MINUTES
OF
IOWA DOT SPECIFICATION COMMITTEE MEETING

November 18, 2021

Members Present:	Darwin Bishop	District 3 - Construction
	Roger Boulet	District 6 - Materials
	Mark Dunn	Contracts & Specifications Bureau
	Daniel Harness	Design Bureau
	Eric Johnsen, Secretary	Contracts & Specifications Bureau
	Wes Musgrove	Construction & Materials Bureau
	Scott Nixon	District 1 - Construction
	Mike Nop	Bridges & Structures Bureau
	Tom Reis, Chair	Contracts & Specifications Bureau
	Willy Sorensen	Traffic & Safety Bureau
	Christy VanBuskirk	Local Systems Bureau
Members Not Present:	Charlie Purcell	Project Delivery Division
Advisory Members Present:	Clayton Burke	Construction & Materials Bureau
	Ashley Buss	Construction & Materials Bureau
	Jeff Devries	Construction & Materials Bureau
	Paul Gielenfeldt	Marshall County
	John Hart	Construction & Materials Bureau
	Desiree McClain	Construction & Materials
	BureauLisa McDaniel	FHWA
	Brian Moore	Research
	Jesse Peterson	Construction & Materials Bureau
	Jeff Schmitt	Construction & Materials Bureau
	Steve Seivert	Bridges & Structures Bureau
	Melissa Serio	Construction & Materials Bureau
	Scott Sommers	Construction & Materials Bureau
	Paul Wiegand	SUDAS
	Cedric Wilkinson	Davenport RCE

The Specification Committee met on Thursday, November 18, 2021, at 9:00 a.m. Tom Reis, Specifications Engineer, opened the meeting. The items were discussed in accordance with the revised agenda dated November 10, 2021:

The minutes are as follows:

1. Article 1101.03, Definition of Terms.
Article 1105.04, Conformity with and Coordination of the Contract Documents.

The Design Bureau requested to include Special Provisions for Conformity with and Coordination of the Contract Documents in the Standard Specifications.

2. Article 2109.03, B, Treatment of Subgrade for Concrete Pavement (Natural Subgrade).
Article 2301.03, F, 3, Placing Concrete (Portland Cement Concrete Pavement).

The Construction and Materials Bureau requested to move subgrade and subbase wetting to Section 2301 and eliminate use of plastic film.

3. Article 2301.03, A, 3, a, 6, a,12, Vibrators (Portland Cement Concrete Pavement).

The Construction and Materials Bureau requested to accommodate more paving machines by updating the vibrator requirements.

4. Article 2301.03, E, 1, c, Placing Reinforcement (Portland Cement Concrete Pavement).

The Construction and Materials Bureau requested to specify an easier method of placing the top layer of steel for double reinforced pavement.

5. Article 2303.03, D, 6, d, Thickness (Acceptance of Asphalt Mixtures)
Article 2303.05 A, 3, d, Flexible Pavement (Basis of Payment, Pavement Thickness).

The Construction and Materials Bureau requested to clarify thickness measurement for flexible pavement.

6. Article 2310.02, A, 3, Concrete (Portland Cement Concrete Overlay).
Article 2413.02, C, Materials (Bridge Deck Surfacing, Repair, and Overlay).

The Construction and Materials Bureau requested to specify limestone aggregate for PCC overlays when the existing material is unknown.

7. Article 2310.03, B, 3, c, Pavement Scarification (Portland Cement Concrete Overlay).

The Construction and Materials Bureau requested to specify white pigmented liquid curing compound as a bond breaker for PCC overlay projects.

8. Article 2310.03, C, 2, a, Joints (Portland Cement Concrete Overlay)

The Construction and Materials Bureau requested to specify that all joints on PCC overlays are sealed unless directed otherwise.

9. Article 2510.03, A, 2, c, Portland Cement Concrete (Removal of Pavement).

The Construction and Materials Bureau requested to eliminate an incorrect specification reference that was obsolete.

10. Article 2526.03, A, 4, Bridges (Construction Survey).

The Construction and Materials Bureau requested to require survey information for bridges be submitted on the provided e-File spreadsheet.

11. Article 2527.03, F, Markings Obliterated During Construction.

The Construction and Materials Bureau requested to allow 5 days for replacing pavement markings obliterated during construction for milled rumble strip operations.

12. Article 2530.03, B, 3, a, 9, Portland Cement Concrete Patches (Partial Depth Finish Patches).

The Construction and Materials Bureau requested to eliminate the option for sawing transverse joints for partial depth PCC finish patches.

13. Article 2530.03, B, 3, b, 2, Placing PCC Patch Material (Partial Depth Finish Patches).

The Construction and Materials Bureau requested to eliminate tining of partial depth PCC finish patches and require grout around the outside of the patch.

14. Article 4151.03, B, 2, Galvanized Reinforcement.

The Construction and Materials Bureau requested to clarify the galvanizing of reinforcing bar hangers and deck hangers.

15. Section 4156 (New Section), Glass Fiber Reinforced Polymer Dowel Bars.

The Construction and Materials Bureau requested to add specifications for glass fiber reinforced polymer dowel bars as an alternative to steel dowels.

16. DS-15XXX, Multi-Component Liquid Pavement Markings.

The Construction and Materials Bureau requested approval of Developmental Specifications for Multi-Component Liquid Pavement Markings.

17. SS-15XXX, Primary and Interstate Pavement Smoothness.

The Construction and Materials Bureau requested approval of revisions to the Developmental Specifications for Primary and Interstate Pavement Smoothness and converting to a supplemental specification to allow inclusion on all projects that meet certain criteria.

18. DS-15085, Sliplining Existing Pipe Culverts.

The Construction and Materials Bureau requested approval of revisions to the Developmental Specifications for Sliplining Existing Pipe Culverts.

19. DS-15XXX, Electronic Ticketing.

The Construction and Materials Bureau requested approval of Developmental Specifications for Electronic Ticketing.

20. DS-15XXX, Ultra High Performance Concrete Connections.
DS-15XXX, Ultra High Performance Concrete Overlay.

The Bridges and Structures Bureau requested approval of Developmental Specifications for Ultra High Performance Concrete Connections and Developmental Specifications for Ultra High Performance Concrete Overlay.

21. DS-15XXX, Partial Removal of Existing Bridge Deck Using Hydrodemolition.

The Construction and Materials Bureau requested approval of Developmental Specifications for Partial Removal of Existing Bridge Deck Using Hydrodemolition.

Additional Items

22. Article 4195.02, A, Neoprene Bearing Pads.

The Construction and Materials Bureau requested to update neoprene bearing pad tolerances to comply with AASHTO M 251-06.

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IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Mike Kennerly / Daniel Harness	**Office:** Design	**Item 1**
Submittal Date: 9-27-2021	**Proposed Effective Date:** 4-19-2022	
Article No.: 1101.03 **Title:** Definition of Terms **Article No.:** 1105.04 **Title:** Conformity with and Coordination of the Contract Documents	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

1101.03, Definition of Terms.

Add to the definition of Contract (also Contract Documents):

- Digital contract files specified in the contract documents.

1105.04, A.

Add the Article and renumber following Articles:

4. Digital Contract Files. Shall apply only when digital files are available, and the Contractor uses automated machine control guidance.

4 5.
~~5~~ 6.
~~6~~ 7.
~~7~~ 8.
~~8~~ 9.
~~9~~ 10.
~~10~~ 11.
~~11~~ 12.

1105.04, E.

Add as the last sentence:

Field adjustment of digital contract files, if necessary, will be completed by the Engineer.

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use **~~Strikeout~~** and **Highlight**.)

1101.03, Definition of Terms.

Add to the definition of Contract (also Contract Documents):

- Digital contract files specified in the contract documents.

1105.04, A.

Add as a new number 4:

Digital Contract Files. Shall apply only when digital files are available and the Contractor uses automated machine control guidance.

Renumber 4 through 10 as 5 through 11.

1105.04, D.

Add as the last sentence:

Field adjustment of digital contract files, if necessary, will be completed by the Engineer.

Reason for Revision: To include Special Provisions for Conformity with and Coordination of the Contract Documents in the Standard Specifications. This gives digital contract files precedence over the plans when files are available and the contract has chosen to use automated machine control guidance.

The Design Bureau is developing an associated standard note that will be included in the plans.

New Bid Item Required (X one)	**Yes**	**No** X
Bid Item Modification Required (X one)	**Yes**	**No** X
Bid Item Obsoletion Required (X one)	**Yes**	**No** X
Comments:		
County or City Comments:		
Industry Comments:		

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IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 2**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2109.03, B **Title:** Natural Subgrade - Treatment of Subgrade for Concrete Pavement **Article No.:** 2301.03 F 3 **Title:** Portland Cement Concrete Pavement – Placing Concrete	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

2109.03, B, Treatment of Subgrade for Concrete Pavement.

Delete the Article and renumber the following Article:

~~**B. Treatment of Subgrade for Concrete Pavement.**~~

~~Unless the Engineer orders otherwise, ensure the subgrade, at the time of placing concrete for Concrete Pavement (Section 2301) or Concrete Base (Section 2201), is either:~~

- ~~In a uniform moist, but not muddy condition to a depth of not less than 1 inch, or~~
- ~~Covered with a single layer of plastic film meeting the requirements of Section 4107. Lap adjacent strips of plastic film by at least 12 inches. Do not stretch plastic film to the extent that its width is noticeably reduced. Plastic film which has been used for curing concrete, salvaged in usable condition, may be used for subgrade treatment.~~

~~**C**~~ **B. Special Compaction of Subgrade.**

2301.03, F, Placing Concrete.

Add the Article and **renumber** subsequent Articles:

3. Unless otherwise directed by the Engineer, wet subgrade or subbase just prior to placing concrete until it is uniformly moist to a depth of not less than 1 inch. Avoid excessive wetting resulting in a muddy condition of subgrade or ponding of water on subbase.

~~**3**~~ **4.**

~~**4**~~ **5.**

~~**5**~~ **6.**

~~**6**~~ **7.**

~~**7**~~ **8.**

~~**8**~~ **9.**

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

2109.03, B

~~**B. Treatment of Subgrade for Concrete Pavement.**~~

~~Unless the Engineer orders otherwise, ensure the subgrade, at the time of placing concrete for Concrete Pavement (Section 2301) or Concrete Base (Section 2201), is either:~~

- ~~In a uniform moist, but not muddy condition to a depth of not less than 1 inch, or~~
- ~~Covered with a single layer of plastic film meeting the requirements of Section 4107. Lap adjacent strips of plastic film by at least 12 inches. Do not stretch plastic film to the extent that its width is noticeably reduced. Plastic film which has been used for curing concrete, salvaged in usable condition, may be used for subgrade treatment.~~

~~**C**~~ **B. Special Compaction of Subgrade.**

2301.03, F

Increase bullet numbering of 3 and all subsequent bullet numbers

Insert the following as a new bullet 3:

Unless otherwise ordered by the Engineer, wet the subgrade or subbase just prior to placing concrete until it is uniformly moist to a depth of not less than 1 inch. Avoid excessive wetting resulting in a muddy condition of the subgrade or ponding of water on the subbase.

Reason for Revision: Wetting subgrade and subbase language for PCC pavement will be provided in 2301.03 F as it is done just prior to paving as part of the paving process. In addition, reference to placing plastic film will be deleted as this is no longer utilized as a construction practice. In addition, reference to subbase was added as both subgrade and subbase should be wetted prior to placing concrete pavement.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		
Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.		

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SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 3**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2301.03, A, 3, a, 6, (12) **Title:** Portland Cement Concrete Pavement – Vibrators	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: Construction and Materials Bureau indicated that they will be doing research to verify that the new specified range is producing a quality product.

Specification Section Recommended Text:
2301.03, A, 3, a, 6, a, 12.

Replace the second sentence:

Tilt trailing end of each vibrator downward to a~~n approximate~~ slope of ~~15~~ 10 to 30 degrees below horizontal.

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

(12) Mount longitudinal axis of vibrator body approximately parallel to direction of paving. Tilt trailing end of each vibrator downward to a~~n approximate~~ slope of ~~15~~ 10 to 30 degrees below horizontal.

Reason for Revision: There are various different pavers used in industry and not all of them have vibrators at approximately 15 degrees from horizontal; therefore, providing and acceptable range allows for accommodation of different equipment and setups while not compromising the intent of having the vibrator body immersed in the concrete pavement to provide an effective zone of vibratory influence.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x

Comments:

County or City Comments:

Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.

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IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 4**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2301.03, E, c **Title:** Portland Cement Concrete Pavement -Placing Reinforcement	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

2301.03, E, 1, c.

Replace the Article:

Use ~~approved~~ continuous bolsters with runners and continuous high chairs with runners, either plastic or steel, meeting requirements of Materials I.M. 451.01 to support reinforcement for bridge approach sections. Hold epoxy coated reinforcing steel in place with epoxy or plastic coated bar supports and epoxy or plastic coated tie wires. Steel reinforcement when supported and tied should not rack, shift, or deflect from its intended position.

1) For single reinforced sections and bottom layers of double reinforced sections, ~~P~~place supports transversely across the approach and space them ~~longitudinally~~ no greater than 4 feet apart.

2) For top layers of double reinforced ~~approach~~ sections, ~~the top layer of reinforcing may be chaired off the bottom layer of reinforcing using approved continuous high chairs with runners, provided they are positioned directly above the continuous bolsters with runners supporting the bottom layer of reinforcing. Hold epoxy coated reinforcing steel in place with epoxy or plastic coated bar supports and epoxy or plastic coated tie wires. Use continuous bolsters with runners and continuous high chairs with runners, either plastic or steel, meeting the requirements of Materials I.M. 451.01~~ place supports longitudinally on top of bottom layer and space them no greater than 4 feet apart.

Comments:

Member's Requested Change: **(Do not use 'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.)**

c. ~~Use approved continuous bolsters with runners to support reinforcement for bridge approach sections.~~ Use continuous bolsters with runners and continuous high chairs with runners, either plastic or steel, meeting the requirements of Materials I.M. 451.01 to support reinforcement for bridge deck approach sections. Hold epoxy

coated reinforcing steel in place with epoxy or plastic coated bar supports and epoxy or plastic coated tie wires. Steel reinforcement when supported and tied should not rack, shift, or deflect from its intended position.

1) For single reinforced sections and bottom layers of double reinforced sections, ~~P~~place supports transversely across the approach and space them ~~longitudinally~~ no greater than 4 feet apart.
2) For top layers of double reinforced ~~approach~~ sections, place supports longitudinally on top of the bottom layer and space them no greater than 4 feet apart.

~~the top layer of reinforcing may be chaired off the bottom layer of reinforcing using approved continuous high chairs with runners, provided they are positioned directly above the continuous bolsters with runners supporting the bottom layer of reinforcing. Hold epoxy coated reinforcing steel in place with epoxy or plastic coated bar supports and epoxy or plastic coated tie wires. Use continuous bolsters with runners and continuous high chairs with runners, either plastic or steel, meeting the requirements of~~ Materials I.M. 451.01~~.~~

Reason for Revision: With the current specification it is very difficult to construct the top layer of steel on a double reinforced section as it involves pulling up each transverse piece of steel and holding it up while tying it to the chaired longitudinal steel.

The proposed specification allows for a more constructable option of placing supports longitudinally on top of the bottom layer. This allows for the top layer of transverse steel to be placed directly on the supports and held up while it is being tied to the top layer longitudinal steel. Additionally, this option secures the transverse steel more rigidly in place as it provides direct support and does not solely rely on tie wires to hold it in position.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		
Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.		

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SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Ashley Buss / Jeff Schmitt	**Office:** Construction and Materials	**Item 5**
Submittal Date: 10/28/2021	**Proposed Effective Date:** April 2022	
Article No.: 2303.03, D, 6, d **Title:** Thickness (Acceptance of Asphalt Mixtures) **Article No.:** 2303.05 A, 3, d **Title:** Flexible Pavement (Basis of Payment, Pavement Thickness)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

2303.03, D, 6, d, Thickness.

Add the Article and **renumber** the existing Article:

3) Establish intended thickness daily with consideration given to field conditions and tie-in features.

3 4) When the quality index falls below 0.00, the Engineer may declare the lot or parts of the lot defective. If the final lift has not been placed, the Engineer may approve additional thickness to be placed on succeeding lifts to ensure a final grade as intended. The unit price of the defective lot will be used for payment of the additional material.

2303.05 A, 3, d, Pavement Thickness.

Replace the Article:

1) Payment will be further adjusted by the appropriate percentage in Table 2303.05-1 below according to the quality index for thickness determined for that lot:

$$QI_{Thickness} = \frac{\text{Average Thickness}_{Measured} - (\text{Thickness}_{Intended} - 0.5)}{\text{Maximum Thickness}_{Measured} - \text{Minimum Thickness}_{Measured}}$$

Table 2303.05-1: Payment Adjustment for Thickness

Quality Index (Thickness) 8 Samples	Percent of Payment
Greater than 0.34	100
0.14 to 0.34	95
0.00 to 0.13	85
Less than 0.00	75 maximum

2) Do not apply the quality index adjustment to a layer with a designated thickness of "variable" or "nominal", or to a layer designated as scratch course or leveling course. Do not apply the quality index adjustment to pavement layers designated in the contract documents as grade correction or cross slope correction. Place grade correction or cross slope correction layers as specified in the contract documents or as directed by the Engineer.

Comments:

Member's Requested Change: (Do not use **'Track Changes'**, or **'Mark-Up'**. Use ~~Strikeout~~ and Highlight.)

2303.05 A, 3, d.

d. Pavement Thickness

Payment will be further adjusted by the appropriate percentage in Table 2303.05-1 below according to the quality index for thickness determined for that lot:

$$QI_{Thickness} = \frac{\text{Average Thickness}_{Measured} - (\text{Thickness}_{Intended} - 0.5)}{\text{Maximum Thickness}_{Measured} - \text{Minimum Thickness}_{Measured}}$$

Table 2303.05-1: Payment Adjustment for Thickness

Quality Index (Thickness) 8 Samples	Percent of Payment
Greater than 0.34	100
0.14 to 0.34	95
0.00 to 0.13	85
Less than 0.00	75 maximum

Do not apply the quality index adjustment to a layer with a designated thickness of "variable" or "nominal", or to a layer designated as scratch course or leveling course. Do not apply the quality index adjustment to pavement layers designated in the contract documents as grade correction or cross slope correction. Place grade correction or cross slope correction layers as specified in the contract documents or as directed by the engineer.

2303.03, D, 6, d.

ADD THE FOLLOWING:

d. Thickness.

3) Establish the intended thickness daily with consideration given to field conditions and tie-in features.

~~3~~4) When the quality index falls below 0.00, the Engineer may declare the lot or parts of the lot defective. If the final lift has not been placed, the Engineer may approve additional thickness to be placed on succeeding lifts to ensure a final grade as intended. The unit price of the defective lot will be used for payment of the additional material.

Reason for Revision:

Reason for the 2303.05 A, 3, d. update:

The need for this update was discussed at the Strategic Asphalt Committee (SAC) meeting on

September 14, 2021. The proposed specification revision has been shared with DMEs and SAC members for feedback.

During flexible paving projects, grade corrections are occasionally required or requested. Grade correction in a sag or a crest in the road will create thicker or thinner sections, respectively. The quality index penalizes HMA placement that is too thick or too thin relative to the target thickness. The quality index penalty should not apply to areas where grade correction is required or requested by the engineer.

Reason for the 2303.03, D, 6, d. update:

The contractor must disclose (to inspector) the intended lift thickness at the beginning of daily paving, as it is the basis for making depth checks during paving, determining the validity of core samples for testing and calculating the quality index (Q.I.) for thickness. Include language to clarify that consideration must be given to adjustments made in the field (slope corrections, runouts, etc.) versus what may be shown on the plans, when enforcing Q.I. for thickness.

