BUREAU OF STRUCTURES

DATE: February 1, 2017
TO: Bridge Manual Users
FROM: DTSD – Bureau of Structures
SUBJECT: **January 2017 Bridge Manual Update**

The Bridge Manual revisions to text and standards are now complete and posted online for this six month cycle. Please see the attached sheets for a list, with brief explanation, of the Text and Standards that were revised. Most corresponding plan insert sheets have also been updated and posted online.

The entire Bridge Manual has been reposted with a January, 2017 date due to our conversion to Word 2013, (resulting in shifts to the justified text that is used in the manual, which resulted in some shifts of information to other pages). Some chapters may not have any edits, but still have the January, 2017 date. The actual chapters and/or chapter examples that have been modified are noted later in this document.

A new sheet border has been placed on all of the standards, however the date in the lower-right corner still reflects the date of the latest update.

Of particular interest in this edition:

- **Throughout:** Many updates to the text and examples to conform to AASHTO LRFD 2016 interims.

- **Chapter 6 and Standards 40.01, 40.03, 40.32, 40.33**: Updates to reflect bid item change from "Concrete Masonry Deck Patching" to "Concrete Masonry Deck Repair"

- **Chapter 13:** Added statement (page 15) that for bridges with only one pier (fixed) that temperature force, TU, should not be included when the abutments are fixed or semi-expansion.

- **Chapter 30:** No revisions at this time. *Very* likely going to 42"SS parapets for all structures meeting certain criteria in the near future. Additional guidance may be given in a Design Memo prior to the July edition of the Bridge Manual.

- **Chapter 36:** Clarified shrinkage and temperature reinforcement. Added guidance for pedestrian and cattle underpasses.

- **Chapter 45:** This chapter has been re-written; better organized with enhanced guidance. In addition, there are four new LFR rating examples:
    - Reinforced Concrete Slab Rating Example – LFR
    - Single Spean PSG Bridge Rating Example – LFR

- Two Span 54W" Prestressed Girder Bridge – Continuity Reinforcement Rating Example – LFR
- Steel Girder Rating Example – LFR

- **Standard 9.01**: Geotextile fabric and the pipe underdrain are now placed at the bottom of the excavation behind abutment types A1, A3 and A4. This is to (hopefully) reduce the occasional problem of washout beneath the abutments when granular material is place by the contractor to provide a workable site.

- **Standard 11.01:** Updated information regarding piles, and reinforcement for CIP piles.

- **Standard 12.03 & 12.05:** Moved the underdrain near the bottom of footing to reduce water flow beneath abutments and slope washout.

- **Standards 24.04 & 24.12:** End steel diaphragms are now detailed to be sloped in order to provide a uniform concrete diaphragm depth.

- *New* **Standard 27.10 – Steel Expansion Bearing Details:** Shows a temperature table for setting bearings on a continuous steel girder bridge. Also shows the calculations necessary for determining the top plate "A" size for steel girder bearings and anchor plate size for prestressed girders using steel bearings.

- **Standard 36.03:** Updated shrinkage and temperature reinforcement, added twin cell box detail, and added top slab thickness and reinforcement requirements.

There is a department wide effort to reduce the number of SPV's and covert, where possible, to Standard Spec or STSP.

Most other changes are fairly minor. Please use the example calculations with care (follow along in AASHTO).

A vertical black bar in the left margin notes all text changes.

The user's feedback regarding the Bridge Manual is important to us as that is where we get many ideas for corrections, clarification and new ideas for enhancement.

January 2017 Bridge Manual Text Update Summary

Chapter	Page Number(s)	Change
4	5	Added clarification for non-standard parapets and superstructure types and add-ons.
6	25	Removed structural backfill plan note for new bridge construction. See Standard Detail 9.01 for notes.
	38, 40	Updated bid item "Concrete Masonry Deck Patching" to "Concrete Masonry Deck Repair"
8	3	Removed Appendix 8-C from Table of Contents
	5	Clarified language for submitting Stream Crossing SSR and hydraulic site report
	6	Added 2-year velocity to erosion control parameters
	9	Removed language about 14 ft/s velocities
	10	Added statement defining determination of freeboard
	17	Added statement regarding current versions of publications
	17	Added link to current version of Item 113 to replace Appendix 8-C
	17	Defined approach section location, for scour computations
	18	Added statement regarding vertical contraction scour
	22	Clarified language about first two abutment scour evaluation methods
	22-23	Introduced and briefly described NCHRP abutment scour evaluation method
	24	Added statement regarding NCHRP method results
	24	Changed language to indicate that first two abutment scour evaluation methods can be very conservative
	60-61	Removed Appendix 8-C content
9	3	Added concrete density as an influence on the modulus of rupture, fr
	11	Changed ASTM A497 to ASTM A1064 to reflect latest welded wire reinf. specification
	26	Adjusted date for moving Draft Bar Tables into Chapter
	26	Removed "lightweight conc. factor" and added "conc. density modification factor", which had no effect on the draft bar tables
12	26	Revised load factor for superstructure (WS) - Service I
	32	Minor revisions to beam seat information
	33	Removed Figure 12.9-1 since the standards cover what was shown
13	8	Updated aesthetics info to only reference Chapter 4
	15	Added statement that for bridges with single fixed piers and fixed or semi-expansion abutments, temperature force, TU, should not be included in the design.
13E - 2	2	Updated sentence to state that Example is current through AASHTO 2016 Interims

