or non-integral end bents shall accommodate the differential seismic displacements between the substructure and the superstructure. The minimum support length capacity shall meet or exceed the minimum support length demand of the superstructure. Support length at fixed bents (superstructure continuous over the bents) need not be computed. The minimum support length (see Figure 9.1) is computed using Equation 9-1 or 9-2.

9.1.1 SDC A and Single Span Bridges

$$N = \left(4 + \Delta_{ot} + 0.2H_s\right)\left(1 + \frac{S^2}{4000}\right) \geq 12'' \qquad (9\text{-}1)$$

Where:

- N Minimum support length (in)
- Δ_{ot} Movement attributed to prestress shortening creep, shrinkage and thermal expansion or contraction to be considered no less than one inch per 100 feet of bridge superstructure length between expansion joints (in)
- H_s The largest column height in the most flexible frame adjacent to the expansion joint under consideration. The average height from the top of column to top of footing for pile bents, or to the point of fixity of drilled shaft or pile foundations. For single spans seated on abutments, the term is taken as the abutment height (ft)
- S The skew angle of the bridge substructure measured from a line normal to the span (degrees)

9.1.2 SDC B and C Bridges

$$N = \left(4 + \Delta_{ot} + 1.65\Delta_{eq}\right)\left(1 + \frac{S^2}{4000}\right) \geq 14'' \qquad (9\text{-}2)$$

Where:

- N Minimum support length (in)
- Δ_{eq} Seismic displacement demand of the long period frame on one side of the expansion joint (in)
- Δ_{ot} Movement attributed to prestress shortening creep, shrinkage and thermal expansion or contraction to be considered no less than one inch per 100 feet of bridge superstructure length between expansion joints (in)

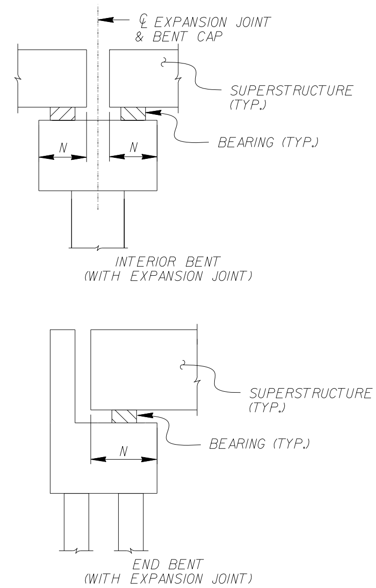

Figure 9.1 Dimensions for Support Length Requirement

9.1.3 SDC D Bridges

The minimum support length for SDC D bridges shall satisfy Equation 9-2 except the lower boundary is 24".

9.2 LONGITUDINAL AND TRANSVERSE CONNECTIONS

Transverse seismic forces are transmitted to the substructure through dowel bars, anchor bolts and/or shear keys. Typically, these components are designed to behave elastically so that the combination of anchor bolts, dowel bars and/or shear keys are designed to satisfy Equation 9-3 in both the longitudinal and transverse directions for bridges of any SDC.

$$V_u \leq \phi_v\left(V_{sk} + V_{ab} + V_{bw}\right) \qquad (9\text{-}3)$$

Where:

- V_u Smaller of elastic shear force or the overstrength plastic hinge shear force (k)
- V_{sk} Shear strength of the shear key (k)
- V_{ab} Shear strength of anchor bolts (k)
- V_{bw} Shear strength of the backwall (k)
- ϕ_v Shear strength reduction factor (dimensionless)