New Bid Item Required (X one)	**Yes**	**No** X
Bid Item Modification Required (X one)	**Yes**	**No** X
Bid Item Obsoletion Required (X one)	**Yes**	**No** X
Comments:		
County or City Comments:		
Industry Comments:		

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IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart / Jesse Peterson	**Office:** Construction & Materials	**Item 6**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2310.02, A, 3 **Title:** Portland Cement Concrete Overlay - Concrete **Article No.:** 2413.02, C Title: Materials	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text:

2310.02, A, 3.

Add to the end of the Article:

If existing pavement aggregate type cannot be determined or is not available, use limestone or dolomite coarse aggregate.

2413.02, C.

Add to the end of the Article:

Unless otherwise specified, use coarse aggregate that is the same type used in the existing bridge deck concrete or limestone or dolomite coarse aggregate.

Comments: The Geology Section recommended using “crushed carbonate” in place of “limestone” as it is more inclusive. The committee decided to use “limestone or dolomite” to be inclusive, but use more common terms.

Specification Section Recommended Text:

2310.02, A, 3.

Add to the end of the Article:

If existing pavement aggregate type cannot be determined or is not available, use limestone coarse aggregate.

2413.02, C.

Add to the end of the Article:

Unless otherwise specified, use coarse aggregate that is the same type used in the existing bridge deck concrete or limestone coarse aggregate.

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

2310.02, A, 3

3. Unless otherwise specified, use coarse aggregate for overlays over existing PCC pavement that is the same type of aggregate as the existing pavement. If the existing pavement aggregate type cannot be determined or is not available, use limestone coarse aggregate.

2413.02, C

C. Apply Sections 4110 and 4115 to the aggregates. Use only those coarse aggregates specifically allowed by Article 4115.05 for this work. Unless otherwise specified, use coarse aggregate that is the same type used in the existing bridge deck concrete or limestone coarse aggregate.

Reason for Revision: Limestone has the lowest coefficient of thermal expansion compared to other coarse aggregates in Iowa and therefore can be used universally as an overlay material.

The specification change is being requested to address one of the contributing causes of bridge deck overlay cracking. The existing Pavement Overlay Specification Section 2310 – "Portland Cement Concrete Overlay" was used as a template for the wording of this specification revision. If the existing bridge deck concrete coarse aggregate is not known, the revision indicates a default of limestone aggregate can be used. Limestone is known to be of the lowest coefficient of thermal expansion and is less subject to inducing cracking.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x

Comments:

County or City Comments:

Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 7**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2310.03, B, 3, c **Title:** Portland Cement Concrete Overlay – Pavement Scarification	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text:

2310.02, C, Seal Coat Bond Breaker.

Rename the Article and **replace** the Article:

~~Seal Coat~~ Bond Breaker.

~~Meet~~ Use white pigmented liquid curing compound meeting the requirements of Article ~~2307.02~~ 4105.05.

2310.03, B, 3, c, Seal Coat Bond Breaker.

Rename the Article and **replace** the Article:

~~Seal Coat~~ Bond Breaker.

Prior to placement of the PCC overlay, place two applications of ~~a seal coat bond breaker to scarified PCC surfaces per Article 2307.03 and as modified per Article 2316.03, B, 2, b~~ liquid curing compound on all scarified PCC patches or other PCC surfaces to be overlain. ~~Do not allow traffic on bond breaker before it has set.~~ Apply each coat evenly on the full area at a rate of 1 gallon per 200 square feet. If drying to the touch occurs within 10 minutes or rapid absorption into the scarified PCC surface is noted, then apply a third coat at a rate of 1 gallon per 200 square feet.

Comments: The Construction and Materials Bureau asked to clarify what surfaces are receiving the bond breaker, as there had been some confusion.

Specification Section Recommended Text:

2310.02, C, Seal Coat Bond Breaker.

Rename the Article and **replace** the Article:

~~Seal Coat~~ Bond Breaker.

~~Meet~~ Use white pigmented liquid curing compound meeting the requirements of Article ~~2307.02~~ 4105.05.

2310.03, B, 3, c, Seal Coat Bond Breaker.

Rename the Article and **replace** the Article:

~~Seal Coat~~ Bond Breaker.

Prior to placement of the PCC overlay, place two applications of ~~a seal coat bond breaker to scarified PCC surfaces per Article 2307.03 and as modified per Article 2316.03, B, 2, b~~ liquid curing compound on all scarified PCC surfaces. ~~Do not allow traffic on bond breaker before it has set.~~ Apply each coat evenly on the full area at a rate of 1 gallon per 200 square feet. If drying to the touch occurs within 10 minutes or rapid absorption into the scarified PCC surface is noted, then apply a third coat at a rate of 1 gallon per 200 square feet.

Comments:

Member's Requested Change: **(Do not use 'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.)**

c. ~~Seal Coat~~ Bond Breaker.

~~Prior to placement of the PCC overlay, place two applications of a seal coat bond breaker to scarified PCC surfaces per Article 2307.03 and as modified per Article 2316.03, B, 2, b. Do not allow traffic on bond breaker before it has set.~~

Place two coats of liquid curing compound meeting the requirements of 4105.05 on all scarified PCC surfaces prior to the placement of the PCC overlay. Apply each coat evenly on the full area at a rate of 1 gallon per 200 square feet. If drying to the touch occurs within 10 minutes or rapid absorption into the scarified PCC surface is noted, then apply a third coat at a rate of 1 gallon per 200 square feet.

Reason for Revision: Seal coat has been a difficult item to get bid and scheduled on PCC overlay projects as the quantity is generally small and sporadic. In 2020 on a PCC overlay, different bond breakers were evaluated to determine their effectiveness in preventing bond between a PCC overlay and scarified PCC surfaces. Application of a white pigmented curing compound as specified above was found to provided excellent bond breaking while being readily available and easily applied by the overlay contractor.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		

Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 8**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2310.03, C, 2, a **Title:** Portland Cement Concrete Overlay - Joints	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: District 1 asked if the specification needed to clarify that sealing is done before any traffic is allowed on the overlay. Article 2310.03 references the requirements of Section 2301, which includes sealing "before any portion of the pavement is opened to the Contractor's forces or to general traffic."

Specification Section Recommended Text:

2310.03, C, 2, a

Replace the Article:

~~Place~~ Saw joints as shown in the contract documents. Seal all joints unless directed otherwise.

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

a. ~~Place~~ Saw joints as shown in the contract documents. Seal all joints unless directed otherwise.

Reason for Revision:

Guidance does exist indirectly in the PV101 Standard; however, DOT staff has frequently asked this question on several overlay projects. In addition, upon field review it was noted that several projects have been constructed without sealing joints. This simple guidance should provide clear intent to designers and inspection staff and eliminate this question and oversite on overlay projects.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x

Comments:

County or City Comments:

Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Jesse Peterson	**Office:** Construction & Materials	**Item 9**
Submittal Date: October 2021	**Proposed Effective Date:** April 2022	
Article No.: 2510.03, A, 2, c **Title:** Portland Cement Concrete	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:
2510.03, A, 2, c.

Delete the last sentence:

~~Apply Article 1105.12, H, to use of this type of equipment.~~

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

2510.03, A, 2, c PORTLAND CEMENT CONCRETE.

c. When pavement removal is adjacent to a bridge, railroad crossing, or similar structure, do not use heavy breaking equipment within 20 feet or within the reinforced section at the bridge approach, whichever is larger or applicable. ~~**Apply Article 1105.12, H, to use of this type of equipment.**~~

Reason for Revision: Article 1105.12, H is no longer in the GS, and thus not supportive of item c.

The removal of the stricken sentence clarifies item c, and eliminates confusion due to a broken, and un-needed cross reference.

John Hart (PCC Field Engineer) and I have coordinated regarding the stricken sentence and we recommend its removal.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x

Comments:

County or City Comments:

Industry Comments:

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Jesse Peterson	**Office:** Construction & Materials	**Item 10**
Submittal Date: October 29, 2021	**Proposed Effective Date:** April 2022	
Article No.: 2526.03, A, 4, e & f **Title:** Bridges	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text:
2526.03, A, 4, Bridges.

Add the Article:

h. For bridges on Primary and Interstate routes, submit required information from Articles 2526.03, A, 4, e and f to the Engineer on the provided bridge e-File spreadsheet.

Comments: Clarified the required information to be on the provided spreadsheet.

Specification Section Recommended Text:
2526.03, A, 4, Bridges.

Add the Article:

h. For bridges on Primary and Interstate routes, submit required information to the Engineer on the provided bridge e-File spreadsheet.

Comments:

Member's Requested Change: (Do not use **'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.**)
2526.03, A, 4, e & f BRIDGES.

e. Submit elevations of all completed substructure beam seats to the Engineer for review prior to installation of bearings and superstructure elements. **For Bridges on Primary and Interstate routes, submit the specified information on the provided bridge e-File spreadsheet.**

f. Take elevations of beams as erected. Develop proposed final deck grades for review by the Engineer on an Excel spreadsheet format. Provide proposed final deck grades to the Engineer for determination of required deck grade adjustments and approval of final deck grades for deck construction. **For Bridges on Primary and Interstate routes, submit the specified information on the provided bridge e-File spreadsheet.** Locations for determining beam elevations are to be according to the plans.

Reason for Revision: For Primary and Interstate bridges CMB has been seeing an increase in Contractors not submitting beam seat and deck grade elevations on the provided e-Files. In some instances, they have been submitted in pdf form. The revision is to eliminate possible data entry errors in the transfer of the as provided data to the provided e-File spreadsheets for proper review by the Engineer. The revision is to also eliminate the possible conflict of the request to receive the information on the provided e-Files.

We propose to limit this to Primary and Interstate bridges where e-Files should be supplied as a matter of protocol, with the understanding that a majority of the local systems bridges do not supply e-Files.		
New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		
Industry Comments:		

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Clayton Burke	**Office:** Construction and Materials	**Item 11**
Submittal Date: Oct 29, 2021	**Proposed Effective Date:** April 2022	
Article No.: 2527.03, F **Title:** Pavement Markings	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

2527.03, F, Markings Obliterated During Construction.

Add the Article:

6. Pavement markings disturbed by milled rumble strip operations shall be replaced within 5 working days from the day markings are disturbed.

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

2527.03 construction.

F. Markings Obliterated during Construction.

1. On sections of pavement open to traffic, place pavement markings where operations have obliterated existing markings.

2. On Primary and Interstate highways, replace pavement markings before the lane or road is opened to traffic in the following situations:

- **a. Multi-Lane Roads:**
  - **1) Divided.**
    - **a)** Lane lines obliterated for 50 feet or more.
    - **b)** Edge lines obliterated for 50 feet or more.
  - **2) Undivided (Three or More Lanes) or Road with Continuous Two-Way Left-Turn Lane.**
    - **a)** Lane lines obliterated for 50 feet or more.
    - **b)** Edge lines obliterated for 50 feet or more.
    - **c)** Center lines obliterated for 50 feet or more.
- **b. Two Lane Roads:**
  - **1)** Edge lines obliterated for 50 feet or more.
  - **2)** Center lines obliterated for 50 feet or more.
  - **3)** No Passing Zone lines obliterated.

3. On other roadways, centerline markings obliterated during construction shall be replaced within 3 calendar days after the operation that obliterated the markings has been completed within the entire project limits. Place traffic control as shown in the contract documents.

4. Within 3 working days from the day the pavement and shoulder work are completed for the project, place edge lines that are not required to be placed before the lane or road is opened to traffic. Place remaining pavement markings within 3 working days from the day the road work is completed for the project.

5. Place symbols and legends within 5 working days from the day the road is open to traffic.

6. Pavement markings disturbed by milled rumble strip operations shall be replaced within 5 working days from the day the markings are disturbed.

Reason for Revision: The revision, proposed by the Work Zone Safety Committee, allows contractors to stage their work such that a mobilization of their paint crew is only necessary once per week. Milled rumble strip operations were reviewed prior to the replacement of the pavement markings, and the area disturbed by the milled rumble strips was not found to confuse the image or function of the markings.

New Bid Item Required (X one)	**Yes**	**No**
Bid Item Modification Required (X one)	**Yes**	**No**
Bid Item Obsoletion Required (X one)	**Yes**	**No**
Comments:		
County or City Comments:		
Industry Comments:		

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 12**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2530.03, B, 3, a, 9 **Title:** Partial Depth Finish Patches – Portland Cement Concrete Patches	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments:

Specification Section Recommended Text:
2530.03, B, 3, a, 9.

Replace the Article:

Recreate a joint or crack in the patch area with a joint board of the proper size and shape. Extend the board to the bottom of the area to be patched, so as to separate completely all patching material on both sides. Use a board of a width approximately equal to the joint or crack. For wide openings, several thicknesses may be used. ~~For patches 6 feet or greater in length:~~

~~**a)**~~ Longitudinal joints for patches 6 feet or greater in length may be reestablished by sawing to a depth of 1/3 the pavement thickness.

~~**b) With approval of the Engineer, transverse joints may be reestablished by sawing the full depth of the patch when use of a form board will not allow complete separation of patch material on both sides of joint.**~~

Comments: None.

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and Highlight.)

9) Recreate a joint or crack in the patch area with a joint board of the proper size and shape. Extend the board to the bottom of the area to be patched, so as to separate completely all patching material on both sides. Use a board of a width approximately equal to the joint or crack. For wide openings, several thicknesses may be used. ~~For patches 6 feet or greater in length:~~

~~**a)**~~ Longitudinal joints for patches 6 feet or greater in length may be reestablished by sawing to a depth of 1/3 the pavement thickness.

~~**b) With approval of the Engineer, transverse joints may be reestablished by sawing the full depth of the patch when use of a form board will not allow complete separation of patch material on both sides of joint.**~~

Reason for Revision: There have been issues related to premature failure of PCC partial depth

patches. Field review has identified that sawing was occurring frequently on transverse joints. This has resulted in the transverse joint not matching width or exact location of the underlying joint nor being deep enough, resulting in contraction and expansive stress being placed of the partial depth patch and leading to failure. By eliminating this practice, risk of failure will be reduced, and construction practices will become more consistent.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		
Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.		

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 13**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: 2530.03, B, 3, b, 2 **Title:** Partial Depth Finish Patches – Placing PCC Patch Material	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

2530.03, B, 3, b, 2.

Replace the last sentence of the Article:

~~Texture patches longer than 1 foot in the manner of the adjacent pavement surface.~~ Apply broom finish to patch surface and then apply a heavy application of grout around perimeter of patch. Position grout so 1 inch is over surrounding pavement and 3 inches is over the patch.

Comments:

Member's Requested Change: (Do not use **'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.**)

2) Place the properly mixed material in the patch area. Consolidated and work into place in a manner that will provide good bonding. Level it with the adjacent pavement to provide a smooth riding surface not varying from existing pavement surface by more than 1/8 inch when measured with a 10 foot straightedge placed over patch. Replace or grind patch to correct deficiencies. ~~Texture patches longer than 1 foot in the manner of the adjacent pavement surface~~. Apply a broom finish to the patch surface and then apply a heavy application of grout around the perimeter of the patch. Position the grout so 1 inch is over the surrounding pavement and 3 inches is over the patch.

Reason for Revision: Partial patches observed had extremely variable and mottled textures, a broom finish is adequate on small repairs of this nature and will simplify construction and not gouge the surface by trying to replicate tining.

Edges of patches can sometimes have voids or pull slightly away from the pavement interface. The grout provides a seal of the edges of the pavement patch interface. This method is used and specified by Minnesota DOT who developed partial depth patch repair procedures.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x

Comments:

County or City Comments:

Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Jesse Peterson	**Office:** Construction & Materials	**Item 14**
Submittal Date: October 2021	**Proposed Effective Date:** April 2022	
Article No.: 4151.03, B, 02 **Title:** Galvanized Reinforcement	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:
4151.03, B, 2.

Replace the Article:

Galvanize reinforcing bar hangers, tie wires, and wire or pressed steel chairs to be used with galvanized reinforcing steel. Either turn up or coat the ends of chairs which may be exposed in the finished concrete. Stainless steel chairs, plastic coated carbon steel chairs, or other types of chairs may be approved by the Engineer. ~~Galvanizing of hangers is optional (required only when to remain exposed), according Article 2412.03, A.~~

Comments:

Member's Requested Change: (Do not use **'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.**)

4151.03, B, 02 GALVANIZED REINFORCEMENT.

2. Galvanize **reinforcing bar hangers,** tie wires and wire or pressed steel chairs to be used with galvanized reinforcing steel. Either turn up or coat the ends of chairs which may be exposed in the finished concrete. Stainless steel chairs, plastic coated carbon steel chairs, or other types of chairs may be approved by the Engineer. **~~Galvanizing of hangers is optional (required only when to remain exposed), according Article 2412.03, A.~~**

Reason for Revision: The revision clarifies that the term "hangers" being referenced to is for "reinforcing bar hangers" such as when reinforcing bar is supported by hanging from above, and not to deck hangers. This clarification brings item 2 into coordination with the overall specification section: "Galvanized Reinforcement". This terminology has been a source of confusion in the field. Additionally, we desire to minimize contact of dissimilar metals with one another, including galvanized reinforcing bars with non-galvanized hangers, ties, and chairs. See email with Ahmad Abu-hawash.

This revision also removes the end sentence which is not applicable to the current section as the statement pertains to "deck hangers". Removal also eliminates conflict with section 2412.03, A, 2, which requires deck hangers to be galvanized due to deterioration concerns with respect to embedded items.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x

Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		
Industry Comments:		

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / John Hart	**Office:** Construction & Materials	**Item 15**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Section No.: 4156 (New Section) **Title:** Glass Fiber Reinforced Polymer Dowel Bars	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

4156, Glass Fiber Reinforced Polymer Dowel Bars.

Add the Section:

4156. 01 Description.

Dowels consisting of a single uncoated non-metallic material, glass fiber reinforced polymer. Use only in load transfer assemblies for CD joints and individual dowels for dowel bar retrofits on non-Interstate PCC pavements with 20 year design truck traffic of less than 1000 per day, as approved by the Engineer.

4156. 02 General Requirements.

A. Use the size and type specified in the contract documents. Meet the requirements for the type and use specified.

B. Approved manufacturers and suppliers are listed in Materials I.M. 451.03B, Appendix C.

C. Comprised of a single nonmetallic material meeting the following requirements:

1. Glass fiber content greater than 70%, per ASTM D2584.

2. Glass transition midpoint temperature ≥ 212°F, per ASTM E1356.

3. Long term absorption at 122°F ≤ 1.0%, per ASTM D570.

4. Transverse shear strength ≥ 19,000 psi, per ASTM D7617.

5. Mean tensile modulus of elasticity ≥ 6,500,000 psi ASTM D7205.

6. No deformation, burrs, or projections on ends of cut dowels.

7. Uncoated diameter measured at both ends and third points with the average not to exceed -1/16 inch of specified diameter.

8. Uncoated length measured end to end not to exceed +/-1/4 inch of specified length.

9. Average approach and leave section deflections not to exceed 7.5 mils at 1 million cycles and not to increase by more than 3.5 mils at 10 million cycles when tested according to Annex A of ACPA T253 PTM No. 642.

D. Coated with a bond-breaker as described in Article 4151.02, B, 5 unless pull-out forces do not exceed 3000 pounds for any specimen, and no specimen shows any surface tears or perforation due to the pullout testing when tested in accordance with the provisions of Section 6 ACPA T 253-21 (no salt/freeze exposure).

