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 Span 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

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page Number(s)</th>
<th>Change</th>
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<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>Added clarification for non-standard parapets and superstructure types and add-ons.</td>
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<tr>
<td>6</td>
<td>25</td>
<td>Removed structural backfill plan note for new bridge construction. See Standard Detail 9.01 for notes.</td>
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<tr>
<td></td>
<td>38, 40</td>
<td>Updated bid item &quot;Concrete Masonry Deck Patching&quot; to &quot;Concrete Masonry Deck Repair&quot;</td>
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<tr>
<td>8</td>
<td>3</td>
<td>Removed Appendix 8-C from Table of Contents</td>
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<tr>
<td></td>
<td>5</td>
<td>Clarified language for submitting Stream Crossing SSR and hydraulic site report</td>
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<td></td>
<td>6</td>
<td>Added 2-year velocity to erosion control parameters</td>
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<td></td>
<td>9</td>
<td>Removed language about 14 ft/s velocities</td>
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<td></td>
<td>10</td>
<td>Added statement defining determination of freeboard</td>
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<td></td>
<td>17</td>
<td>Added statement regarding current versions of publications</td>
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<tr>
<td></td>
<td>17</td>
<td>Added link to current version of Item 113 to replace Appendix 8-C</td>
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<tr>
<td></td>
<td>17</td>
<td>Defined approach section location, for scour computations</td>
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<td></td>
<td>18</td>
<td>Added statement regarding vertical contraction scour</td>
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<td></td>
<td>22</td>
<td>Clarified language about first two abutment scour evaluation methods</td>
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<td></td>
<td>22-23</td>
<td>Introduced and briefly described NCHRP abutment scour evaluation method</td>
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<td>24</td>
<td>Added statement regarding NCHRP method results</td>
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<td>24</td>
<td>Changed language to indicate that first two abutment scour evaluation methods can be very conservative</td>
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<tr>
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<td>60-61</td>
<td>Removed Appendix 8-C content</td>
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<tr>
<td>9</td>
<td>3</td>
<td>Added concrete density as an influence on the modulus of rupture, fr</td>
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<td>11</td>
<td>Changed ASTM A497 to ASTM A1064 to reflect latest welded wire reinf. specification</td>
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<td>26</td>
<td>Adjusted date for moving Draft Bar Tables into Chapter</td>
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<td>26</td>
<td>Removed &quot;lightweight conc. factor&quot; and added &quot;conc. density modification factor&quot;, which had no effect on the draft bar tables</td>
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<tr>
<td>12</td>
<td>26</td>
<td>Revised load factor for superstructure (WS) - Service I</td>
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<td></td>
<td>32</td>
<td>Minor revisions to beam seat information</td>
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<tr>
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<td>33</td>
<td>Removed Figure 12.9-1 since the standards cover what was shown</td>
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<tr>
<td>13</td>
<td>8</td>
<td>Updated aesthetics info to only reference Chapter 4</td>
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<td>15</td>
<td>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.</td>
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<tr>
<td></td>
<td>13E - 2</td>
<td>Updated sentence to state that Example is current through AASHTO 2016 Interims</td>
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<tr>
<td>12</td>
<td>Corrected reference to Table in AASHTO LRFD Specification</td>
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<td>16</td>
<td>Added concrete density modification factor to modulus of rupture, $fr$, equation</td>
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<td>25</td>
<td>Added concrete density modification factor to shear resistance, $V_c$, equation</td>
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<td>27</td>
<td>Added concrete density modification factor to minimum transverse reinf. calculation</td>
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<td>25 Added concrete density modification factor to nominal shear resistance (two-way action), $V_n$, equation</td>
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<td>26,28,30,33 Added concrete density modification factor to modulus of rupture, $fr$, equation</td>
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<td>Added the standard name for placing heavy riprap</td>
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<td>Added reference to LRFD [3.8], where new wind speeds (3-second gust) are described.</td>
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<td></td>
<td>77 Added concrete density modification factor to allowable tensile stress calculation</td>
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<tr>
<td>18</td>
<td>Revised slab bridge on Interstate Policy Item</td>
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<td>12 Added concrete density modification factor to shear resistance, $V_n$, equation</td>
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<td>25-26 Added new lower limit for crack control bar spacing ($s$), and new upper limit for ($dc$)</td>
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<td>69 Added concrete density modification factor to shear resistance (two-way action), $V_r$, equation</td>
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<td>Added concrete density modification factor to tensile stress limit after losses calculation</td>
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<td>17 Added new coefficient to temporary compression stress limit calculation</td>
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<td>Added concrete density modification factor to modulus of rupture, fr, equation</td>
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<td>Added concrete density modification factor to minimum transverse reinf. calculation</td>
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<td>28,29</td>
<td>Added concrete density modification factor to nominal shear resistance, Vcw and Vci equations</td>