	12	Corrected reference to Table in AASHTO LRFD Specification
	16	Added concrete density modification factor to modulus of rupture, fr, equation
	25	Added concrete density modification factor to shear resistance, Vc, equation
	27	Added concrete density modification factor to minimum transverse reinf. calculation

14E -1	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	20,21,23,24, 26,27	Added concrete density modification factor to shear resistance, Vc, equation
	22,25,28	Added concrete density modification factor to modulus of rupture, fr, equation
14E - 4	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	24,31,32	Added concrete density modification factor to shear resistance, Vc, equation
	25	Added concrete density modification factor to nominal shear resistance (two-way action), Vn, equation
	26,28,30,33	Added concrete density modification factor to modulus of rupture, fr, equation

15	3	Added the standard name for placing heavy riprap

17	5	Added reference to LRFD [3.8], where new wind speeds (3-second gust) are described.
	77	Added concrete density modification factor to allowable tensile stress calculation

18	3	Revised slab bridge on Interstate Policy Item
	12	Added concrete density modification factor to shear resistance, Vn, equation
	25-26	Added new lower limit for crack control bar spacing (s), and new upper limit for (dc)
	26	Added concrete density modification factor to modulus of rupture, fr, equation
18E -1	3	Updated sentence to state that Example is current through AASHTO 2016 Interims
	17,19,23,69	Added concrete density modification factor to modulus of rupture, fr, equation
	69	Added concrete density modification factor to shear resistance (two-way action), Vr, equation

19	16,17	Added concrete density modification factor to tensile stress limit after losses calculation
	17	Added new coefficient to temporary compression stress limit calculation

	25,29	Added concrete density modification factor to modulus of rupture, fr, equation
	28	Added concrete density modification factor to minimum transverse reinf. calculation
	28,29	Added concrete density modification factor to nominal shear resistance, Vcw and Vci equations
19E -1	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	9	Added reference to LRFD [Table 3.4.1-4] for live load Service III load factors
	17,27	Added concrete density modification factor to tensile stress limit after losses calculation
	19	Added new coefficient to temporary compression stress limit calculation
	21	Added concrete density modification factor to temporary tensile stress limit calculation
	34,41	Added concrete density modification factor to modulus of rupture, fr, equation
	41,42	Added concrete density modification factor to nominal shear resistance, Vcw and Vci equations
	43	Added concrete density modification factor to minimum transverse reinf. calculation
19E - 2	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	9	Corrected number for LRFD Table reference
	14	Added concrete density modification factor to modulus of rupture, fr, equation
19E - 3	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	12	Added reference to LRFD [Table 3.4.1-4] for live load Service III load factors
	13	Added new coefficient to temporary compression stress limit calculation
	13	Added concrete density modification factor to temporary tensile stress limit calculation
	13	Added concrete density modification factor to tensile stress limit after losses calculation
	23,27	Added concrete density modification factor to modulus of rupture, fr, equation
	27,28	Added concrete density modification factor to nominal shear resistance, Vcw and Vci equations
	29	Added concrete density modification factor to minimum transverse reinf. calculation
19E - 4	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	4	Added new coefficient to temporary compression stress limit calculation

	4	Added concrete density modification factor to temporary tensile stress limit calculation
	6,7	Minor text modifications

27	2	Clarifies temperature range for bearing design, steel and prestressed
	4,10	Removed reference to specific Edition of Construction Specifications
	5	Emphasized why Method B is currently not allowed
	6	Stated that all elastomeric bearings are to meet Zone D requirements
27E -1	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	2	Updated table to show Temperature Zone D and a minimum grade of elastomer of 4, which are to be used for all bearings in the state