E. Protect dowels in dowel assemblies stored outdoors, longer than 90 days either at fabricator or project site, from UV exposure with a suitable tarp/covering. Record on an identification tag the date dowel assemblies were placed outdoors.

F. Store dowel assemblies off the ground on pavement or wood supports. When stacking is necessary, place wood supports between assemblies or other method to ensure a stable stack.

G. Friction fit or clipped into assemblies to ensure stability and prevent dowels from becoming misaligned during handling and placement.

Comments:

Member's Requested Change: (Do not use 'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.)

Section 4156. Glass Fiber Reinforced Polymer Dowel Bars

4156. 01 Description
Dowels comprised of a single uncoated non-metallic material, glass fiber reinforced polymer. Use only in load transfer assemblies for CD joints and individual dowels for dowel bar retrofits on non-interstate primary PCC pavements with 20-year design truck traffic of less than 1,000 per day, as approved by the Engineer.

4156. 02 General Requirements

A. Use the size and type specified in the contract documents. Meet the requirements for the type and use specified.

B. Approved manufacturers and suppliers are listed in Materials I.M. 451.03B, Appendix C.

C. Comprised of a single nonmetallic material meeting the following requirements:

a. Glass fiber content greater than 70%, per ASTM D2584
b. Glass transition midpoint temperature ≥ 212 °F, per ASTM E1356
c. Long term absorption at 122°F ≤ 1.0%, per ASTM D570
d. Transverse shear strength ≥ 19 000 psi, per ASTM D7617
e. Mean tensile modulus of elasticity ≥ 6,500,000 psi ASTM D7205
f. No deformation, burrs, or projections on ends of cut dowels
g. Uncoated diameter measured at both ends and third points with the average not to exceed - 1/16 inch of specified diameter
h. Uncoated length measured end to end not to exceed +/- ¼ inch of specified length
i. Average approach and leave section deflections not to exceed 7.5 mils at 1 million cycles and not to increase by more than 3.5 mils at 10 million cycles when tested according to Annex A of ACPA T253 PTM No. 642.

D. Coated with a bond-breaker as described in 4151.02 B 5 unless pull-out forces do not exceed 3,000 pounds for any specimen, and no specimen shows any surface tears or perforation due to the pullout testing when tested in accordance with the provisions of Section 6 ACPA T 253-21 (no salt/freeze exposure).

E. Protect dowels in dowel assemblies stored outdoors, longer than 90 days either at fabricator or project site, from UV exposure with a suitable tarp/covering. Record on an identification tag the date dowel assemblies were placed outdoors.

F. Store dowel assemblies off the ground on pavement or wood supports. When stacking is necessary, place wood supports between assemblies or other method to ensure a stable stack.

G. Friction fit or clipped into assemblies to ensure stability and prevent dowels from becoming misaligned during handling and placement.

Reason for Revision: Steel dowels have been in short supply the past construction season and the addition of this article offers another viable option to provide load transfer in PCC pavements. Application has been limited to lower volume roadways as research and load testing has not progressed above 10 million load cycles at this time. Requirements have been derived from guidance from ACPA, research reports, and existing ASTM Standards. It is anticipated in the future that an ASTM Standard for glass fiber polymer reinforced dowels will be released. Upon release it is anticipated that much of the language provided can be referenced directly to this standard. This was placed as a new section so that it could be competitively bid and provided as an option on all applicable projects.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		
Industry Comments: Reviewed with ICPA and members – in agreement. This has been shared with the ICPA/members. No negative comments have been received.		

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Clayton Burke	**Office:** Construction and Materials	**Item 16**
Submittal Date: Oct 29, 2021	**Proposed Effective Date:**	
Article No.: **Title:**	Other: Multicomponent Pavement Markings DS	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 2/15/2022

Specification Committee Approved Text: See attached Developmental Specifications for Multi-Component Liquid Pavement Markings.

Comments: Clayton Burke will be the controller for this DS.

District 3 questioned the sequence of placing temporary markings and grooving on a new asphalt surface, since the permanent pavement markings must wait 2 weeks. DS was clarified that temporary pavement markings should be placed before grooving, so that the temporary pavement markings do not need to be removed or cause issues with the permanent pavement markings adherence.

The modified road standards were added to the DS, as has been done with the SPs.

Specification Section Recommended Text: See attached Developmental Specifications for Multi-Component Liquid Pavement Markings.

Comments: Modified Road Standards will be included in the DS until they are incorporated into the regular Standard Road Plans.

Member's Requested Change: (Do not use **'Track Changes'**, or **'Mark-Up'**. Use ~~Strikeout~~ and Highlight.)

See attachment

Reason for Revision:

The pavement marking taskforce is proposing to transition the multicomponent pavement markings special provision to a developmental specification.

New Bid Item Required (X one)	**Yes**	**No** X
Bid Item Modification Required (X one)	**Yes**	**No** X
Bid Item Obsoletion Required (X one)	**Yes**	**No** X

Comments:

County or City Comments:

Industry Comments:

DS-15089
(New)

DEVELOPMENTAL SPECIFICATIONS
FOR
MULTI-COMPONENT LIQUID PAVEMENT MARKINGS

Effective Date
February 15, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

15089.01 DESCRIPTION.

Provide reflectorized white and yellow multi-component, 100% solids multi-component liquid pavement markings that are free of toxic heavy metals for installation on asphalt and PCC pavement surfaces.

15089.02 MATERIALS.

A. General.

1. Apply multi-component liquid pavement markings in accordance with Article 2527.01 of the Standard Specifications.

2. Use materials capable of producing pavement markings with a wet-film thickness (WFT) of at least 20 mils. Apply at a greater WFT as recommended by the material manufacturer based on pavement type, pavement composition, environmental conditions, placement within a rumble, and other relevant factors. The following is a list of approved products. The Contractor may use an approved equal product pursuant to meeting all other areas of this specification.
   - HPS-3/ HPS-4 manufactured by Ennis-Flint, Inc.
   - 3180 Series MFUA-10 manufactured by SWARCO
   - LS65qs manufactured by Epoplex

3. Provide materials in accordance with the retroreflectivity requirements below.

Table 15089.02-1: Minimum Initial Retroreflectivity Requirements

Minimum Coefficient of Retroreflected Luminance	
White lines, Symbols, and Legends	400 mcd/sq. m/lux
Yellow lines	250 mcd/sq. m/lux

4. Provide yellow markings distinguishable from white markings in the dark.

5. Mix individual components before use if stored for more than 12 months.

B. Multi-Component Liquid Material.

1. Provide multi-component liquid material meeting the following requirements and characteristics:
- **a.** Composed only of multi-component liquids and pigments,
- **b.** Does not emit or leach solvents into the environment upon application to a pavement surface,
- **c.** The infrared spectrum for all components shall match the reference sample provided by the manufacturer for the product tested and approved by the Department,
- **d.** Free of lead, cadmium, mercury, hexavalent chromium, and other toxic heavy metals as defined by the EPA,
- **e.** White material no darker than or no yellower than 17778 of Federal Standard Number 595C Colors,
- **f.** Daytime color of the yellow epoxy meeting the following CIE chromaticity limits using illuminant "D65/2":

Table 15089.02-2: Daytime Chromaticity Coordinates

Daytime Chromaticity Coordinates (Corner Points) - Yellow				
	1	**2**	**3**	**4**
x	0.470	0.485	0.520	0.480
y	0.440	0.460	0.450	0.420

- **g.** White daylight directional reflectance (Y) of least 83%,
- **h.** Yellow daylight directional reflectance (Y) of at least 50%,
- **i.** Nighttime color of yellow meeting the following chromaticity limits in ASTM D 6628:

Table 15089.02-3: Nighttime Chromaticity Coordinates

Nighttime Chromaticity Coordinates (Corner Points) - Yellow				
	1	**2**	**3**	**4**
x	0.575	0.508	0.473	0.510
y	0.425	0.415	0.453	0.490

- **j.** Contrast ratio of 0.98 or greater when measured on a black/white drawdown card at 15 mils WFT application rate.

2. Provide shadow lane line markings (legend BLB6 or BLC6) according to attached modified Standard Road Plans. Black epoxy should satisfy color chip 37038 of Federal Standard 595B and have similar quality as the white and yellow multi-component pavement markings. An anti-skid material shall be incorporated with the shadow line marking at a minimum rate of 15 pounds per gallon.

3. Adhesion Capabilities.
Provide material meeting the adhesion requirements of the ACI Committee 403 when tested on PCC. Apply multi-component liquid pavement markings during the test to concrete pavements with a tensile strength of at least 300 psi and ensure the failure of the system occurs in the concrete during testing.

4. Abrasion Resistance.
Provide material with an abrasion resistance wear index no greater than 82 when tested in accordance with ASTM C 501 with a CS 17 wheel under a load of 1000 g for 1000 cycles. The Department defines the wear index as the weight in milligrams of material abraded from the sample under the test conditions.

5. **Hardness.**
   Provide material with a Type D durometer hardness from 75 to 90 when tested in accordance with ASTM D 2240 after curing for 72 hours at 73°F ±4°F.

6. **Tensile Strength.**
   For epoxy-amine based multicomponent systems, including variations of this base chemistry, provide material with a tensile strength of at least 6000 psi when tested in accordance with ASTM D 638 after curing for 72 hours at 73°F ±4°F. For polyurea based multicomponent systems provide material with a tensile strength of at least 3000 psi when tested in accordance with ASTM D 638 after curing for 72 hours at 73°F ±4°F.

7. **Compressive Strength.**
   For epoxy-amine based multicomponent systems, including variations of this base chemistry, provide material with a compressive strength of at least 12,000 psi when tested in accordance with ASTM D 695 after curing for 72 hours at 73°F ±4°F.

C. Retroreflective Media.

1. Provide first drop wet media per the minimum rate shown for each product below. Use one of the following products for all grooved: edge lines, white broken lines, ramp edge lines, and lane drop lines:
   - 3M Connected Roads All Weather Elements Series 70E or 50E: Minimum rate 5 pounds per gallon
   - Potters VisiUltra 455: Minimum rate 8 pounds per gallon
   - SWARCO DURALUX 334/ 334 Plus: Minimum rate 8 pounds per gallon

2. Provide second drop glass spheres with the following gradation on all lines except for black broken lane lines:

Table 15089.02-4: Utah Blend Gradation

Sieve Size	% Passing
No. 18	65-80
No. 30	30-50
No. 50	0-5

   a. Glass spheres shall be dual coated.
   b. Apply glass spheres at a minimum rate of 15 pounds per gallon. Application rate shall provide required minimum levels of retroreflectivity in accordance with Table 15089.02-1.

3. Provide beads packaged in moisture-proof, multi-wall shipping bags, and in containers marked with the following information:
   a. Manufacturer name,
   b. Manufacturer address,
   c. Type of treatment,
   d. Batch number, and
   e. Date of manufacture.

D. Sampling and Testing.

1. Test daylight directional reflectance and color meeting the requirements of ASTM E 1349.

2. Provide 1 pint samples of each manufacturer's lot or batch of material when manufactured to an independent lab for this testing. NTPEP data may be substituted if the product has not changed from initial submittal to NTPEP for evaluation of these products.

3. Submit to the Engineer a manufacturer's Certificate of Compliance for all components of the multi-component liquid pavement marking system.

4. Mark containers with the following information:
   a. Name of manufacturer,
   b. Product identification number,
   c. Lot or batch number,
   d. Date of manufacture,
   e. Color, and
   f. Net weight of contents.

15089.03 CONSTRUCTION.

A. General.

1. The contract documents will specify quantity, locations, and type of pavement markings required.

2. Allowable painting dates will be from April 8th to October 22nd. Minimum pavement surface temperatures for application of pavement markings shall be 40°F and rising.

3. For all pavement markings, ensure pavement surface is dry and free from dirt, dust, oil, curing compound, and other contaminates which may interfere with markings properly bonding to the surface. Ensure the clean surface is at least 1 inch wider than anticipated marking. Shoot an air blast on the pavement surface immediately prior to placing new marking. Air blast is not intended to remove large amounts of dust, but only a very small amount of residue that might be left from removal and cleaning operation.

4. For pavement markings placed on a new asphalt surface, install any necessary temporary pavement markings, and wait a minimum of 2 weeks from the day the surface is completed before installing permanent markings.

5. Ensure the following for all painted pavement markings:
   - Uniform thickness
   - Uniform distribution of glass beads throughout the line width,
   - Line widths as specified, with a tolerance of ± 1/2 inch for all lines,
   - Markings have sharp edges and cutoffs at the ends.

B. Grooving.

1. Perform grooving after surface corrections for pavement smoothness, shouldering, and fog sealing have been completed.

2. Grooved in lines shall be 80 mils with a tolerance of ±10 mils in depth and the width of the line plus 1 inch with a tolerance of ± 1/8 inch.

3. Equipment shall be capable of recessing the total width of the recess in one pass. Ensure the bottom of the groove has a fine corduroy-like texture. The maximum allowable rise between the high and low points across the width of the groove is 10 mils.

4. Do not place temporary pavement markings within grooves.

C. Traffic Control.
Apply the provisions of Section 2528 of the Standard Specifications to traffic control for removing

and placing painted and taped pavement markings, along with the following additional requirements:

1. Place traffic control devices on the roadway before removal operations have commenced. Leave traffic control devices in place through the completed curing time of the newly applied pavement markings.

2. Do not close any longer length of lane than can be adequately removed and replace in a single working day.

3. For painted pavement markings, do not remove traffic control devices until the newly applied pavement markings are tack free.

D. Final Inspection
Provide an acceptable, calibrated 30 meter geometry (100 feet), retroreflectometer to use on the project which will remain the property of the Contractor. In the presence of the Engineer, measure the retro-reflectivity of the pavement markings. Take a minimum of five randomly spaced readings per line type every 1 mile. The average minimum retro-reflectivity per mile shall be as per table 1 from Article 15089.02, A, 3.

E. Defective Pavement Markings.

1. Markings that are low on initial retroreflectivity up to 20% may, at the discretion of the Engineer, be accepted with a price adjustment.

2. Repair, at no additional cost to the Contracting Authority, all pavement markings which, after application and curing, the Engineer determines to be defective and not in conformance with these specifications. Remove the defective markings completely and clean to the underlying pavement surface according to the requirements of Article 2527.03, C of the Standard Specifications. Remove the defective area plus all adjacent marking material extending 1 foot in any direction. After surface preparation work is complete, finish the repair by reapplying new marking material over the cleaned pavement surface according to the requirements of these specifications.

15089.04 METHOD OF MEASUREMENT.

A. Measurement for pavement markings and grooves cut, satisfactorily placed, or approved, will be as follows:

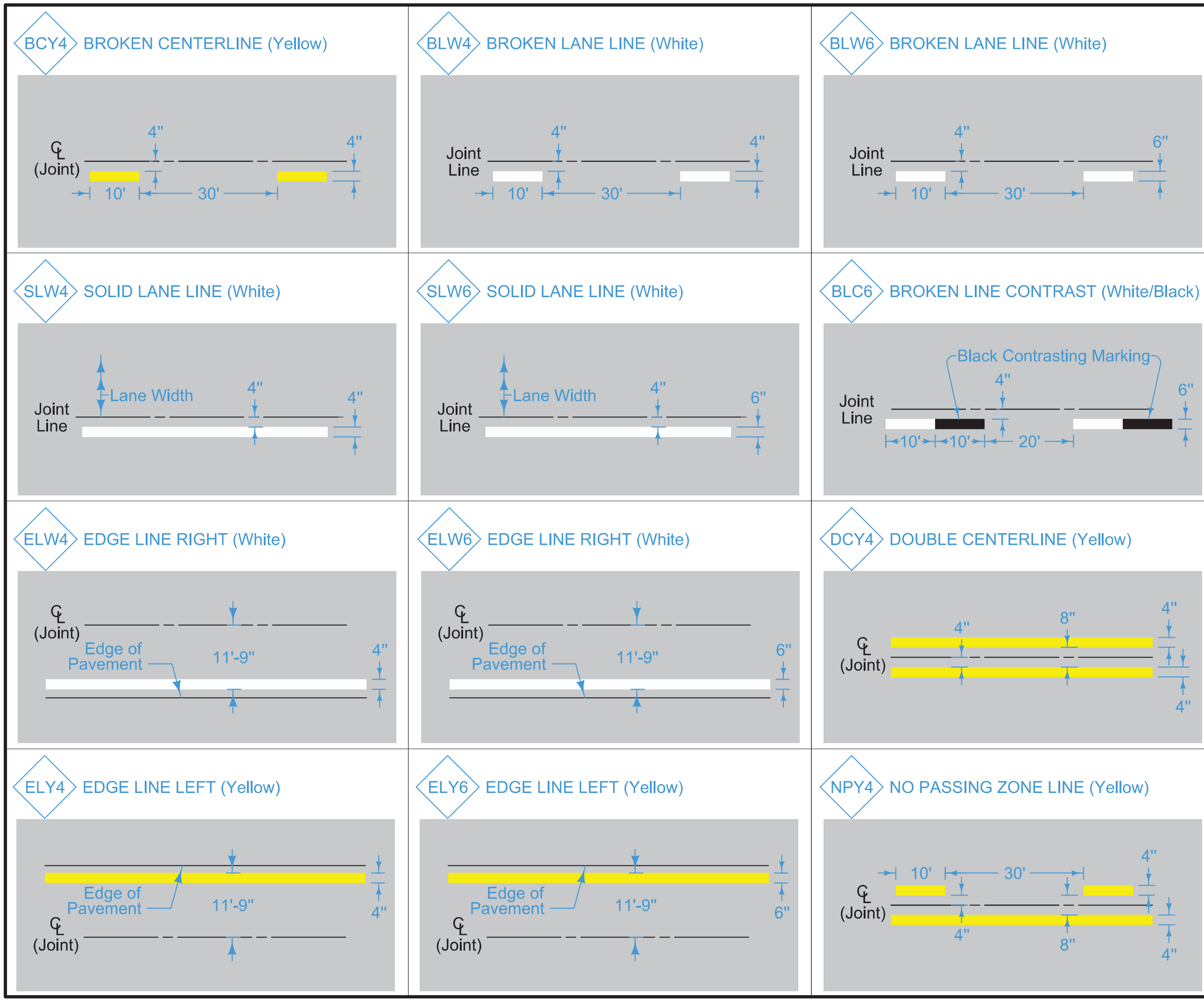
1. **Painted Pavement Markings, Multi-Component Liquid.**
Stations placed.

2. **Grooves Cut for Pavement Markings.**
Stations. This quantity will be equivalent to the number of stations measured for the pavement markings. Additional width and transition length will be incidental.

B. The Engineer will measure the number of stations, based on a single 6 inch width of line. The length of markings will be determined using beginning and ending points, and adjusting for breaks at ramps, station equations, or other locations shown in the contract documents. The measurement for dashed and dotted lines will be adjusted to exclude skips. Measurement of lines wider than 6 inches will be adjusted by the quantity factor to a 6 inch line.

15089.05 BASIS OF PAYMENT.

Painted Pavement Markings, Multi-Component Liquid and Grooves Cut for Pavement Markings will be paid for per Article 2527.05 of the Standard Specifications.



Lane layouts shown are typical.

Centerlines and lane lines may be painted either side of centerline.

Drawings on sheets 1 to 3 are oriented to represent direction of traffic moving from left to right.

