South Carolina
Department of Transportation

BRIDGE DESIGN MEMORANDUM – DM0220

TO: **RPG Structural Engineers**
Design Consultants

DATE: May 8, 2020

RE: **Revision to SCDOT Bridge Design Manual**

Apply these updated requirements to all projects where design has not advanced beyond the preliminary design phase.

The attached table provides revisions to the *SCDOT Bridge Design Manual* in order to bring it up to compliance with the *AASHTO LRFD Bridge Design Specifications*, 8th Edition. Additionally, other minor non-AASHTO LRFD related revisions were made to update the Bridge Design Manual.

Please note the changes below in your copy of the *SCDOT Bridge Design Manual.*

Terry B. Koon, P.E.
Structural Design Support Engineer

TBK:hl

ec:
John Boylston, Director of Preconstruction
Robbie Isgett, Director of Construction
David Cook, Director of Maintenance
Robert Perry, Director of Traffic Engineering
Chris Gaskins, Design Build Engineer
Rob Bedenbaugh, Precon. Support Engineer
David Rister, Acting Director of Mega Projects
Jennifer Necker, RP Engineer - Lowcountry
Leah Quattlebaum, RP Engineer – Pee Dee
Philip Sandel, RP Engineer - Midlands
Julie Barker, RP Engineer – Upstate
Tad Kitowicz, FHWA
Blake Gerken, FHWA

File: PC/TBK/HL

Post Office Box 191
955 Park Street
Columbia, SC 29202-0191

List of changes to SCDOT Bridge Design Manual			
SCDOT BDM SECTION #	**LINE # (omit if full section)**	**OLD contents (omit if all inclusive)**	**changed to**
12.6.1.3	1	48H:1V (2.08%)	50H:1V (2%)
12.6.1.3	3,7,12	2.08%	2.00%
12.6.1.3	9	to 36H:1V (2.78%)	per SCDOT Roadway Design Manual
12.6.1.6	14	bike lanes will have a cross slope of 24H:1V (4.16%).	See SCDOT Roadway Design Manual for bike lanes cross slope
12.6.1.6	15	48H:1V (2.08%).	50H:1V (2%)
Figure 12.6.3 - 12.6.7		48H:1V	50H:1V
13.1.2.1	1		Reference: LRFD Articles 3.4 and 3.5
13.1.2.2	4		Reference: LRFD Articles 3.6 and 3.11
13.1.3.1			Reference: LRFD Article 1.3.2.1
13.3.2.4			See LRFD Article 3.4.1
14.3	1,3	LRFD Article 5.7.3.5	LRFD Article 5.6.3.4
15.1.2	1	LRFD Article 5.7	LRFD Article 5.6
15.1.2	3	LRFD Article 5.7.2.2	LRFD Article 5.6.2.2
15.1.2	4	LRFD Article 5.7.3.2.5	LRFD Article 5.6.3.2.5
15.1.2	5	LRFD Article 5.7.3.2.1	LRFD Article 5.6.3.2.1
15.1.3.1			Delete entire Section (Referenced Article Deleted from AASHTO)
15.1.3.2			Reference: LRFD Article 5.6.3.3
15.1.4	1	LRFD Article 5.8	LRFD Article 5.7
15.1.4	11	LRFD Article 5.6.3	LRFD Article 5.8.2
15.1.4	12	LRFD Article 5.13.2	Delete Reference (Referenced Article Deleted from AASHTO)
15.1.4	13	LRFD Article 5.8.3	LRFD Article 5.7.3
15.1.4	16	LRFD Eq. 5.8.3.3-1	LRFD Eq. 5.7.3.3-1
15.1.4	17	LRFD Eq. 5.8.3.3-2	LRFD Eq. 5.7.3.3-2
15.1.4	19	LRFD Equation 5.8.3.3-2	LRFD Equation 5.7.3.3-2
15.1.4	22	LRFD Eq. 5.8.3.3-3	LRFD Eq. 5.7.3.3-3
15.1.4	24	LRFD Eq. 5.8.3.3-4	LRFD Eq. 5.7.3.3-4
15.1.4	32	LRFD Article 5.8.3.4.2	LRFD Article 5.7.3.4.2
15.1.4	33	LRFD Article 5.8.2.5	LRFD Article 5.7.2.5
15.1.4	34	LRFD Table 5.8.3.4.2-1	LRFD Equation 5.7.3.4.2-1
15.1.4	35	LRFD Table 5.8.3.4.2-2	LRFD Equation 5.7.3.4.2-2
15.1.4	36	LRFD Article 5.8.3.4	LRFD Article 5.7.3.4
15.1.4	39	LRFD Eq. 5.8.2.4-1	LRFD Eq. 5.7.2.3-1