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<tr>
<td>6, 7</td>
<td>Minor text modifications</td>
<td></td>
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<td>27</td>
<td>Clarifies temperature range for bearing design, steel and prestressed</td>
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</tr>
<tr>
<td>4, 10</td>
<td>Removed reference to specific Edition of Construction Specifications</td>
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<td>5</td>
<td>Emphasized why Method B is currently not allowed</td>
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<td>6</td>
<td>Stated that all elastomeric bearings are to meet Zone D requirements</td>
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<tr>
<td>27E-1</td>
<td>Updated sentence to state that Example is current through AASHTO 2016 Interims</td>
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<tr>
<td></td>
<td>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</td>
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<td>36</td>
<td>Provided additional guidance for pedestrian and cattle underpasses</td>
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<tr>
<td>10, 11</td>
<td>Added concrete density modification factor to shear resistance, Vc, equation for culvert slabs</td>
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<tr>
<td>11, 12</td>
<td>Added concrete density modification factor to shear resistance, Vc, equation for culvert walls</td>
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<tr>
<td>12, 13</td>
<td>Added new lower limit for crack control bar spacing (s), and new upper limit for (dc)</td>
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<td>14</td>
<td>Added concrete density modification factor to modulus of rupture, fr, equation</td>
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<tr>
<td>27</td>
<td>Added minimum thickness requirement for box culvert top slabs</td>
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<tr>
<td>34</td>
<td>Clarified Shrinkage and Temperature reinforcement for box culverts</td>
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<tr>
<td>36E-1</td>
<td>Updated sentence to state that Example is current through AASHTO 2016 Interims</td>
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<tr>
<td>20</td>
<td>Change corner bar spacing from 7.5-inches to 7-inches to match negative steel and shrinkage and temperature spacing.</td>
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<tr>
<td>21</td>
<td>Added concrete density modification factor to modulus of rupture, fr, equation</td>
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<tr>
<td>24</td>
<td>Added note for the design of shrinkage and temperature bars</td>
<td></td>
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<tr>
<td>25</td>
<td>Updated reinforcement details</td>
<td></td>
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<tr>
<td>26</td>
<td>Updated detail per revised reinforcement</td>
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<tr>
<td>32, 33</td>
<td>Added concrete density modification factor to shear resistance, Vc, equation for culvert slabs</td>
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<tr>
<td>33, 34</td>
<td>Added concrete density modification factor to shear resistance, Vc, equation for culvert walls</td>
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<tr>
<td>40</td>
<td>Enhanced language regarding superstructure replacements</td>
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<tr>
<td>31</td>
<td>Corrected ACE reference [14.4.2.9] to [17.4.2.9]</td>
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<tr>
<td>45</td>
<td>Entire Chapter</td>
<td>Entire chapter was rewritten to put into a more logical order, as well as enhanced guidance for when and how to load rate bridges.</td>
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<tr>
<td>45E-1</td>
<td>Added clarifier, &quot;For LRFR&quot;</td>
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<tr>
<td>4, 6, 7, 9-12</td>
<td>Updated code references</td>
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<td>Changed &quot;including&quot; to &quot;included&quot;</td>
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<td>6</td>
<td>Removed maximum reinforcement check</td>
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<tr>
<td>8</td>
<td>Changed calculation of variable $d_s$ to include $c_{\text{bot}}$ defined previously</td>
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<tr>
<td>9</td>
<td>Changed &quot;and&quot; to &quot;an&quot;</td>
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<tr>
<td>10</td>
<td>Changed calculation of variable $d_s$ to include $c_{\text{top}}$ defined previously, and subtracted 0.5&quot; for wearing surface</td>
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<tr>
<td>12,17</td>
<td>Added concrete density modification factor to modulus of rupture, $f_r$, equation</td>
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<tr>
<td>14,24</td>
<td>Updated code references</td>
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<td>18</td>
<td>Added concrete density modification factor to nominal shear resistance, $V_{cw}$ and $V_{ci}$ equations</td>
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<tr>
<td>19</td>
<td>Formatted solution for $V_u$ and added units</td>
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<td>22</td>
<td>Added concrete density modification factor to tensile stress limit after losses calculation</td>
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<tr>
<td>23,24</td>
<td>Updated WBM references</td>
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<tr>
<td>45E -2</td>
<td>Added example LFR calculations for bridge defined in Example 45E1</td>
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<td>45E -3</td>
<td>Adjusted page break location</td>
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<tr>
<td>45E -4</td>
<td>Updated WBM references</td>
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<td>Updated page break location</td>
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<tr>
<td>45E -6</td>
<td>Updated code references</td>
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<tr>
<td>45E -7</td>
<td>Added example LFR calculations for bridge defined in Example 45E2</td>
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<tr>
<td>45E -8</td>
<td>Added example LFR calculations for bridge defined in Example 45E3</td>
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<tr>
<td></td>
<td>Added example LFR calculations for bridge defined in Example 45E4</td>
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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 ■ Clarified 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
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.
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
  - Clarified 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
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
  ▪ Clarified 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.
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"