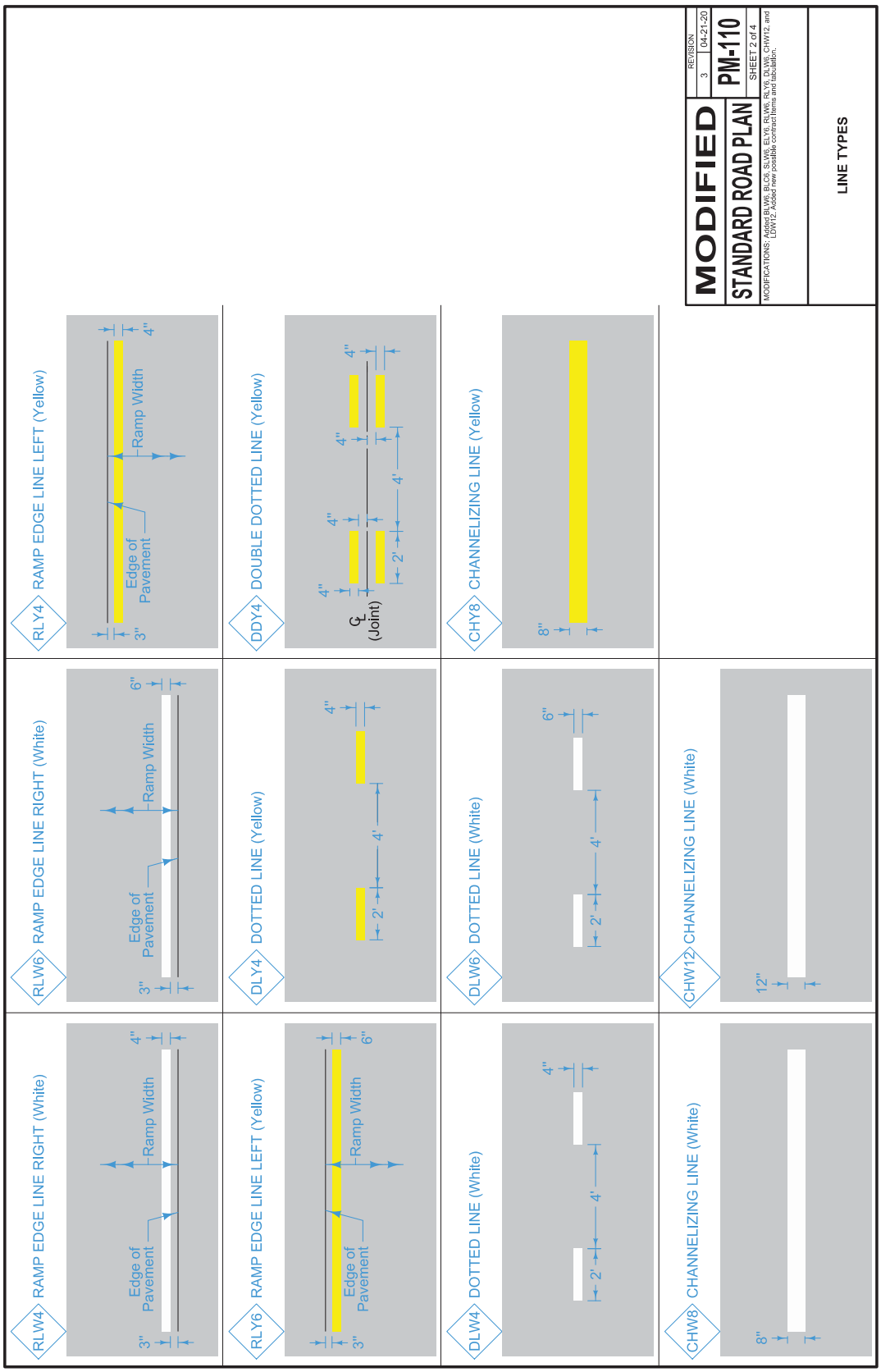
Possible Contract Items:
- Pavement Marking Line Items
- Painted Pavement Markings,
  - Multi-Component Liquid
- Grooves Cut for Pavement Markings

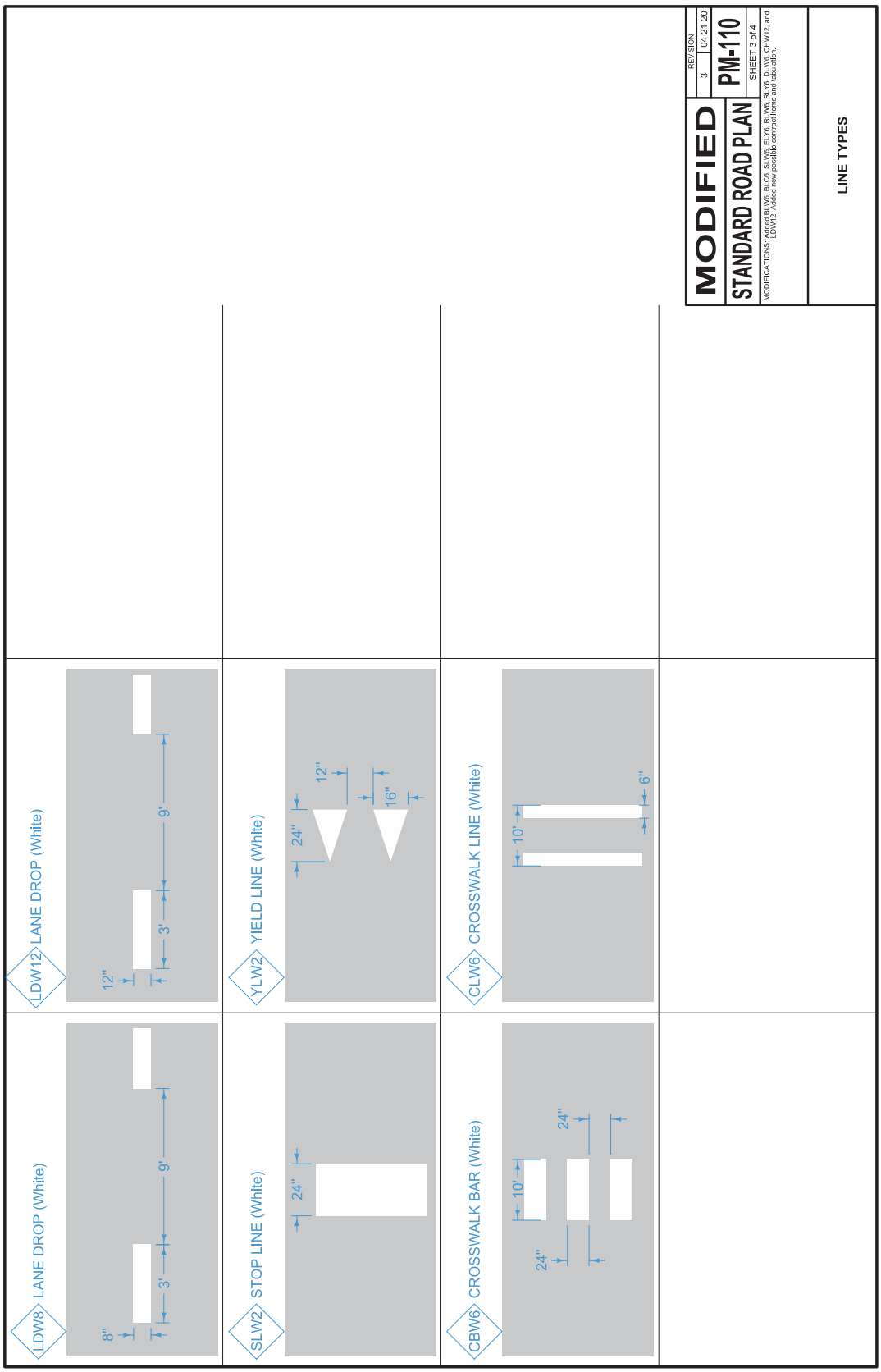
Possible Tabulations:
- 108-22
- 108-22M

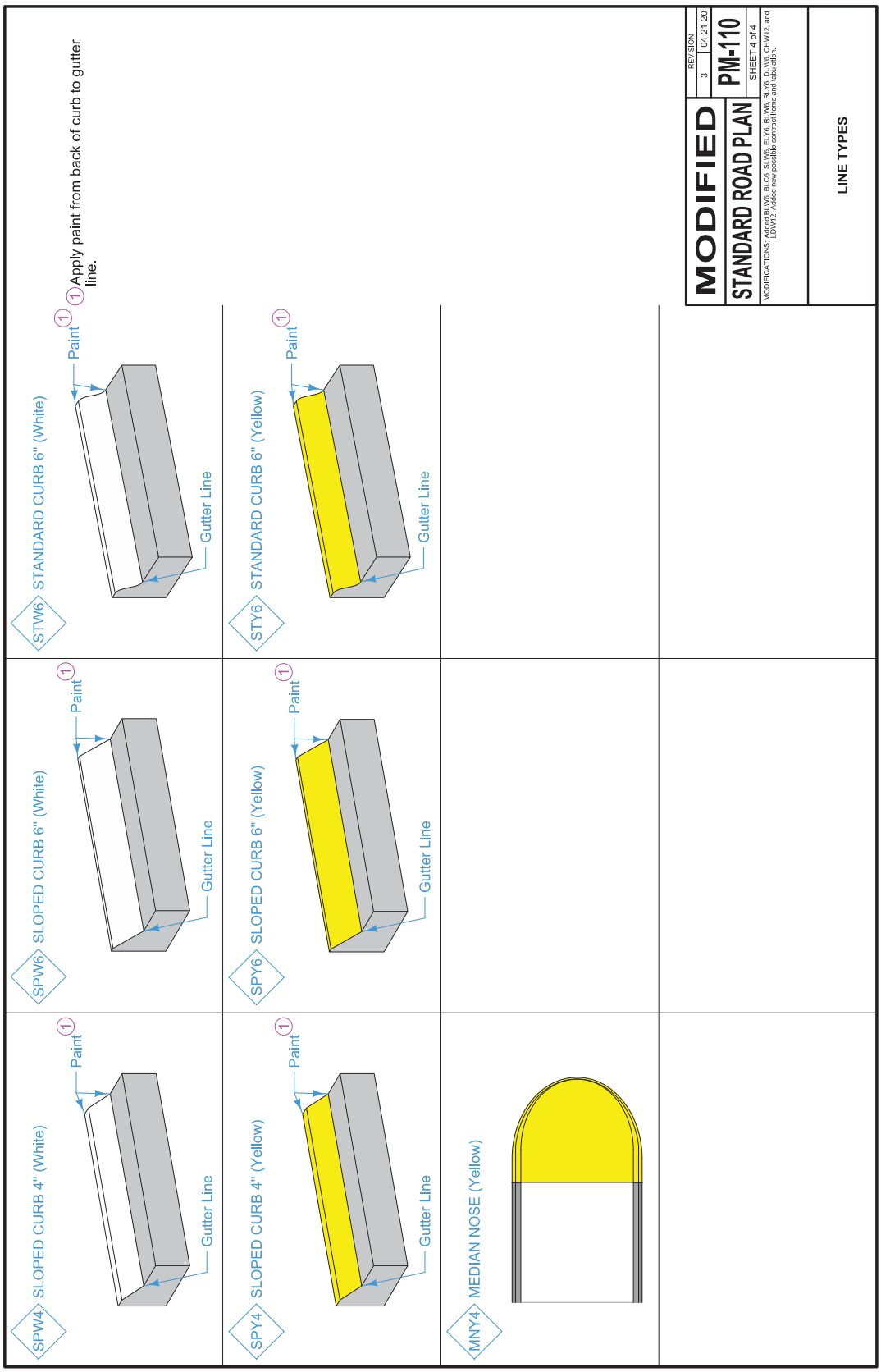
MODIFIED	REVISION	
	3	04-21-20
STANDARD ROAD PLAN	PM-110	
	SHEET 1 of 4	

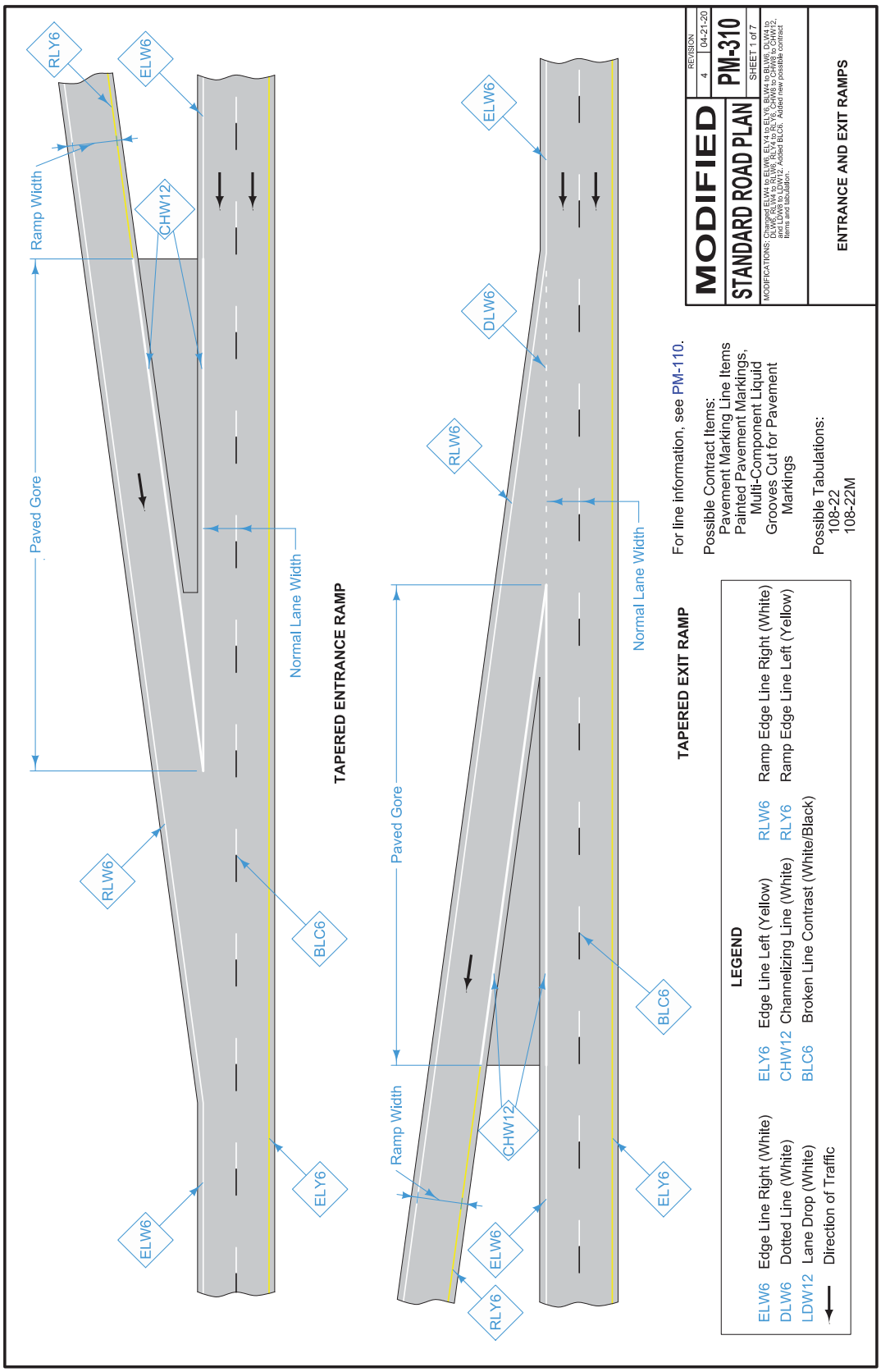
MODIFICATIONS: Added BLW6, BLC6, SLW6, ELY6, RLW6, RLY6, DLW6, CHW12, and LDW12. Added new possible contract items and tabulation.