List of changes to SCDOT Bridge Design Manual (continued)			
15.1.4	41	LRFD Eq. 5.8.2.5-1	LRFD Eq. 5.7.2.5-1
15.1.4	44	LRFD Article 5.8.3.2	LRFD Article 5.7.3.2
15.1.4	46	LRFD Article 5.8.3.5	LRFD Article 5.7.3.5
15.1.4	50	LRFD Article 5.8.2	LRFD Article 5.7.2
15.1.4	50	LRFD Article 5.8.3.6	LRFD Article 5.7.3.6
15.1.5	1	LRFD Article 5.6.3	LRFD Article 5.8.2
15.1.7	1	LRFD Article 5.7.3.4	LRFD Article 5.6.7
15.2.2	2	ASTM A 706	AASHTO M 31, Type W
15.3.1.2	1	LRFD Article 5.12.3	LRFD Article 5.10.1
15.3.1.5	4	bridge decks	bridge decks and their appurtenances; including barrier parapets, railing walls, raised medians, and sidewalks.
15.3.1.5	14, 15		Add the following sentence to the end of the paragraph: "Steel studs, Stirrups or diaphragm reinforcement extended into the decks are not considered as deck reinforcement.",
15.3.1.6.1			See Bridge Design Memo DM0320
15.3.1.6.3			See Bridge Design Memo DM0320
Figure 15.3-4			See Bridge Design Memo DM0320
Figure 15.3-5			See Bridge Design Memo DM0320
Figure 15.3-6			See Bridge Design Memo DM0320
15.3.1.7			See Bridge Design Memo DM0320
15.3.1.7.2			See Bridge Design Memo DM0320
15.3.1.7.4			See Bridge Design Memo DM0320
15.3.1.7.6			See Bridge Design Memo DM0320
15.3.1.8	1	LRFD Articles 5.11.2.3 and 5.11.5.2.1	LRFD Articles 5.10.8.2.3 and 5.10.8.4.2a
15.4.1	1	LRFD Article 5.14.4	LRFD Article 5.12.2
15.4.1.4	1	LRFD Articles 5.7.3.3.2, 5.10.8, and 5.14.4.1	LRFD Articles 5.6.3.3, 5.10.6, and 5.12.2.1
15.4.1.4	4	LRFD Articles 5.7.3.3.2 and 5.10.8	LRFD Articles 5.6.3.3 and 5.10.6
15.4.1.4	7	LRFD Article 5.14.4.1	LRFD Article 5.12.2.1
15.4.1.4	10	LRFD Equation 5.14.4.1-1	LRFD Equation 5.12.2.1-1
15.4.2	1	LRFD Article 5.7.3.6.2	LRFD Article 5.6.3.5.2
15.4.2	7-8		Camber for the dead-load deflection of the span shall be 1/8 in for concrete flat slab spans 22 ft in length, 3/16 in for concrete flat slab spans 30 ft in length, and 3/8 in for concrete flat slab spans 40 ft in length.
15.4.4	1	LRFD Article 5.14.4.1	LRFD Article 5.12.2.1
15.4.5	1	LRFD Articles 5.6.2 and 5.10.8	LRFD Articles 5.5.1.1 and 5.10.6
15.4.5	2-6		Deleted