36	5	Provided additional guidance for pedestrian and cattle underpasses
	10,11	Added concrete density modification factor to shear resistance, Vc, equation for culvert slabs
	11,12	Added concrete density modification factor to shear resistance, Vc, equation for culvert walls
	12,13	Added new lower limit for crack control bar spacing (s), and new upper limit for (dc)
	14	Added concrete density modification factor to modulus of rupture, fr, equation
	27	Added minimum thickness requirement for box culvert top slabs
	34	Clarified Shrinkage and Temperature reinforcement for box culverts
36E -1	2	Updated sentence to state that Example is current through AASHTO 2016 Interims
	20	Change corner bar spacing from 7.5-inches to 7-inches to match negative steel and shrinkage and temperature spacing.
	21	Added concrete density modification factor to modulus of rupture, fr, equation
	24	Added note for the design of shrinkage and temperature bars
	25	Updated reinforcement details
	26	Updated detail per revised reinforcement
	32,33	Added concrete density modification factor to shear resistance, Vc, equation for culvert slabs
	33,34	Added concrete density modification factor to shear resistance, Vc, equation for culvert walls

40	19	Enhanced language regarding superstructure replacements
	31	Corrected ACE reference [14.4.2.9] to [17.4.2.9]

45	Entire Chapter	Entire chapter was rewritten to put into a more logical order, as well as enhanced guidance for when and how to load rate bridges.
45E -1	2	Added clarifier, "For LRFR"
	4,6,7,9-12	Updated code references
	5	Changed "including" to "included"
	6	Removed maximum reinforcement check

	8	Changed calculation of variable d_s to include $cover_{bot}$ defined previously
	9	Changed "and" to "an"
	10	Changed calculation of variable d_s to include $cover_{top}$ defined previously, and subtracted 0.5" for wearing surface
45E -2	12,17	Added concrete density modification factor to modulus of rupture, fr, equation
	14,24	Updated code references
	18	Added concrete density modification factor to nominal shear resistance, Vcw and Vci equations
	19	Formatted solution for Vu and added units
	22	Added concrete density modification factor to tensile stress limit after losses calculation
	23,24	Updated WBM references
45E -3	7,8	Adjusted page break location
	11	Updated WBM references
	11	Updated code references
45E -4	8,28,35,36	Updated WBM references
	18,19,28, 29,31,32	Updated page break location
	24,35	Updated code references
45E -5	Entire Section	Added example LFR calculations for bridge defined in Example 45E1
45E -6	Entire Section	Added example LFR calculations for bridge defined in Example 45E2
45E -7	Entire Section	Added example LFR calculations for bridge defined in Example 45E3
45E -8	Entire Section	Added example LFR calculations for bridge defined in Example 45E4

January 2017 Standard Details Update Summary

Chapter 4

- Std 4.01 ■ No revisions.
- Std 4.02 ■ No revisions.
- Std 4.03 ■ No revisions.
- Std 4.04 ■ Clarified edge of deck location
- Std 4.05 ■ No revisions.

Chapter 7

- Std 7.01 ■ No revisions.
- Std 7.02 ■ No revisions.
- Std 7.03 ■ No revisions.
- Std 7.04 ■ No revisions.
- Std 7.05 ■ No revisions.
- Std 7.06 ■ No revisions.
- Std 7.07 ■ No revisions.

Chapter 9

- Std 9.01 ■ Added geotextile to abutment drainage details
  - ■ Added abutment plan view and wing section details for drainage

Chapter 11

- Std 11.01 ■ Updated "CIP Pile Weld Detail"
  - ■ Removed Pile Resistance Table. Added note to refer to 11.3.1.17.7
  - ■ Updated "Section Thru Concrete CIP Piling Used when Piles are Exposed" Detail. Added reinforcement table.

Chapter 12

- Std 12.01 ■ Updated pipe underdrain note
- Std 12.02 ■ Clairified sidewalk notch detail for concrete parapets
- Std 12.03 ■ Moved the underdrain near the bottom of the footing and updated note
- Std 12.04 ■ No revisions.
- Std 12.05 ■ Moved the underdrain near the bottom of the footing and updated note
- Std 12.06 ■ No revisions.
- Std 12.07 ■ Updated pipe underdrain note
- Std 12.08 ■ Updated pipe underdrain note
- Std 12.09 ■ Minor - Spelling correction
- Std 12.10 ■ No revisions.
- Std 12.11 ■ No revisions.
- Std 12.12 ■ Added plan and elevation detail for parapet on A3 and A4 abutments
- Std 12.13 ■ Removed 1/2" joint filler in parapet for A3 and A4 abutments

Chapter 13

- Std 13.01 ■ Refer to Standard 13.08 for anchor bolt clearance
- Std 13.02 ■ No revisions.
- Std 13.03 ■ No revisions.
- Std 13.04 ■ No revisions.
- Std 13.05 ■ No revisions.
- Std 13.06 ■ No revisions.
- Std 13.07 ■ No revisions.
- Std 13.08 ■ Added note to not lap bundled bars

Std 13.10 ■ No revisions.
Std 13.11 ■ No revisions.