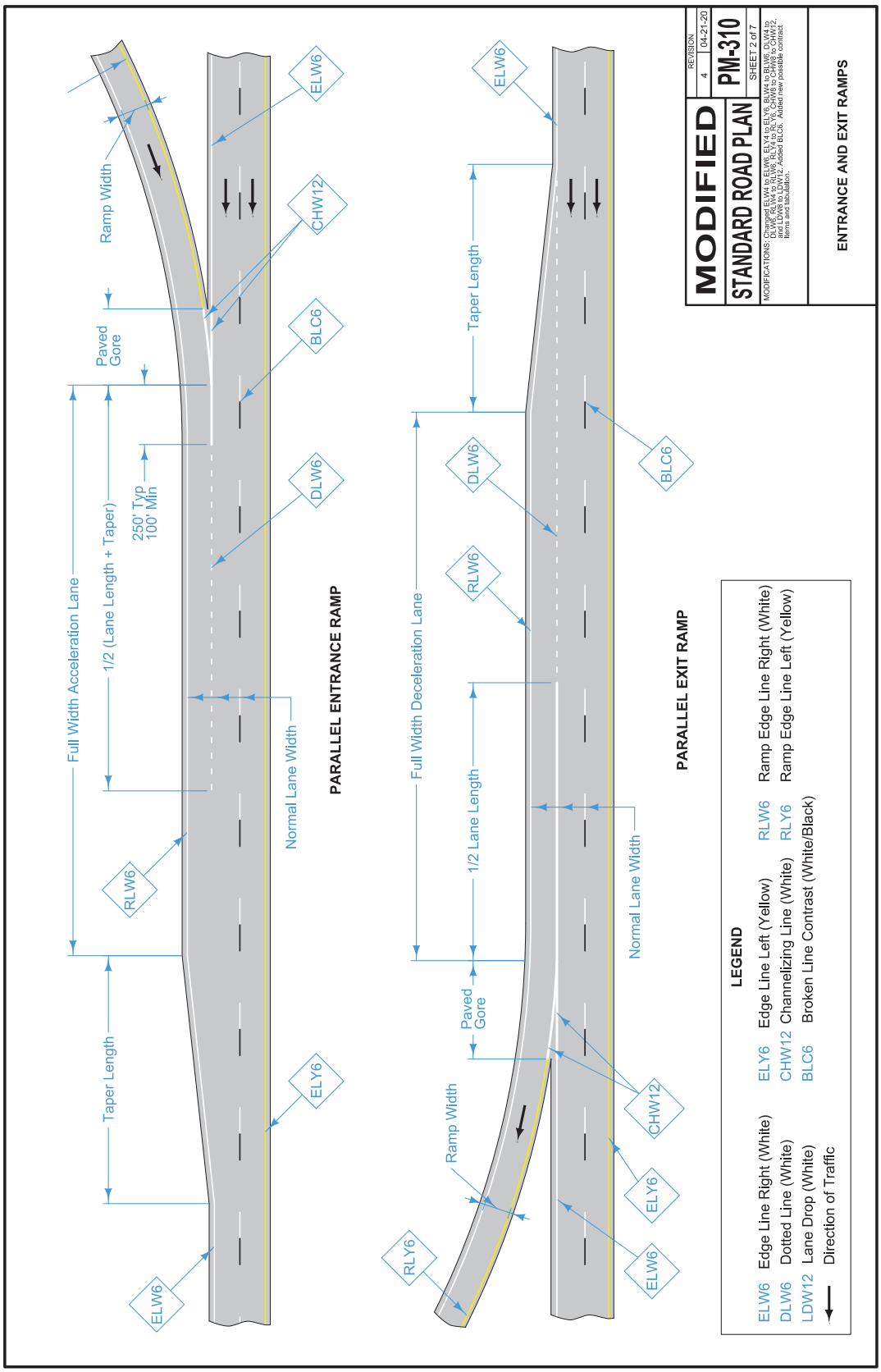
LINE TYPES

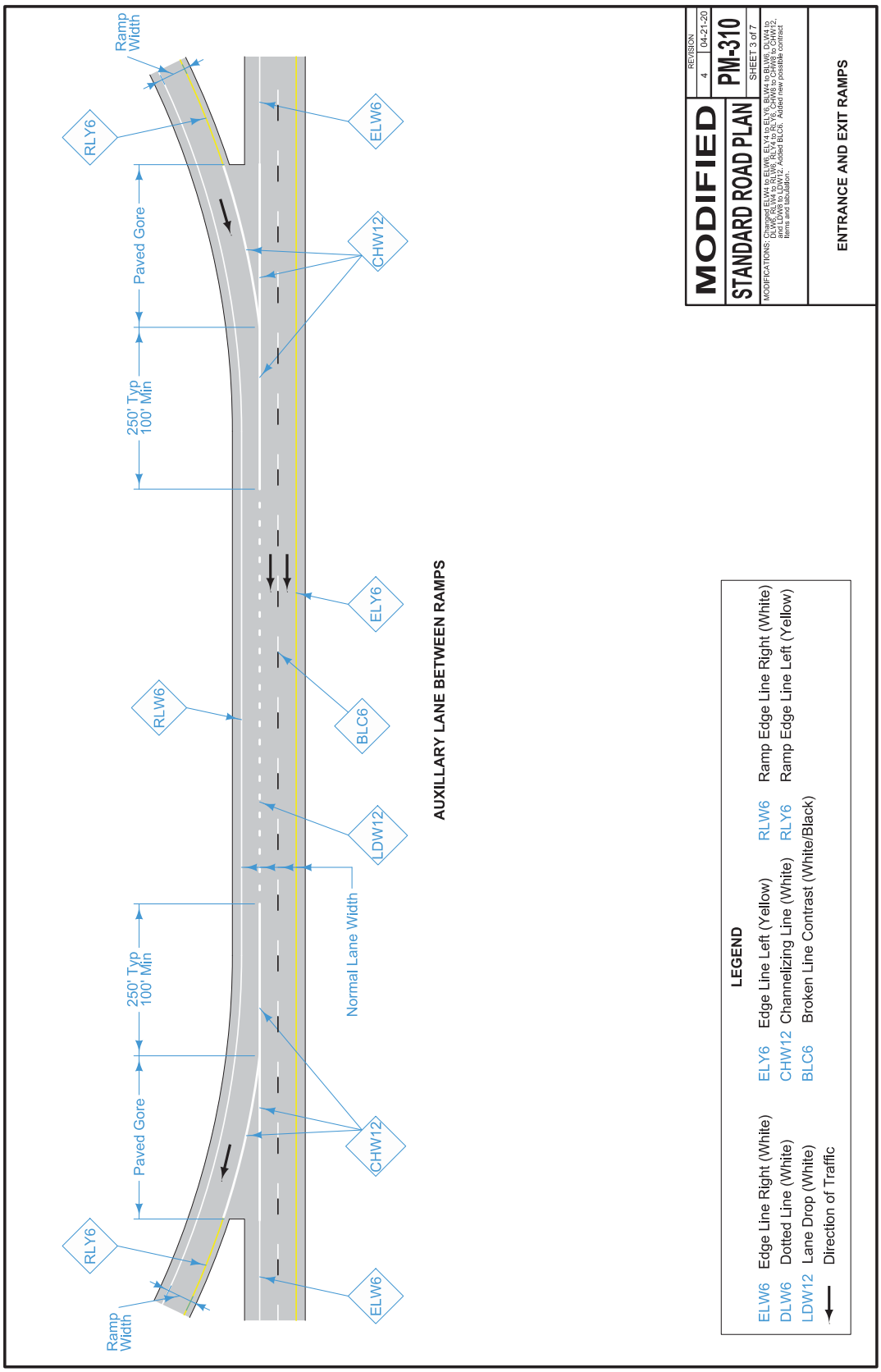

RLW4 RAMP EDGE LINE RIGHT (White)
Edge of Pavement
Ramp Width
3"
4"
RLW6 RAMP EDGE LINE RIGHT (White)
Edge of Pavement
Ramp Width
3"
6"
RLY4 RAMP EDGE LINE LEFT (Yellow)
Edge of Pavement
Ramp Width
3"
4"
RLY6 RAMP EDGE LINE LEFT (Yellow)
Edge of Pavement
Ramp Width
3"
6"
DLW4 DOTTED LINE (White)
2'
4'
4"
DLW6 DOTTED LINE (White)
2'
4'
6"
DLY4 DOTTED LINE (Yellow)
2'
4'
4"
DDY4 DOUBLE DOTTED LINE (Yellow)
4"
4"
4"
4"
℄ (Joint)
2'
4'
CHW8 CHANNELIZING LINE (White)
8"
CHW12 CHANNELIZING LINE (White)
12"
CHY8 CHANNELIZING LINE (Yellow)
8"
MODIFIED
STANDARD ROAD PLAN
REVISION
3 04-21-20
PM-110
SHEET 2 of 4
MODIFICATIONS: Added RLW6; BLC6; SLW6; ELY6; RLW6; RLY6; DLW6; CHW12; and LDW12; Added new possible contract items and tabulation.
LINE TYPES

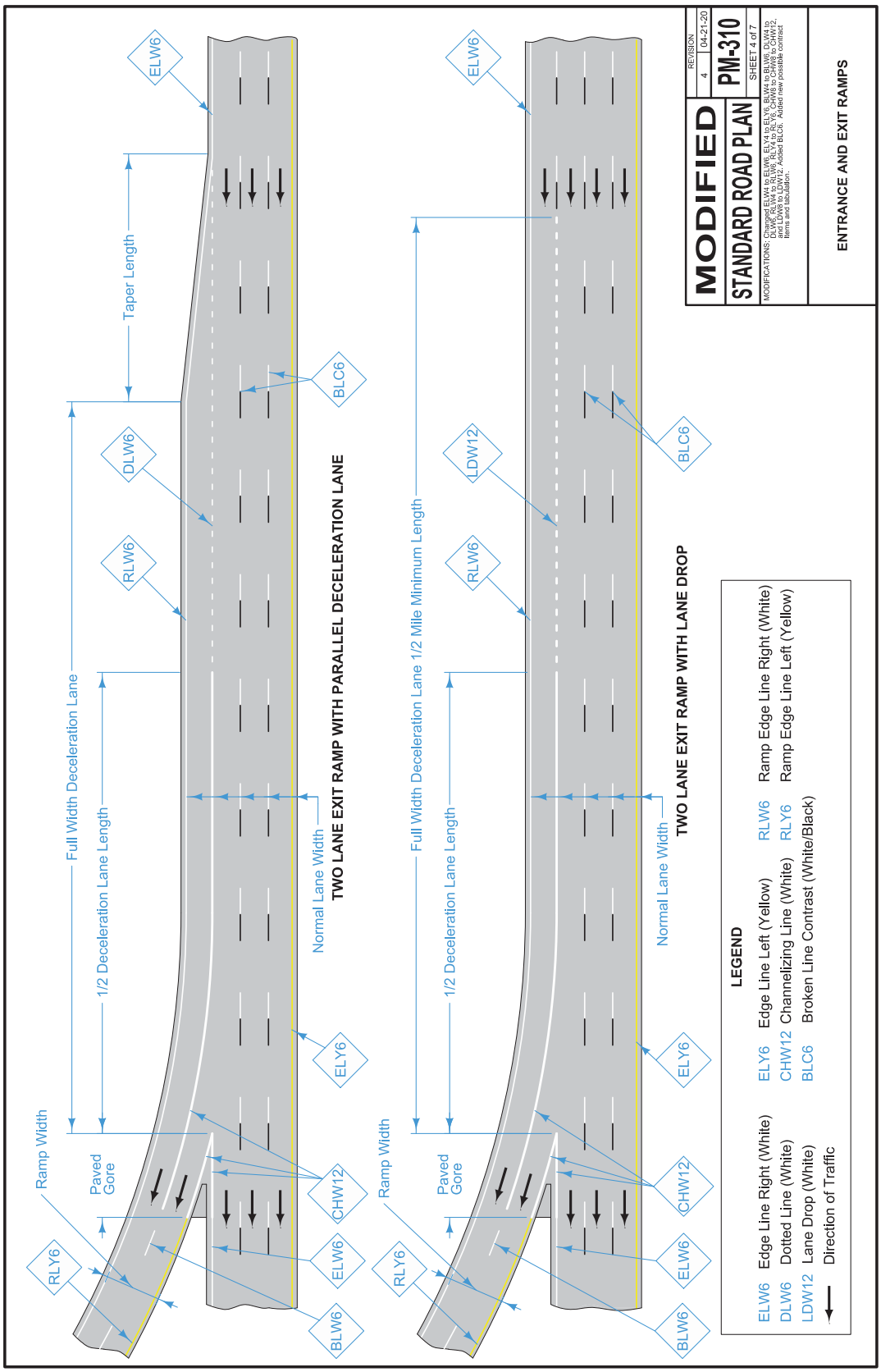

LDW8 LANE DROP (White)
8"
3'
9'
LDW12 LANE DROP (White)
12"
3'
9'
SLW2 STOP LINE (White)
24"
YLW2 YIELD LINE (White)
24"
12"
16"
CBW6 CROSSWALK BAR (White)
10'
24"
24"
CLW6 CROSSWALK LINE (White)
10'
6"
MODIFIED
STANDARD ROAD PLAN
REVISION
3 04-21-20
PM-110
SHEET 3 of 4
MODIFICATIONS: Added BLW6; BLC6; SLW6; ELY6; RLW6; RLY6; DLW6; CHW12, and LDW12. Added new possible contract items and tabulation.
LINE TYPES

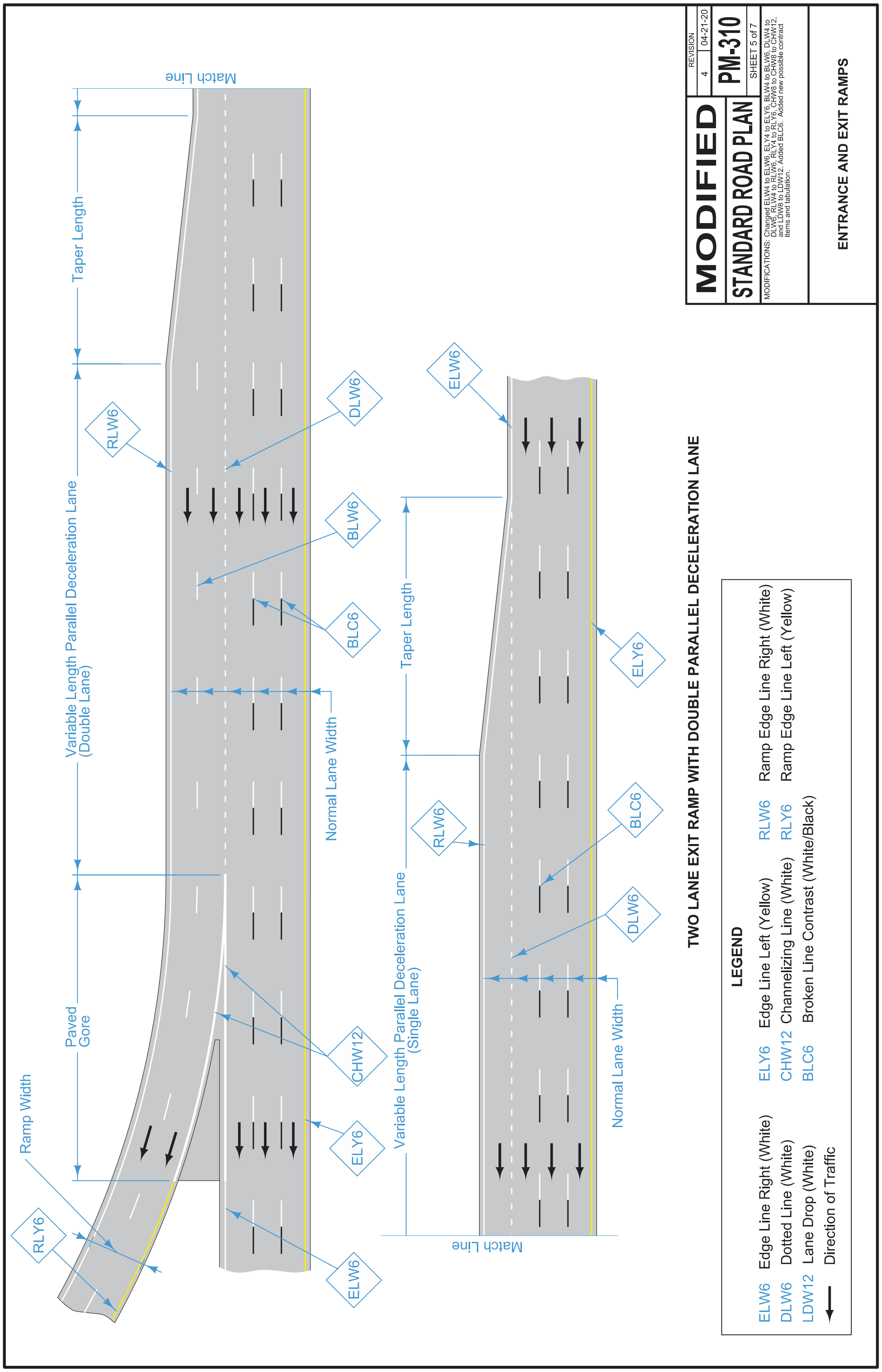

STW6 STANDARD CURB 6" (White)
Paint
1
Gutter Line
1 Apply paint from back of curb to gutter line.
STY6 STANDARD CURB 6" (Yellow)
Paint
1
Gutter Line
SPW6 SLOPED CURB 6" (White)
Paint
1
Gutter Line
SPY6 SLOPED CURB 6" (Yellow)
Paint
1
Gutter Line
SPW4 SLOPED CURB 4" (White)
Paint
1
Gutter Line
SPY4 SLOPED CURB 4" (Yellow)
Paint
1
Gutter Line
MNY4 MEDIAN NOSE (Yellow)
MODIFIED
STANDARD ROAD PLAN
REVISION
3 04-21-20
PM-110
SHEET 4 of 4
MODIFICATIONS: Added BLW6, BLO6, SLW6, ELY6, RLW6, RLY6, DLW6, CHV12, and LDW12. Added new possible contract items and tabulation.
LINE TYPES

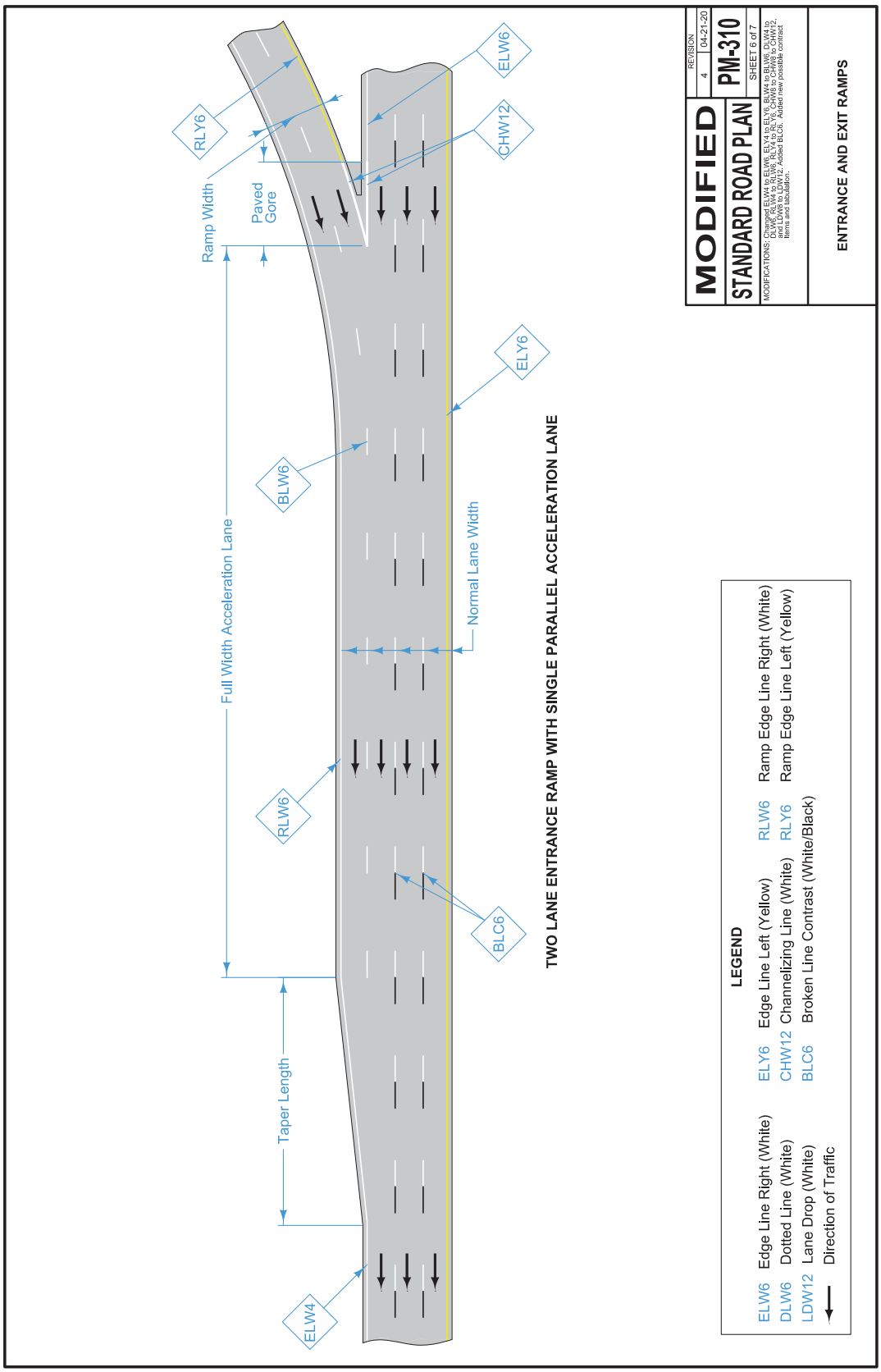

RLY6
ELW6
Ramp Width
CHW12
Paved Gore
RLW6
BLC6
ELY6
ELW6
Normal Lane Width
TAPERED ENTRANCE RAMP
ELW6
DLW6
RLW6
Normal Lane Width
Paved Gore
Ramp Width
CHW12
BLC6
ELY6
ELW6
RLY6
TAPERED EXIT RAMP
For line information, see PM-110.
Possible Contract Items:
Pavement Marking Line Items
Painted Pavement Markings,
Multi-Component Liquid
Grooves Cut for Pavement
Markings
Possible Tabulations:
108-22
108-22M
LEGEND
ELW6 Edge Line Right (White)
DLW6 Dotted Line (White)
LDW12 Lane Drop (White)
Direction of Traffic
ELY6 Edge Line Left (Yellow)
CHW12 Channelizing Line (White)
BLC6 Broken Line Contrast (White/Black)
RLW6 Ramp Edge Line Right (White)
RLY6 Ramp Edge Line Left (Yellow)
MODIFIED
STANDARD ROAD PLAN
PM-310
SHEET 1 of 7
REVISION
4 04-21-20
MODIFICATIONS: Changed ELW4 to ELW6, ELY4 to ELY6, RLW4 to RLW6, DLW4 to DLW6, CHW8 to CHW12, RLY4 to RLY6, CHW8 to CHW12, and LDW8 to LDW12. Added BLC6. Added new possible contract items and tabulation.
ENTRANCE AND EXIT RAMPS