List of changes to SCDOT Bridge Design Manual (continued)			
Figure 15.4-1			Deleted
15.4.6	8	LRFD Article 5.11.1.2	LRFD Article 5.10.8.1.2
15.4.9	1	LRFD Article 5.14.4.1	LRFD Article 5.12.2.1
15.4.11	1,2	LRFD Article 5.11.1.2	LRFD Article 5.10.8.1.2
15.4.11	4	LRFD Article 5.11.1.2.3	LRFD Article 5.10.8.1.2c
15.5.3.1	1,3	LRFD Article 5.9.4	LRFD Article 5.9.2.3
15.5.3.3	17	LRFD Article 5.9.4	LRFD Article 5.9.2.3
15.5.3.4	1	LRFD Article 5.9.5	LRFD Article 5.9.3
15.5.3.5	1	LRFD Article 5.11.4	LRFD Article 5.9.4.3
15.5.3.5	10	LRFD Equation 5.11.4.2-1	LRFD Equation 5.9.4.3.2-1
15.5.3.5	13	LRFD Article 5.11.4.3	LRFD Article 5.9.4.3.3
15.5.6.4	1	LRFD Article 5.8.4	LRFD Article 5.7.4
15.5.6.4	2-10		Delete the Section and use referenced LRFD Article above
15.5.7	1	LRFD Article 5.13.2.2	LRFD Article 5.12.4
16.2.1.3.5	3	ASTM A325	ASTM F3125 (for Grade A325)
16.2.1.5	2	LRFD Table 6.6.2-1	LRFD Table 6.6.2.1-2
16.2.2	3	A325 (Type 1)	ASTM F3125, Grade A325 (Type 1)
16.2.2	4	A325 (Type 3)	ASTM F3125, Grade A325 (Type 3)
16.4			See LRFD Article 6.6.1
16.7.1	3,4	A325 (Type 3)	ASTM F3125, Grade A325 (Type 3)
16.7.1	4	A325 (Type 1)	ASTM F3125, Grade A325 (Type 1)
17.1.2	1,3	LRFD Article 5.12	LRFD Article 5.14
17.4.2	14, 15	For flat slabs and cored slabs, the bottom reinforcing steel that is parallel to the roadway shall be #7 bars at 6 in on center.	For flat slabs and cored slabs, the bottom reinforcing steel that is parallel to the roadway shall be #9 bars at 6 in on center.
17.4.2	19, 20	All approach slabs shall be doweled to the end bent or pavement rest with #6 bars at 12 in on center.	All approach slabs shall be doweled to the end bent or pavement rest with #6 bars minimum at 12 in on center.
17.5.1	7	LRFD Article 5.8.4	LRFD Article 5.7.4
19.2.4	1	LRFD Articles 10.7.1.10, 10.7.1.11, and 10.7.1.12	SCDOT Geotechnical Design Manual

List of changes to SCDOT Bridge Design Manual (continued)			
19.2.4	4-9	Piles shall be a minimum of 10 ft in length. At end bents, if the depth to suitable rock strata is less than 10 ft, typical practice is to drive the piles in holes cored in the rock and backfill with Class 4000 DS Concrete. A minimum core depth of 5 ft into scour-resistant rock is recommended. The minimum tip elevation shall reflect the elevation where the required ultimate pile capacity can be obtained, the penetration required to resist lateral pile loads, and the penetration of any overlaying unsuitable soil strata, as specified in LRFD Article 10.7.1.11.	Piles shall be a minimum of 10 ft in length. At end bents, if the depth to suitable rock strata is less than 10 ft, typical practice is to drive or place the piles in holes cored in the rock and backfilled with Class 4000 DS Concrete. A minimum core depth of 5 ft into scour-resistant rock is recommended. The minimum tip elevation shall reflect the elevation where the required ultimate pile capacity can be obtained, the penetration required to resist lateral pile loads, and the penetration of any overlaying unsuitable soil strata, as specified in the SCDOT Geotechnical Design Manual.
19.2.6.2	1	LRFD Article 10.7.1.5	LRFD Article 10.7.1.2
19.2.6.7	1,2	Minimum spacing requirements are not related to group effect. Group effects are specified in LRFD Articles 10.7.3.7.3 and 10.7.3.10.	Reference: SCDOT Geotechical Design Manual
19.2.6.10	1	LRFD Article 10.7.1.13	SCDOT Geotechnical Design Manual
19.2.6.11	1	LRFD Article 10.7.1.14	SCDOT Geotechnical Design Manual
19.3.2	1-4	The LRFD Specifications provides procedures to estimate the axial resistance of drilled shafts in cohesive soils and cohesionless soils in LRFD Articles 10.8.3.3 and 10.8.3.4, respectively. In both cases, the resistance is the sum of the shaft and tip resistances. LRFD Article 10.8.3.5 discusses the determination of axial resistance of drilled shafts in rock.	Reference: SCDOT Geotechnical Design Manual
19.3.3	10	LRFD Article 5.7.4.4	LRFD Article 5.6.4.4
19.3.3	10-12	If the drilled shaft is extended above ground to form an interior bent or part of a bent, it should be analyzed and designed as a column.	If a drilled shaft is extended above ground, above the scour line, or through liquefiable soil, structurally design the shaft as a column and detail the longitudinal reinforcing steel with a maximum spacing of 8 inches center-to-center. For oversized drilled shafts, if analysis indicates potential hinging zone below ground, appropriate detailing shall be provided.
19.5.4	1	LRFD Articles 5.8.3, 5.13.3.6, and 5.13.3.8	LRFD Articles 5.7.3, 5.12.8.6, and 5.12.8.8
19.5.6.1	1	LRFD Article 10.6.3.1.5	SCDOT Geotechnical Design Manual