Chapter 14

Std 14.02 ■ Clairified bid items for standard coping and traffic barriers
Std 14.03 ■ No revisions.
Std 14.04 ■ No revisions.
Std 14.05 ■ No revisions.
Std 14.11 ■ No revisions.
Std 14.12 ■ No revisions.
Std 14.13 ■ Updated pipe underdrain note

Chapter 15

Std 15.01 ■ No revisions.
Std 15.02 ■ No revisions.
Std 15.03 ■ No revisions.

Chapter 17

Std 17.01 ■ No revisions.
Std 17.02 ■ Added note to use "Pigmented Surface Sealer" for inside and top faces of parapets

Chapter 18

Std 18.01 ■ No revisions.
Std 18.02 ■ No revisions.

Chapter 19

Std 19.01 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 19.02 ■ No revisions.
Std 19.03 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 19.04 ■ No revisions.
Std 19.11 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 19.12 ■ No revisions.
Std 19.13 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 19.14 ■ No revisions.
Std 19.15 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 19.16 ■ No revisions.
Std 19.17 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 19.18 ■ No revisions.
Std 19.19 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 19.20 ■ No revisions.
Std 19.31 ■ No revisions.
Std 19.32 ■ Added minimum edge of deck thickness for "NY3/NY4" railings
■ Changed all "Slab" references to "Deck"
Std 19.33 ■ No revisions.
Std 19.34 ■ No revisions.
Std 19.35 ■ No revisions.
Std 19.36 ■ Changed "3 1/2" Square" to "3 1/2" x 3 1/2" "
Std 19.37 ■ Revised fastner note: "…and the minimum ~~end or~~ edge distance shall be 1 1/2."
Std 19.38 ■ No revisions.
Std 19.50 ■ Added PS box girder usage note. Contact BOS for special provisions.
Std 19.51 ■ No revisions.

Std 19.52	■	Minor - Spelling correction
Std 19.53	■	No revisions.
Std 19.54	■	No revisions.
Std 19.55	■	No revisions.
Std 19.56	■	No revisions.

Chapter 23

Std 23.01	■	No revisions.
Std 23.02	■	No revisions.
Std 23.03	■	No revisions.

Chapter 24

Std 24.02	■	Separated into NOTES and DESIGNER NOTES
	■	Clarifed detail where longitudinal and transverse stiffener meet
	■	A couple of minor items in PART GIRDER ELEVATION
Std 24.03	■	No revisions.
Std 24.04	■	No revisions.
Std 24.06	■	No revisions.
Std 24.08	■	No revisions.
Std 24.09	■	No revisions.
Std 24.10	■	No revisions.
Std 24.11	■	Revised NOTES regarding deck pours (72 hours between pours is required)
	■	Cleaned up and clarified drawings
Std 24.12	■	No revisions.

Chapter 27

Std 27.02	■	No revisions.
Std 27.05	■	No revisions.
Std 27.06	■	No revisions.
Std 27.07	■	Cleaned up and rearranged notes
	■	Added 85 deg note, which was on insert sheet for many years
	■	Increased elastomer side cover to 1/4" to match standard spec
	■	Updated Diameter symbol to "DIA."
Std 27.08	■	Added Designer Note stating dim. 'X' of top plate 'A' is a minimum.
	■	Removed obsolete test reference for adhesive for TFE to steel plate
	■	Added reference to new standard 27.10 for Plate 'A' sizing
Std 27.09	■	Removed obsolete test reference for adhesive for TFE to steel plate
	■	Added reference to new standard 27.10 for anchor plate sizing
NEW Std 27.10	■	Bearing Details for Thermal Movement

Chapter 28

Std 28.01	■	Updated Diameter symbol to "DIA."
Std 28.02	■	No revisions.
Std 28.03	■	Removed note saying fabrication drawing is subject to approval of BOS
Std 28.04	■	No revisions.
Std 28.05	■	No revisions.
Std 28.06	■	No revisions.
Std 28.07	■	No revisions.
Std 28.08	■	No revisions.