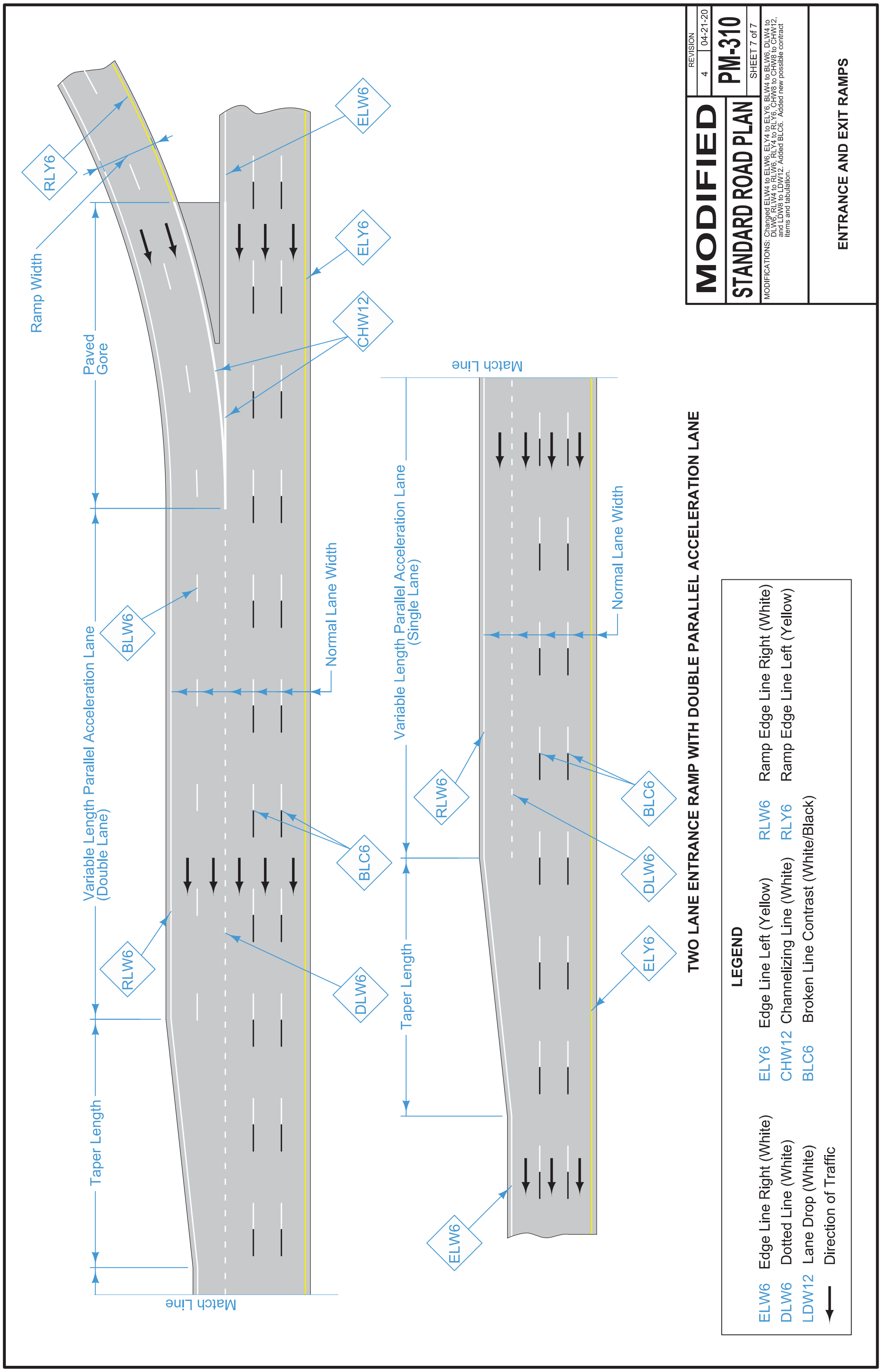

MODIFIED
STANDARD ROAD PLAN
PM-310
SHEET 2 of 7
REVISION
4 04-21-20
MODIFICATIONS: Changed ELW4 to ELW6, ELY4 to ELY6, BLW4 to BLW6, DLW4 to DLW6, RLW4 to RLW6, RLY4 to RLY6, CHW4 to CHW12, and LDW4 to LDW12. Added BLC6. Added new pavement marker items and tabulation.
ENTRANCE AND EXIT RAMPS
PARALLEL ENTRANCE RAMP
Full Width Acceleration Lane
1/2 (Lane Length + Taper)
Taper Length
Ramp Width
Paved Gore
250' Typ
100' Min
Normal Lane Width
ELW6
CHW12
BLC6
DLW6
RLW6
ELY6
PARALLEL EXIT RAMP
Full Width Deceleration Lane
1/2 Lane Length
Taper Length
Ramp Width
Paved Gore
Normal Lane Width
ELW6
DLW6
RLW6
BLC6
CHW12
ELY6
RLY6
LEGEND
ELW6 Edge Line Right (White)
DLW6 Dotted Line (White)
LDW12 Lane Drop (White)
ELY6 Edge Line Left (Yellow)
CHW12 Channelizing Line (White)
BLC6 Broken Line Contrast (White/Black)
RLW6 Ramp Edge Line Right (White)
RLY6 Ramp Edge Line Left (Yellow)
Direction of Traffic


Ramp Width
RLY6
ELW6
Paved Gore
CHW12
250' Typ
100' Min
ELY6
RLW6
BLC6
LDW12
AUXILLARY LANE BETWEEN RAMPS
Normal Lane Width
250' Typ
100' Min
Paved Gore
CHW12
RLY6
ELW6
Ramp Width
LEGEND
ELW6 Edge Line Right (White)
ELY6 Edge Line Left (Yellow)
RLW6 Ramp Edge Line Right (White)
DLW6 Dotted Line (White)
CHW12 Channelizing Line (White)
RLY6 Ramp Edge Line Left (Yellow)
LDW12 Lane Drop (White)
BLC6 Broken Line Contrast (White/Black)
Direction of Traffic
MODIFIED
STANDARD ROAD PLAN
PM-310
REVISION
4 04-21-20
SHEET 3 of 7
MODIFICATIONS: Changed ELW4 to ELW6, ELY4 to ELY6, BLW4 to BLW6, DLW4 to DLW6, RLW4 to RLW6, RLY4 to RLY6, CHW4 to CHW12, and LDW8 to LDW12. Added BLC6. Added new pavement items and tabulation.
ENTRANCE AND EXIT RAMPS


ELW6
Taper Length
DLW6
RLW6
BLC6
Full Width Deceleration Lane
1/2 Deceleration Lane Length
Normal Lane Width
TWO LANE EXIT RAMP WITH PARALLEL DECELERATION LANE
ELY6
Ramp Width
Paved Gore
CHW12
RLY6
ELW6
BLW6
ELW6
LDW12
RLW6
BLC6
Full Width Deceleration Lane 1/2 Mile Minimum Length
1/2 Deceleration Lane Length
Normal Lane Width
TWO LANE EXIT RAMP WITH LANE DROP
ELY6
Ramp Width
Paved Gore
CHW12
RLY6
ELW6
BLW6
LEGEND
ELW6 Edge Line Right (White)
DLW6 Dotted Line (White)
LDW12 Lane Drop (White)
Direction of Traffic
ELY6 Edge Line Left (Yellow)
CHW12 Channelizing Line (White)
BLC6 Broken Line Contrast (White/Black)
RLW6 Ramp Edge Line Right (White)
RLY6 Ramp Edge Line Left (Yellow)
MODIFIED
STANDARD ROAD PLAN
PM-310
SHEET 4 of 7
REVISION
4 04-21-20
MODIFICATIONS: Changed ELW4 to ELW6, ELY4 to ELY6, BLW4 to BLW6, DLW4 to DLW6, RLW4 to RLW6, RLY4 to RLY6, CHW4 to CHW12, and LDW8 to LDW12. Added BLC6. Added new pavement marker items and tabulation.
ENTRANCE AND EXIT RAMPS


MODIFIED
STANDARD ROAD PLAN
PM-310
REVISION
4
04-21-20
SHEET 5 of 7
MODIFICATIONS: Changed ELW4 to ELW6, ELY4 to ELY6, BLW4 to BLW6, DLW4 to DLW6, RLW4 to RLW6, RLY4 to RLY6, CHW8 to CHW12, and LDW8 to LDW12. Added BLC6. Added new possible contract items and tabulation.
ENTRANCE AND EXIT RAMPS
TWO LANE EXIT RAMP WITH DOUBLE PARALLEL DECELERATION LANE
Match Line
Taper Length
Variable Length Parallel Deceleration Lane (Double Lane)
Paved Gore
Ramp Width
Normal Lane Width
Variable Length Parallel Deceleration Lane (Single Lane)
RLW6
DLW6
BLW6
BLC6
CHW12
ELY6
ELW6
RLY6
LEGEND
ELW6 Edge Line Right (White)
DLW6 Dotted Line (White)
LDW12 Lane Drop (White)
Direction of Traffic
ELY6 Edge Line Left (Yellow)
CHW12 Channelizing Line (White)
BLC6 Broken Line Contrast (White/Black)
RLW6 Ramp Edge Line Right (White)
RLY6 Ramp Edge Line Left (Yellow)


RLY6
ELW6
CHW12
Ramp Width
Paved Gore
ELY6
BLW6
Full Width Acceleration Lane
Normal Lane Width
RLW6
BLC6
Taper Length
ELW4
TWO LANE ENTRANCE RAMP WITH SINGLE PARALLEL ACCELERATION LANE
LEGEND
ELW6 Edge Line Right (White)
DLW6 Dotted Line (White)
LDW12 Lane Drop (White)
ELY6 Edge Line Left (Yellow)
CHW12 Channelizing Line (White)
BLC6 Broken Line Contrast (White/Black)
RLW6 Ramp Edge Line Right (White)
RLY6 Ramp Edge Line Left (Yellow)
Direction of Traffic
MODIFIED
STANDARD ROAD PLAN
PM-310
REVISION
4 04-21-20
SHEET 6 of 7
MODIFICATIONS: Changed ELW4 to ELW6, ELY4 to ELY6, BLW4 to BLW6, DLW4 to DLW6, RLW4 to RLW6, RLY4 to RLY6, CHW8 to CHW12, and LDW8 to LDW12. Revised BLC8 to BLC6. Added new pavement items and tabulation.
ENTRANCE AND EXIT RAMPS


MODIFIED
STANDARD ROAD PLAN
PM-310
REVISION
4
04-21-20
SHEET 7 of 7
MODIFICATIONS: Changed ELW4 to ELW6, ELY4 to ELY6, BLW4 to BLW6, DLW4 to DLW6, RLW4 to RLW6, RLY4 to RLY6, CHW8 to CHW12, and LDW8 to LDW12. Added BLC6. Added new possible contract items and tabulation.
ENTRANCE AND EXIT RAMPS
TWO LANE ENTRANCE RAMP WITH DOUBLE PARALLEL ACCELERATION LANE
LEGEND
ELW6 Edge Line Right (White)
DLW6 Dotted Line (White)
LDW12 Lane Drop (White)
Direction of Traffic
ELY6 Edge Line Left (Yellow)
CHW12 Channelizing Line (White)
BLC6 Broken Line Contrast (White/Black)
RLW6 Ramp Edge Line Right (White)
RLY6 Ramp Edge Line Left (Yellow)
Ramp Width
Paved Gore
Variable Length Parallel Acceleration Lane (Double Lane)
Taper Length
Normal Lane Width
Match Line
Variable Length Parallel Acceleration Lane (Single Lane)
RLY6
ELW6
ELY6
CHW12
BLW6
RLW6
BLC6
DLW6

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove	**Office:** Construction & Materials	**Item 17**
Submittal Date: Oct 29, 2021	**Proposed Effective Date:** April 19, 2022	
Article No.: **Title:**	**Other: SS-XXXX** SUPPLEMENTAL SPECIFICATIONS FOR PRIMARY AND INTERSTATE PAVEMENT SMOOTHNESS	

Specification Committee Action:

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 02/15/2022

Specification Committee Approved Text: See attached Supplemental Specifications for Primary and Interstate Pavement Smoothness

Comments: The SS will be applied to all projects utilizing Sections 2301, 2303, and 2310 bid items on the Interstate and Primary system.

The Construction and Materials Bureau asked to revise Article 2317.03, B, 5 to require submission on the form supplied by the Iowa DOT.

Specification Section Recommended Text: See attached Supplemental Specifications for Primary and Interstate Pavement Smoothness

Comments: Do we want this SS to be effective prior to the April letting?

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

Add 2317.03.B.1.n add roundabouts

2317.03.B.5 add Submit all final profile summary sheets in either a csv or Excel file format and final ProVAL compatible files to the Construction and Materials Bureau via smoothness.cmb@iowadot.us following completion of paving on the project

Reason for Revision: 2317.03B.1.n – clarification is desired

2317.03B.5 naming convention and file types makes data data retrieval out of DocExpress too cumbersome.

New Bid Item Required (X one)	**Yes**	**No**
Bid Item Modification Required (X one)	**Yes**	**No**
Bid Item Obsoletion Required (X one)	**Yes**	**No**

Comments:

County or City Comments:

Industry Comments:

SS-15011
(Replaces DS-15079)

SUPPLEMENTAL SPECIFICATIONS
FOR
PRIMARY AND INTERSTATE PAVEMENT SMOOTHNESS

Effective Date
February 15, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

These specifications replace Section 2317 of the Standard Specifications.

2317.01 GENERAL.
Evaluate pavement smoothness for Interstate and Primary main line pavement surfaces, and other road surfaces included on Primary projects, except when specifically excluded or modified by the contract documents. Main line pavement is defined as permanent pavement for through lanes.

A. Index used for determining the pavement smoothness is the Mean Roughness Index (MRI) per segment as determined by latest version of the FHWA's software, ProVAL.

B. The other measure of pavement smoothness is the Area of Localized Roughness (ALR) based on a continuous MRI computed over a 25 foot distance as determined by latest version of ProVAL.

C. A pavement segment is defined as a continuous area of finished pavement 0.1 mile in length and one lane (10 to 12 foot nominal) in width. A partial segment may result from an interruption of the continuous pavement surface (in other words, bridge approaches, side road tie-ins, the completion of the daily paving operations, and so forth). Pay adjustments will be prorated for partial segments. If a segment is less than 100 feet in length and requires corrective work, Engineer will waive corrective work requirement for segment and instead assess a prorated disincentive. Contracting Authority will subject the segment to ALR correction in accordance with Table 2317.05-1

2317.02 EQUIPMENT.

A. Provide and operate an inertial profiler meeting the requirements of AASHTO M 328 and Materials I.M. 341, Appendix A. Ensure operator is trained and certified to operate profiler as required by the Contracting Authority.

B. For corrective work by diamond grinding, use grinding and texturing equipment meeting the requirements of Section 2532 of the Standard Specifications.

2317.03 TESTING AND EVALUATION.

A. Testing.

1. Obtain profiles of both wheel paths for each lane according to procedures shown in Materials I.M. 341, Appendix A. Wheel paths are defined as 3 feet and 9 feet from the center line or lane line. Average the two wheel path profile indexes for each segment.

2. Engineer may use an inertial profiler, 10 foot straightedge, or other means to detect irregularities in excluded surface areas or areas outside the required wheel paths for required corrective action.

3. Test bridge approaches according to Section 2428 of the Standard Specifications.

4. Test pavement within 5 working days of completion of paving.

5. Paved shoulders will be excluded from smoothness testing. When used as a temporary driving surface, evaluate paved shoulders for ALR. Take corrective action for ALR greater than 250.0 inches/mile.

B. Evaluation.

1. Determine a MRI using the latest version of the ProVAL "Ride Quality" analysis and following procedures shown in Materials I.M. 341, Appendix A for each segment of finished pavement surface with a posted speed over 45 mph except for:
- **a.** Roads intersecting the mainline pavement less than 600 feet in length.
- **b.** Road connections 150 feet before an intersection that end at a stop sign (or a yield sign at roundabouts).
- **c.** Twenty feet on either side of bridges, bridge approaches, existing EF joints, manholes, or water valve boxes in the lane that the obstruction is located.
- **d.** Ramps and loops.
- **e.** Bridge approaches (evaluated according to Section 2428 of the Standard Specifications).
- **f.** Storage lanes, turn lanes, and other auxiliary lanes less than 1000 feet.
- **g.** Pavement less than 8.5 feet in width.
- **h.** Single lift pavement overlays 2 inches thick or less, unless the existing surface has been corrected by milling or scarification.
- **i.** Single lift pavement overlays 2 inches thick or less placed directly on PCC pavement.
- **j.** Paved shoulders.
- **k.** Detour pavement.
- **l.** Crossovers.
- **m.** Individual sections of pavement less than 100 feet in length.
- **n.** Roundabouts

2. Determine ALR using the latest version of the ProVAL "Smoothness Assurance" analysis and following the procedures shown in Materials I.M. 341, Appendix A, for each segment of finished pavement surface with a posted or advisory speed over 35 mph except for:
- **a.** Side road connections 150 feet before an intersection that end at a stop sign (or a yield sign at roundabouts).
- **b.** Twenty feet on either side of bridges, bridge approaches, manholes, or water valve boxes in the lane that the obstruction is located.
- **c.** Bridge approaches (evaluated according to Section 2428 of the Standard Specifications).
- **d.** Pavement less than 8.5 feet in width.
- **e.** Paved shoulders (unless used as a temporary driving surface).
- **f.** Detour pavement.
- **g.** Crossovers.

h. Individual sections of pavement less than 50 feet in length.

3. Engineer may determine and identify irregularities of 1/8 inch or more in 10 feet longitudinally for excluded surface areas or areas outside required wheel paths.

4. Submit final profile summary sheets to the Engineer within 14 calendar days following completion of paving on project. When testing is done at completion of paving on project, provide Engineer ProVal files along with profile summary sheets.

5. Submit preliminary profile summary sheets on provided form (https://iowadot.gov/Construction_Materials/materialsforms/ProfileSummarySheet.xlsx) and final ProVAL compatible files to the Construction and Materials Bureau via smoothness.cmb@iowadot.us following completion of paving on the project.

2317.04 CORRECTIVE ACTIONS.

A. General.

1. Pavement will be evaluated in 0.1 mile segments using inertial profiler, to determine pavement segments where corrective work or pay adjustments will be necessary.

2. Within each 0.1 mile segment, correct ALR greater than 250.0 Inches/mile regardless of MRI value. Take corrective action.

3. Separately identify ALR.

4. On lanes over 8.5 feet in width, for through traffic which requires matching the surface of new pavement to the surface of an existing pavement, determine MRI and ALR for the existing lane. Compare MRI values and ALR areas according to Materials I.M. 341, Appendix A. If MRI and ALR for new pavement are less than the MRI and ALR for the existing surface, no negative payment adjustment or correction for MRI or ALR will be required.

B. MRI Correction.
Correct 0.1 mile segments having an initial MRI greater than those tolerances shown in Article 2317.05. Correct these segments to reduce MRI to that shown in Tables 2317.05-2 and 2317.05-3. Contractor has the option to replace these segments. On segments where corrections are made, test entire 0.1 mile segment of pavement to verify that corrections have met the MRI as shown in Tables 2317.05-2 and 2317.05-3.

C. ALR Correction.
Correct ALR greater than those tolerances shown in Article 2317.05. Correct these segments to reduce the ALR to that shown in Table 2317.05-1. Contractor has the option to replace these areas. On segments where corrections are made, test entire 0.1 mile segment of pavement to verify corrections have met ALR level shown in Table 2317.05-1.