List of changes to SCDOT Bridge Design Manual (continued)			
19.5.6.2	1	LRFD Article 10.6.3.2.5	SCDOT Geotechnical Design Manual
19.5.7	1	LRFD Article 10.6.3.3	SCDOT Geotechnical Design Manual
19.5.8	1	LRFD Articles 3.12.6, 10.6.2.2, and 10.7.2.3	LRFD Article 3.12.6, 10.6.2.4, and SCDOT Geotechnical Design Manual
19.5.9	1	LRFD Articles 5.10.8 and 5.13.3	LRFD Articles 5.10.6 and 5.12.8
19.5.9	12,20	LRFD Article 5.13.3	LRFD Article 5.12.8
19.5.9	18	LRFD Article 5.8.3.4	LRFD Article 5.7.3.4
Figure 19.5-2	note	LRFD Article 10.6.3.1.5	LRFD Article 10.6.1.3
20.1.8	1	LRFD Article 5.6.3	LRFD Article 5.8.2
20.3.4	8	LRFD Article 5.6.3	LRFD Article 5.8.2
20.3.5	10	LRFD Article 5.7.4.3	LRFD Article 5.6.4.3
20.3.7	1	LRFD Article 5.7.4	LRFD Article 5.6.4
20.3.7	4	LRFD Article 5.7.4.3	LRFD Article 5.6.4.3
20.3.7	6	LRFD Article 5.7.4.1	LRFD Article 5.6.4.1
21.1.1.2	2	$\Delta T = \alpha L (T_{MaxDesign} - T_{MinDesign})$ LRFD Equation 3.12.2.3-1	$\Delta T = 1.2\alpha L (T_{MaxDesign} - T_{MinDesign})$ modified LRFD Equation 3.12.2.3-1 Where, 1.2 is the load factor.
21.1.1.12			Delete Examples 21.1-1 and 21.1-2
21.2.1.3	3	$\Delta T = \alpha L (T_{MaxDesign} - T_{MinDesign})$ LRFD Equation 3.12.2.3-1	$\Delta T = 1.2\alpha L (T_{MaxDesign} - T_{MinDesign})$ modified LRFD Equation 3.12.2.3-1 Where, 1.2 is the load factor.
21.2.1.8	5, 6	For beveled bearing plates, maintain a minimum of 1 in thickness at the edge of the bearing plate.	For beveled bearing plates, use a minimum thickness of 1 ½ inches at the centerline of bearing while maintaining 1 inch minimum at the low side of the bevel.
21.2.3	21, 22	The designer shall check the bearing against horizontal walking in accordance with LRFD Article 14.7.6.4	The designer shall check the bearing against horizontal walking.
DM 0108	21	LRFD Article 5.14.1.4.9	LRFD Article 5.12.3.3.9
DM 0108	26-27	The requirements of AASHTO LRFD Articles 5.14.1.4.6, 5.14.1.4.7, and 5.14.1.4.8 shall apply.	The requirements of AASHTO LRFD Articles 5.12.3.3.6, 5.12.3.3.7, and 5.12.3.3.8 shall apply.
DM 0108	35,42	LRFD Article 5.9.4	LRFD Article 5.9.2.3