Chapter 29

Std 29.01	■	Updated downspout materials note

Std 29.02 ■ Updated downspout materials note
Std 29.03 ■ Updated downspout materials note

Chapter 30

Std 30.02 ■ No revisions.
Std 30.04 ■ No revisions.
Std 30.05 ■ No revisions.
Std 30.07 ■ No revisions.
Std 30.08 ■ No revisions.
Std 30.09 ■ Updated Diameter symbol to "DIA."
Std 30.10 ■ No revisions.
Std 30.11 ■ Updated bid item for fencing placed on structures
Std 30.12 ■ No revisions.
Std 30.13 ■ No revisions.
Std 30.14 ■ No revisions.
Std 30.15 ■ No revisions.
Std 30.16 ■ No revisions.
Std 30.17 ■ No revisions.
Std 30.18 ■ No revisions.
Std 30.19 ■ No revisions.
Std 30.20 ■ No revisions.
Std 30.21 ■ No revisions.
Std 30.24 ■ No revisions.
Std 30.25 ■ No revisions.
Std 30.26 ■ No revisions.
Std 30.27 ■ No revisions.
Std 30.28 ■ No revisions.
Std 30.29 ■ No revisions
Std 30.30 ■ No revisions.
Std 30.31 ■ No revisions.
Std 30.32 ■ No revisions.
Std 30.33 ■ No revisions.
Std 30.34 ■ Added note "A1 abut. shown. See Standard 12.12 for A3 & A4 abut. details"
Std 30.35 ■ Added note "A1 abut. shown. See Standard 12.12 for A3 & A4 abut. details"
Std 30.36 ■ Added note "A1 abut. shown. See Standard 12.12 for A3 & A4 abut. details"
Std 30.37 ■ Added note "A1 abut. shown. See Standard 12.12 for A3 & A4 abut. details"

Chapter 36

Std 36.01 ■ No revisions.
Std 36.02 ■ No revisions.
Std 36.03 ■ Added top slab thickness and reinforcement requirements
■ Added a twin cell box culvert section
■ Clairified haunch details
Std 36.04 ■ No revisions.
Std 36.05 ■ No revisions.
Std 36.06 ■ No revisions.
Std 36.07 ■ No revisions.
Std 36.08 ■ No revisions.
Std 36.10 ■ No revisions.
Std 36.11 ■ Fixed graphic for Typical Joint Seal Detail (had undefined layers)
Std 36.12 ■ No revisions.
Std 36.13 ■ No revisions.

Std 36.14 ■ No revisions.
Std 36.15 ■ No revisions.
Std 36.16 ■ No revisions.

Chapter 37

Std 37.01 ■ No revisions.
Std 37.02 ■ No revisions.

Chapter 38

Std 38.01 ■ Noted that CP Rail has different requirements for crash walls, including a 600 kip load 6 feet above the rail, which this standard does NOT account for.

Chapter 39

Std 39.02 ■ No revisions.
Std 39.03 ■ Updated Diameter symbol to "DIA."
Std 39.09 ■ No revisions.
Std 39.10 ■ No revisions.
Std 39.11 ■ Updated Diameter symbol to "DIA."
Std 39.12 ■ No revisions.
Std 39.13 ■ No revisions.

Chapter 40

Std 40.01 ■ Changed SPV from "Concrete Masonry Deck Patching" to "Concrete Masonry Deck Repair"
Std 40.02 ■ No revisions.
Std 40.03 ■ Changed SPV from "Concrete Masonry Deck Patching" to "Concrete Masonry Deck Repair"
Std 40.04 ■ Showing overlay at joint and paving block pour. (change in collaboration with contractors)
Std 40.05 ■ No revisions.
Std 40.06 ■ No revisions.
Std 40.07 ■ No revisions.
Std 40.08 ■ No revisions.
Std 40.09 ■ No revisions.
Std 40.10 ■ No revisions.
Std 40.11 ■ No revisions.
Std 40.12 ■ No revisions.
Std 40.13 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 40.14 ■ No revisions.
Std 40.15 ■ No revisions.
Std 40.16 ■ No revisions.
Std 40.17 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 40.18 ■ No revisions.
Std 40.19 ■ Changed welded wire reinf. spec. from ASTM A497 to ASTM A1064
Std 40.20 ■ No revisions.
Std 40.21 ■ No revisions.
Std 40.22 ■ No revisions.
Std 40.23 ■ No revisions.
Std 40.24 ■ Updated Diameter symbol to "DIA."
Std 40.25 ■ No revisions.
Std 40.26 ■ No revisions.
Std 40.31 ■ No revisions.
Std 40.32 ■ Changed SPV from "Concrete Masonry Deck Patching" to "Concrete Masonry

Deck Repair"

Std 40.33

- Changed SPV from "Concrete Masonry Deck Patching" to "Concrete Masonry Deck Repair"