D. Engineer Identified Irregularities.
Correct areas over 1/8 inch in 10 feet identified by Engineer.

E. Bridge Approach Sections.
Correct bridge approach sections according to Section 2428 of the Standard Specifications.

F. Corrective Work.
When Contractor is not responsible for adjoining surface, ALR in the 20 feet at the end of a section will be reviewed by Engineer. Correct ALR determined to be under the control of Contractor and resulting from Contractor's operations. Correction of ALR determined to be beyond control of Contractor will be paid according to Article 1109.03, B of the Standard

Specifications. Complete corrective work prior to determining pavement thickness. Do not use bush hammers or other impact devices.

1. **PCC Pavement.**
   Make corrections using an approved profiling device or by removing and replacing pavement. Apply corrective methods to full lane width. Ensure, when completed, corrected area (full lane width) has uniform texture and appearance, with the beginning and ending of the corrected area squared normal to centerline of paved surface. Where surface corrections are made, grooving will not be required.

2. **HMA Pavement.**
   - **a.** Make corrections by diamond grinding, overlaying, replacing, or inlaying the area. If surface is corrected by diamond grinding, perform same work and use same equipment as specified for PCC pavement.
   - **b.** If surface is corrected by overlay, replacement, or inlay; begin and end surface correction with a transverse saw cut normal to pavement lane lines or edge lines within any one area. Profile of surface shall be smooth with no bumps or dips at beginning or end of correction.
   - **c.** Overlay correction shall be for entire pavement width. Pavement cross slope shall be maintained through corrected areas.

G. Verification Testing.

1. Engineer will perform verification testing to validate Contractor's certified quality control testing. If Engineer's verification test results validate Contractor's test results, Contractor's results will be used for acceptance. Disputes between Contractor's and Engineer's test results will be resolved according to Materials I.M. 341, Appendix A.

2. Engineer may test entire project length if it is determined Contractor's certified test results are inaccurate. Contractor will be charged for this work at a rate of $800.00 per lane-mile, with a minimum charge of $1500.00.

3. Furnishing inaccurate tests may result in decertification of Contractor's certified operator.

2317.05 PAY ADJUSTMENTS.

A. General.

1. Pay adjustments will be based on initial MRI determined for the segments prior to performing any corrective work. Areas excluded from Inertial profiler testing and bridges approaches will not be subject to price adjustments.

2. If Contractor elects to remove and replace segments, Contractor will be paid the price adjustment that corresponds to the initial index obtained on the pavement segments after replacement.

3. When the plans indicate an area of pavement shall be hand finished, the area will not be subject to reduced payment. However, the area shall be profiled and corrected as necessary to meet these specifications.

B. Areas of Localized Roughness.
Payment for areas of localized roughness will be adjusted as shown in Table 2317.05-1.

Table 2317.05-1: Schedule for Adjustment Payment for Areas of Localized Roughness

ALR in 25 Foot Continuous Mean International Roughness Index (MRI) Inches per mile	Dollars per foot of pavement length per lane
200.0 to 250.0	-30.00 or grind*
Greater than 250.0	Grind*

*Correct these areas to below 200.0 inches per mile

C. PCC Pavement.

Payment for mean International Roughness Index for PCC pavement will be adjusted as shown in Table 2317.05-2.

Table 2317.05-2: Schedule for Adjustment Payment for PCC Pavements

Mean International Roughness Index (MRI) Inches per mile	Dollars per 0.1 mile segment per lane
Less than 55.0	1500.00
55.0 to 63.0	11812.5 - 187.5 X MRI
63.0 to 75.0	0.00
75.0 to 90.0	7500 – 100 X MRI or grind*
Greater than 90.0	Grind*

*Correct these areas to below 75.0 inches per mile

D. HMA Pavement.

The payment for mean International Roughness Index for HMA pavement will be adjusted as shown in Table 2317.05-3.

Table 2317.05-3: Schedule for Adjustment Payment for HMA Pavements

Mean International Roughness Index (MRI) Inches per mile	Dollars per 0.1 mile segment per lane
Less than 30.0	1500.00
30.0 to 39.0	6500 - 166.6667 X MRI
39.0 to 75.0	0.00
75.0 to 90.0	7500 – 100 X MRI or grind*
Greater than 90.0	Grind*

*Correct these areas to below 75.0 inches per mile

Office of Construction & Materials

Materials I.M. 341IRI

Appendix A
DETERMINING PAVEMENT RIDE QUALITY

SCOPE

This IM describes procedures used to perform smoothness testing on new pavements surfaces. A certified person is required to perform the testing, evaluation, and reporting.

PROCEDURE

A. Apparatus

1. Inertial Profiler meeting requirements of AASHTO M 328 (this requires an auto start/stop) and currently certified on Iowa DOT test strips or other state test strips approved by Iowa DOT. For surfaces other than dense graded HMA, a large footprint laser is required.

2. Ten-foot straight edge or a 10-foot straight edge software simulation.

3. Distance measuring wheel or tape.

4. Latest version of ProVAL software. http://www.roadprofile.com/proval-software/current-version/

5. Latest version of the Iowa DOT Spreadsheet, Profile Summary Sheet. https://iowadot.gov/Construction_Materials/materialsforms/ProfileSummarySheet.xlsx

B. Profiler Approval

1. Profilers will be checked and approved by Iowa DOT Materials Laboratory before each construction season for proper operation. Profilers checked and approved in another state in the current year may be approved. Submit a request to Special Investigations Engineer for consideration of approval.

2. ProVAL will be used to analyze the profiler files. Criteria for approval includes:

    a) High pass and low pass filters set to 0. Other settings according to manufacturer's recommendation (Settings used for approval shall be the same used throughout the season).
    b) Submittal of 5 good runs of the test strip as ERD files.
    c) DMI distance shall be within 0.15% of actual test strip distance.
    d) Equipment repeatability score with IRI filter shall be 0.90 or greater.
    e) Equipment accuracy score with the IRI filter shall be 0.88 or greater when compared to reference profiler.
    f) Average IRI shall be within 5% of reference profiler IRI.

C. Calibration and Verifications

Checks, calibrations, and verification of subsystems vary by manufacturer. Follow manufacturer's recommended procedures and frequencies to ensure proper profile collection.

D. Test Procedure

1. Contractor (or sub-contractor) responsible for smoothness testing shall give Engineer and District Materials Engineer 48 hour notice prior to testing so District Materials Office may provide verification testing.

2. Dirt and debris may affect collection of the profile. Excessive mud or caked mud shall be removed prior to testing. A grader blade or power broom will knock concrete crumbs off longitudinal or transverse grooving.

3. Perform warm up and checks of profiler.
    a) For most profilers, tire pressures should be maintained at the same pressures as when the distance was last calibrated.
    b) It is advisable to do a bounce test and vertical height test on sensors before beginning testing.

4. Ensure computer settings are the same as when the unit was approved by Department. High-pass and low pass filter settings should be "0".

5. Test in direction of traffic whenever possible.

6. Test unit positioning.

    a) Perform testing with sensors in wheel paths, 3 feet and 9 feet from centerline or lane line, for lanes 11 feet to 12 feet wide unless noted otherwise in the contract documents.

    b) For testing on wider lanes such as ramps and loops, position driver side sensor 3 feet from left edge line. If passenger side sensors are within 1 foot of a longitudinal joint, adjust travel path to the right so sensor is 2 feet from joint line.

    c) For testing tapers to and from a full lane, begin or end section testing when pavement is either 12 feet or at full lane width whichever is less.

    d) Begin collecting profile data for ALR 50 feet before beginning header from old to new surface and 50 feet beyond header from new to old surface. Figure 1

    e) Figure 2 and 3 show examples of how to analyze ALR at obstructions defined in Article 2317.03, B, 2, b of the Standard Specifications.

7. Ensure there is enough room before and after section to be tested to allow for a 300 foot run-in and run-out area for the profiler before and after the test section according to manufacturer's recommendations. The run-in allows accelerometers, lasers, and computer to stabilize before start of the section. Mark intended start and stop location of section and place reflective cones or strips to trigger auto start/stop sensor on profiler.

8. Use event feature to mark on the file reference points like, side road intersections, roadway signs, maintenance markers, stations markers, and mileposts. In the event of rough segments or ALR, this will help the grinding personnel locate the area to grind. (The as driven stationing from profiler will rarely match stationing on roadway unless roadway is completely flat with no curves. The longer the run of the profiler, the farther the profiler stationing will be off from plan stationing.)

9. During the profiler run, use the ignore feature at bridges and bridge approaches to mark areas on the file and exclude the data from the analysis. Profiler still collects data and it can be recovered later during analysis if the key is pressed inadvertently.

10. Label file so it can be easily found and retrieved later. (Project number, lane, and beginning station in file name is one way to label)

11. When a segment is corrected by grinding to improve the segment MRI, entire segment shall be retested and MRI determined to verify the corrected segment is in specification compliance.

E. Analyzing and Reporting

1. Use profiler software export function to export an unfiltered "ERD" file.

2. Use latest version of ProVAL to perform MRI and ALR analysis on ERD files.

3. Report results on Iowa DOT provided Excel spreadsheet (Figure 4). Sheet may be downloaded at https://iowadot.gov/Construction_Materials/materialsforms/ProfileSummarySheet.xlsx. Test report is required on this form for project acceptance.

4. Areas needing correction will be noted by the software on the spreadsheet. For segments that are ground to correct MRI, show corrected MRI and mark the box to the left of the segment to show grinding has been completed on that spreadsheet.

5. There are two types of reports:
   a) **Final.** Used to indicate that report is being submitted for acceptance.
   b) **Corrected.** Used to indicate that there was either an error in original test report or that the section was corrected by grinding and retested.

6. Test report laboratory numbers shall be continuous and increasing numerically as each succeeding test is performed. Laboratory numbers shall have a letter added to the end of the original laboratory number for corrected reports (i.e., original report number 01-218L-05, corrected report number 01-218L-05-A).

7. Submit final and corrected reports to Engineer through DocExpress. If smoothness testing is done after paving is completed, submit ProVAL file(s) to DocExpress also. Label ProVAL file(s) with the project as part of file name.

8. Keep ProVAL files not submitted to DocExpress until validation of Contractor test results have been confirmed.

9. An example of a completed report form is shown in Figure 4.

F. Certification

Use trained and certified person to do testing, evaluation, and reporting. Certification information is in Materials I.M. 213.

VALIDATION OF CONTRACTOR TEST RESULTS

To use Contractor test results in acceptance decision, results must be validated.

Normally District Materials Office will perform verification testing within 1 month from receiving final test reports and notification from Contractor that pavement is available for testing. Validation tolerances are in Materials I.M. 216.

Contractor test results that cannot be validated, District Materials Office will promptly notify Contractor and begin dispute resolution process. Testing disputes arising between the Contracting Agency and Contractor shall be resolved in a reliable, unbiased manner. This may involve an evaluation performed by the Iowa DOT Central Materials Laboratory. Resolution decisions by Iowa DOT Central Materials Laboratory will be final.

District Materials Engineer will select some or all of the following steps for dispute resolution:

1. Check numbers and calculations.
2. Review testing procedures.
3. Compare profiles and dates of testing.
4. Check equipment operation, calibrations, and tolerances.
5. Perform side-by side tests.
6. Involve Central Materials Laboratory.

If discrepancy cannot be resolved using steps listed above, or if it is determined that Contractor’s testing is in error, then Agency test results will be used for acceptance decision for project.

Figure 1. Area of Localized Roughness (ALR) Analysis at the Beginning of Project (Same at End of Project)

Note: The ALR at any point covers profile 12.5' back and 12.5' forward.

Figure 2. ALR Analysis at the Bridges/ Bridge Approaches

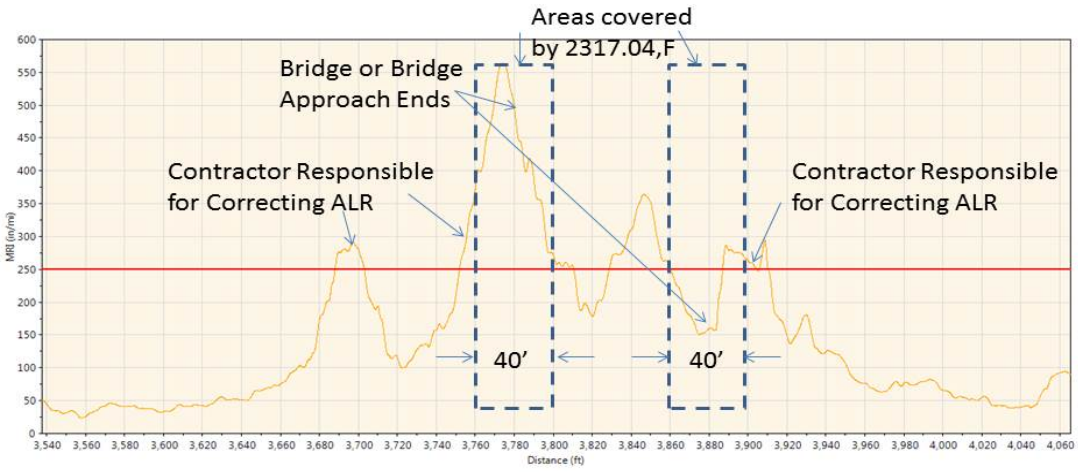


Figure 3. ALR Analysis at the Manholes and Water Valve Boxes

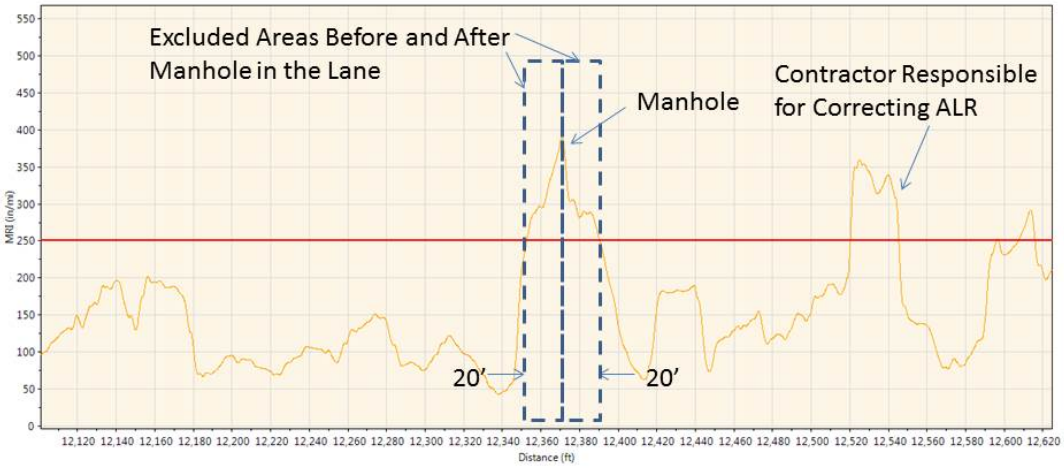


Figure 4. Standard Spreadsheet for Reporting Results

8-8-16 Ver

Profile Summary Sheet

IOWA DOT
SMARTER | SIMPLER | CUSTOMER DRIVEN

Project Number	NHSX-061-3(59)--3H-75
Date Measuered	8/8/2016
Tested By	Kevin Jones
Direction	Westbound
Lane Description	Mainline: Lane 1

Report Number	16-061-75-1
Smoothness Equation	HMA
Posted Vehicle Speed	> 45 mph

Stationing	**Section 1**	**Section 2**	**Section 3**
Beginning	218+63		
Ending	178+63		

Area of Localized Roughness (ALR)	
200.0 ≤ ALR < 250.0 (ft.)	19
ALR ≥ 250.0 (ft.)	10

Grind	**Beginnimg Sta.**	**Ending Sta.**	**Segment Length (ft)**	**Final Smoothness (in/mi)**	**Segment Pay Adjustment**
☐	218+63	213+35	528	82.16	$716.00
☐	213+35	208+07	528	33.34	$943.33
☐	208+07	202+79	528	35.54	$576.67
☐	202+79	197+51	528	28.68	$1,500.00
☐	197+51	192+23	528	37.65	$225.00
☐	192+23	186+95	528	30.60	$1,400.00
☐	186+95	181+67	528	27.77	$1,500.00
☐	181+67	178+63	304	93.05	CW
☐					
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Total Pay Adjustment	Smoothness Corrective Work Required
Areas of Localized Roughness Deduction	Corrective Work Needed
Total Pay Adjustment + Areas of Localized Roughness Deduction	

Data Entered By	Kevin Jones
Signature/Certification #	CI778

This is to certify that all testing and evaluation herein described has been performed according to applicable contract specifications and requirements.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Melissa Serio	**Office:** Construction & Materials	**Item 18**
Submittal Date: 10/15/21	**Proposed Effective Date:** Whenever updated DS can take effect	
Article No.: **Title:**	**Other:** DS-15085, Developmental Specifications for Sliplining Existing Pipe Culverts	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 02/15/2022

Specification Committee Approved Text: See attached Developmental Specifications for Sliplining Existing Pipe Culverts.

Comments: None.

Specification Section Recommended Text: See attached Developmental Specifications for Sliplining Existing Pipe Culverts.

Comments:

Member's Requested Change: (Do not use **'Track Changes'**, or **'Mark-Up'**. Use ~~Strikeout~~ and Highlight.)

Revise 15085.02, D. Annular Space Grouting.

D. Use foamed cellular concrete meeting the requirements of Section 2506 of the Standard Specifications. Alternate Mix Designs are allowed when quantity for annular space grouting is estimated to be less than 10 cubic yards for the contract.

Reason for Revision: Based on discussion at various DME meetings (most recently September 2021), revise DS so it does not restrict annular space grouting material to just foamed cellular concrete when contract has smaller quantities.

New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x

Comments: None

County or City Comments:

Industry Comments:

DS-15090
(Replaces DS-15085)

DEVELOPMENTAL SPECIFICATIONS
FOR
SLIPLINING EXISTING PIPE CULVERTS

Effective Date
February 15, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

15090.01 DESCRIPTION.
Furnish and install liner pipe at locations specified in the contract documents.

15090.02 MATERIALS.

A. Furnish liner pipe meeting the material requirements for the type of pipe specified.

1. **Solid Wall HDPE Pipe with Integral Joint.**
   Comply with requirements of ASTM F 714 (SDR 32.5) and ASTM D 3350 (cell classification 334433C or higher).

2. **Profile Wall HDPE Pipe with Integral Joint.**
   Comply with requirements of ASTM F 894, ASTM D 2412 (minimum RSC of 160 at 3% deflection), and ASTM D 3350 (cell classification 334433C or higher).

3. **Profile Machine Spiral Wound PVC Pipe with Integral Joint.**
   Comply with requirements of ASTM F 1697 and provide a pipe stiffness as defined in ASTM F 1741 using a safety factor of 2.0.

4. **Profile Wall PVC Pipe with Integral Joint.**
   Comply with requirements of ASTM F 949 or F 1803.

5. **Corrugated Steel Pipe (CSP).**
   Comply with requirements of Article 4141.02 of the Standard Specifications and Standard Road Plan DR-104.

6. **Polypropylene Pipe (PP).**
   Comply with requirements of ASTM F 2764 or F 2736.

7. **Steel Reinforced Polyethylene (SRPE)**
   Comply with requirements of ASTM F 2562, Class 1.

B. Pipe Connections.
Use liner pipe capable of being joined into a continuous length. Ensure joints are adequate for pushing or pulling the liner pipe through the existing pipe.

C. Pipe Dimension Table.
Use liner pipe meeting dimensions as shown in Table DS-15090.02-1. Verify there is enough clearance in existing pipe to ensure adequate room for liner pipe installation (based on manufacturer's dimensions) and grouting.

Table DS-15090.02-1: Liner Pipe Size

Existing Pipe, Nominal Size, Inches	Liner Pipe, Nominal Size, Inches						
	Profile Wall HDPE[(a)]	Solid Wall HDPE[(b)]	Profile Spiral Wound PVC[(a)]	Profile Wall PVC[(a)]	CSP[(a)]	PP[(a)]	SRPE[(a)]
24	18	22	19	18	21	18	-
30	24	28	25	24	27	24	-
36	30	32	30	30	30	30	30
42	36	36	36	36	36	36	36
48	40	42	42	42	42	42	42
54	42	48	48	48	48	--	48
60	48	54	54	54	54	48	54
66	54	--	60	--	60	--	60
72	60	63	66	60	66	60	66
78	66	--	69	--	72	--	72
84	72	--	--	--	78	--	72
90	--	--	--	--	84	--	84
96	--	--	--	--	90	--	-

(a) ASTM or AASHTO standard nominal size is based on inside diameter.
(b) ASTM standard nominal size is based on outside diameter.

D. Annular Space Grouting
Use foamed cellular concrete meeting the requirements of Section 2506 of the Standard Specifications. Alternate Mix Designs are allowed when quantity for annular space grouting is estimated to be less than 10 cubic yards for the contract.

15090.03 CONSTRUCTION.

A. Prior to sliplining, clean the existing pipe of obstructions or debris that will prevent the insertion of the liner.

B. Secure the liner pipe to prevent floating during grouting and ensure minimum change in flowline, especially on the inlet end.

C. Annular Space Grouting.
Comply with construction requirements in Section 2506 of the Standard Specifications.

15090.04 METHOD OF MEASUREMENT.
Measurement for Sliplining Existing Culverts will be the linear feet shown in the contract documents for each culvert.

15090.05 BASIS OF PAYMENT.
Payment per linear foot includes all costs to inspect and clean the existing culvert and all labor, equipment, and materials for sliplining, securing the liner pipe in the existing culvert, and annular space

grouting. If Contractor demonstrates the grouting is greater than 120% of the estimated amount to fill the annular space, the grouting volume greater than 120% of the estimate will be paid for as extra work as provided in Article 1109.03, B of the Standard Specifications.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove, Cedric Wilkinson, CMB staff	**Office:** Construction & Materials	**Item 19**
Submittal Date: November 8, 2021	**Proposed Effective Date:** December 2021	
Article No.: **Title:**	**Other:** Developmental Specifications for Electronic Ticketing	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 12/21/2021

Specification Committee Approved Text: See attached Developmental Specifications for Electronic Ticketing.

Comments: Kevin Merryman will be the controller for this DS.

Due to concerns from the aggregate industry, the aggregate portion of this DS was removed, so it will only apply to asphalt and ready mixed concrete.

The Construction and Materials Bureau requested that the DS only apply to the primary work type on the contract, so for PCC projects, e-ticketing would not be required for any asphalt items. Similarly for an asphalt overlay, e-ticketing would not be required for any PCC items.

Specification Section Recommended Text: See attached Developmental Specifications for Electronic Ticketing.

Comments:

Member's Requested Change: **(Do not use 'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.)**

N/A- please see attached draft Developmental Specification

Reason for Revision: The proposed Developmental Specification is necessary to pilot the e-Ticketing Handling System (e-THS) developed by Info Tech on up to 100 contracts during the 2022 construction season.

New Bid Item Required (X one)	**Yes**	**No** X
Bid Item Modification Required (X one)	**Yes**	**No** X
Bid Item Obsoletion Required (X one)	**Yes**	**No** X

Comments: This DS provides a framework for e-ticketing for PCC, HMA, and Aggregate materials, and has broad support among the contracting industry. The draft DS incorporates industry feedback and lessons-learned, and is the culmination of over 150 pilot projects conducted in the past two years.

County or City Comments:

Industry Comments:

Sheila Beshears, Riverstone Group: Under C. 1. g. 2). We have concerns that this will be confusing asking for all these times on the ticket. Since this is under "All Materials" are aggregate plants supposed to provide all these times? At most, we get a time when the truck arrives and when the truck leaves our site. I understand that the other times are for the mix plant or project site but it is conceivable that someone will be expecting all these times to be listed on the ticket and not understand that is doesn't apply. If this section could be cleaned up or made more clear what is expected for each

material we would appreciate it.

Randy Olson, Iowa Limestone Producers Association: As of July 2021, IDOT reported to our Iowa Limestone Producers Association Technical Committee that Electronic Ticketing wouldn't be implemented til after spring 2023. A few specific questions: 1) How many aggregate producers were involved directly in the 150 pilot projects in the last 2 years? 2)How much time will Aggregate producers be allowed to implement such a system? 3) Which are the proposed 100 projects for E-ticketing for 2022? In short, Aggregate producers want to be a part of solutions for the Iowa DOT - we appreciate strong partnership and collaboration. Our membership has raised concerns about the ability to meet this proposed specification across the aggregate industry with limited visibility, planning, and discussion - especially with a shortened timeline than was previously advised by Iowa DOT.

DS-15091
(New)

DEVELOPMENTAL SPECIFICATIONS
FOR
ELECTRONIC TICKETING

Effective Date
December 21, 2021

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

15091.01 DESCRIPTION.

A. This work shall consist of providing electronic material tickets for all loads of flexible paving mixture or ready mixed PCC delivered to the project. Electronic ticketing will only be required for the primary material supplied to the project, i.e. flexible paving mixture for an HMA resurfacing project or PCC for a PCC paving project. Electronic tickets for other materials supplied to a project may be submitted at the Contractor's option. The Contractor/supplier can use the plant ticketing system of their choice to create the material ticket data.

B. Ticket data shall include the following:

1. After each truck is loaded, ticket data must be electronically captured, and ticket information uploaded via web service / Application Programming Interface (API) to the agency.

2. Material ticket data will be submitted to https://iowa.ticketing.gov via an HTTPS POST as JSON documents. Include the API key specific to each customer in each request as an HTTP header.

3. Material supplier must test to confirm that ticketing data can be shared from the originating system no less than 30 days prior to project start. Topic shall be discussed at the pre-construction meeting.

4. Ticket data must be available immediately upon project start so there are no delays to viewing tickets.

5. Provide the same data that is currently accessible and viewed by agency users previously on printed tickets specific to state projects.

6. Transmit ticket data before the truck leaves the plant and transmit any updates to the ticket data within 5 minutes of a change

15091.02 CONSTRUCTION DATA.

Contractor shall submit material ticket data in accordance with the plant manufacturer's system recommendations to provide the following.

A. Net weight (or volume for ready mix concrete) of material being transported (to nearest 0.01 ton or cubic yard).

B. Running daily total of net weight of material (or volume for ready mix concrete) being transported (to the nearest 0.01 ton or cubic yard).

C. Each material ticket shall contain the following:

1. **General Ticket information (All Material).**
   - **a.** Date.
   - **b.** Iowa DOT Project Number.
   - **c.** Name of Contractor
   - **d.** Name of material supplier.
   - **e.** Unique truck ID.
   - **f.** Plant/scale name (source).
   - **g.** Truck Status Times:
     - **1)** Loaded time (time batched) shall be available.
     - **2)** Provided other truck status times as available.
       - **a)** Ticketed.
       - **b)** Load time.
       - **c)** Left plant.
       - **d)** Arrive at project.
       - **e)** Begin unload.
       - **f)** Finish unload.
       - **g)** Leave project.

2. **Portland Cement Concrete.**
   - **a.** Loaded time (water/cement time).
   - **b.** Wet and dry batch weights (if computer generated).
   - **c.** Water:
     - **1)** In aggregate.
     - **2)** Total water.
     - **3)** Water/cement ratio.
     - **4)** Max water/cement ratio.
     - **5)** Allowable water to add.
   - **d.** Admixtures (including brand names if available):
     - **1)** Retarder and weights.
     - **2)** Water reducer and weights.
     - **3)** Air entrainment and weights.
     - **4)** Special performance admixtures and weights.
     - **5)** Concrete fibers.
   - **e.** Cementitious material(s) and weights.
   - **f.** CPI Name and certificate number.

3. **Flexible Pavement Mixture.**
   - **a.** Type of material.
   - **b.** Gross weight (if not automatic weighed).
   - **c.** Tare weight (if not automatic weighed).
   - **d.** Net weight.
   - **e.** Mix design number.

15091.03 METHOD OF MEASUREMENT.

None.

15091.04 BASIS OF PAYMENT.

Payment for electronic ticketing will be incidental to the material being provided.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Mike Nop / Steve Seivert	**Office:** Bridges and Structures	**Item 20**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: **Title:**	**Other:** New DS-15XXX, Ultra High Performance Concrete Connections New DS-15XXX, Ultra High Performance Concrete Overlay	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 03/15/2022

Specification Committee Approved Text: See attached Developmental Specifications for Ultra High Performance Concrete Connections and Developmental Specifications for Ultra High Performance Concrete Overlay.

Comments: These DSs will not have a controller.

District 6 Materials asked if the overlay DS should have a mix design section as is included in the connections DS.

Specification Section Recommended Text: See attached Developmental Specifications for Ultra High Performance Concrete Connections and Developmental Specifications for Ultra High Performance Concrete Overlay.

Comments: These could be approved for an earlier effective date if the Bridges and Structures Bureau would like.

Member's Requested Change: (Do not use 'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.)

1. Request that SP-150697 be converted to a Developmental Specification and applied to all new projects using Ultra High Performance Concrete as joint fill between cast-in-place and/or precast concrete bridge elements.
2. Request that SP-150580 be converted to a Developmental Specification and applied to all new projects using Ultra High Performance Concrete as a bridge deck overlay and riding surface.

Reason for Revision: The UHPC Special Provisions have been used successfully on several bridge projects. Due to the exceptional strength and durability properties of UHPC, the Bridges and Structures Bureau will continue to utilize UHPC for accelerated bridge construction connections and bridge deck overlays.

These new Developmental Specifications will help promote the use of UHPC as several Counties have expressed interest in the EDC-6 UHPC initiative and have inquired about the availability of Developmental Specifications.

New Bid Item Required (X one)	**Yes x**	**No**
Bid Item Modification Required (X one)	**Yes**	**No x**
Bid Item Obsoletion Required (X one)	**Yes**	**No x**

Comments: New bid items for: "Ultra High Performance Concrete (UHPC) Connections" CY

"Deck Overlay (UHPC)" SY

County or City Comments:
Industry Comments:

DS-15092
(New)

DEVELOPMENTAL SPECIFICATIONS
FOR
ULTRA HIGH PERFORMANCE CONCRETE CONNECTIONS

Effective Date
March 15, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

15092.01 DESCRIPTION.

A. Furnish all materials, tools, and labor necessary for the performance of all work to form, prepare bonding surfaces, cast, finish, and cure Ultra High Performance Concrete (UHPC) where required per plan for Ultra High Performance Concrete Connections.

B. Submittals.

1. General.
- **a.** Provide submittals to the Engineer in electronic format, in accordance with Article 1105.03 of the Standard Specifications.
- **b.** The submittals requiring written approval from the Engineer are as follows:

2. UHPC Placement Plan.
- **a.** Submit the UHPC Placement Plan for approval 30 days before casting concrete that includes a joint surface abutting UHPC for the superstructure to substructure connection (e.g. abutment footing concrete).
- **b.** The UHPC Placement Plan shall include, but not necessarily be limited to, the following:
  - Proposed method(s) of joint surface preparation to achieve the required concrete surface profile texture, as required in the design plans.
  - Proposed forming method(s).
  - Proposed batching sequence. The batching sequence shall include the order and time of introduction of the materials and the mixing time.
  - Proposed sequence and schedule for UHPC placement operations.
  - Details of all equipment to be used to batch and place UHPC materials, including mixers, pumps, concrete buggies, etc.
  - Curing procedures, including minimum cure time and minimum strength requirements prior to loading.
  - Include a plan that describes the process for curing and transporting the test specimens to assure that field curing conditions are being replicated.

- Details of the UHPC mix's average anticipated strength by age for the following time increments shall be indicated in table form: 12 hours, 24 hours, 36 hours, 48 hours, 60 hours, 72 hours, for each day from 4 days through 14 days, 21 days, 28 days.
- Testing procedures.
- Quality control / quality assurance procedures for verification of mix uniformity.

3. UHPC Mix Design.

a. Submit UHPC mix design to the Engineer 60 days prior to first placement of UHPC. Results of all compressive and pullout tests, conducted by an AASHTO accredited testing lab, shall be submitted to the Engineer for review and approval with the mix design. The Engineer may waive the tests of the UHPC mix if these tests have been previously performed for material supplied by the manufacturer.

b. A minimum of eight cylinders 3 inches by 6 inches for compressive strength testing and three additional 12-inch diameter by 7 1/2 inch deep cylinders for pullout testing shall be cast for mix design testing.

c. All compressive test cylinders shall be cured using the same method of curing proposed to be used in the field. The temperature during curing shall be within 18°F of the low end of the proposed temperature range for curing in the field. Compressive testing times are at 4 days, 7 days, 21 days and 28 days and two cylinders shall be tested for each testing day. The compressive strength shall be measured by ASTM C39 and shall meet 12 ksi minimum at 4 days and 21 ksi minimum at 28 days. Only a UHPC mix design that passes these tests may be used to form the joints.

d. The additional three 12 inch diameter by 7 1/2 inch cylinders shall each have one 32 inch long epoxy-coated reinforcing bar cast in the center of the circular face for pullout testing. The axis of the bar shall be perpendicular to the formed surface. The bars shall be No. 4 bars embedded 3 inches deep. These cylinders shall be kept wet for four days prior to delivery to the testing lab. Pullout testing shall be in accordance with ASTM E488 – Unconfined Test Method. The test shall be performed as soon as practical after corresponding compressive test samples reach 12 ksi compressive strength. Pullout test samples pass if the bars yield without the UHPC failing and without the bars pulling out of the UHPC.

4. List of Similar Bridge Projects.

Sixty days prior to first placement of UHPC, provide to the Engineer a list of bridge projects in which the proposed UHPC material has been used as joint fill between cast-in-place and/or precast concrete elements (within or outside the USA). The Engineer reserves the right to reject proposed UHPC material which lacks a proven track record for precast concrete joint filling in bridge applications.

15092.02 MATERIALS.

A. UHPC Material.

UHPC material shall meet the following requirements at 28 days, unless noted otherwise.

Table 15092.02-1: UHPC Material

Property	Test Method	Value
Compressive Strength (min.) Heat-Treated * Non Heat-Treated ** Non Heat-Treated, 4 Day **	ASTM C 39	 ≥ 25 ksi ≥ 21 ksi ≥ 12 ksi
Flexural Performance of Fiber-Reinforced Concrete (First- Peak Strength)	ASTM C 1609 (using modifications described in ASTM C 1856)	≥ 1200 psi at 28 days

Long-Term Shrinkage, initial reading after set	ASTM C 157	≤ 766 microstrain
Chloride Ion Penetrability	ASTM C 1202	≤ 250 coulombs
Chloride Ion Penetrability, 1/2 inch depth	AASHTO T259	≤ 0.07 oz/ft^3
Scaling Resistance	ASTM C 672	Y < 3
Abrasion Resistance, 2x weight, ground surf.	ASTM C 944	< 0.025 oz. lost
Freeze-Thaw Resistance, 600 cycles	ASTM C 666A	RDM > 96%
Alkali-Silica Reaction, tested for 28 days	ASTM C 1260	Innocuous

* Heat treated according to Manufacturer's recommendation; Temperature not to exceed 250°F.
** Not heat-treated-cured at a temperature of 60°F ± 3°F

B. Water.

1. Free from foreign materials in amounts harmful to concrete and embedded steel and meeting the following requirements:

Table 15092.02-2: Water for UHPC

Property	Test Method	Value
Presence of Oil		None
pH	AASHTO T 26	5.0 to 8.5
Organic Solids, max PPM	AASHTO T 26	200
Total Inorganic Solids, max PPM	AASHTO T 26	2000
Chloride Ion Content, PPM		500
Sulphate Ion Content, PPM		1000

2. Potable water obtained from a municipal supply, suitable for drinking, may be accepted without testing.

C. Fiber Reinforcement.
Steel fibers are required for the UHPC.

15092.03 CONSTRUCTION.

A. Quality Assurance.
Determine flow of freshly mixed UHPC according to ASTM C 1856. The measured diameter of the concrete shall be within the following limits: minimum 8 inches; maximum 10 inches. The test shall be performed on every UHPC concrete batch. Record the flow for each batch in the QA/QC log. Provide a copy of the log to the Engineer.

B. Pre-Pour Meeting.
Prior to the initial placement of UHPC, arrange for an onsite meeting with the UHPC representative and the Engineer. The Contractor's staff and the Contracting Authority's inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for mixing, transporting, finishing, and curing of the UHPC material. Arrange for a representative of the UHPC supplier to be on site during the placement of all UHPC connections. The UHPC representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

C. Storage.
Assure the proper storage of UHPC premix fibers and additives as required by the UHPC supplier's specifications to protect materials against loss of physical and mechanical properties.

D. Forming, Batching, Placement, and Curing.

1. Work together with the UHPC Manufacturer to ensure appropriate initial strength gains to meet the desired project schedule.

2. The 7 day minimum age for subjecting concrete to loads shall not apply to the UHPC. Cure duration shall be based on early strength breaks using cube tests and UHPC Manufacturer's recommendation.

3. For UHPC joint applications connecting bridge superstructure to bridge substructure, abutment backfilling operations can proceed when abutment UHPC closure pour strength of 6 ksi has been achieved, unless otherwise recommended by the UHPC Manufacturer.

4. For all UHPC joint applications the bridge can be opened to traffic, including construction equipment, when strength of 14 ksi has been achieved, unless otherwise recommended by the UHPC Manufacturer.

5. Forming, batching, placing, and curing shall be in accordance with the procedures as submitted to and accepted by the Engineer.

6. The design and fabrication of forms shall follow approved installation drawings and shall follow the recommendations of the UHPC Manufacturer. All the forms for UHPC shall be constructed from a transparent plexiglass type material. The forms shall not absorb water.

7. Follow the batching sequence as specified by the UHPC Manufacturer and as approved by the Engineer.

8. The UHPC joint shall be cast using one continuous placement. No cold joints shall be permitted.

9. The concrete in the form shall be cured according to Manufacturer's recommendations at minimum temperature of 60°F to attain the design strength.

E. Material Testing.

1. **Destructive Testing.**
   - **a.** Due to the special nature and equipment required to test the UHPC, the UHPC supplier shall be responsible for providing Material Testing Services and Results. The Results shall be signed and sealed by the UHPC Supplier's Engineer, licensed and registered in the State of Iowa. The results shall be provided as arranged with the Engineer, to meet the construction schedule and requirements for opening the bridge.
   - **b.** For each day of UHPC placement, cast four sets of compressive test cubes and two sets of compressive test cylinders. Each cubic set shall consist of three, 2 inch by 2 inch cubes. Each cylindrical set shall consist of three, 3 inch by 6 inch cylinders. All sets shall be cured in an environment like the material they represent.
   - **c.** Early strength test breaks shall use cube sets to validate achievement of the required compressive strength. Cubic compressive tests shall be performed in accordance with ASTM C109. Three cube specimens shall be tested for each of the following early strength milestones: 6 ksi prior to abutment backfilling operations, 10 ksi prior to grinding UHPC overfill, and 14 ksi prior to opening the bridge to traffic. The remaining three cubic specimens shall be treated as reserves.
   - **d.** Final strength test breaks shall use cylinder tests to validate achievement of the required compressive strength. Cylindrical compressive tests shall be performed in accordance with ASTM C39. Three cylinder specimens shall be tested at 28 days to validate the required 21 ksi final strength. The remaining three cylindrical specimens shall be treated as reserves.

e. When test data shows specified strength milestones are not achieved, notify the Engineer. Wait until the next scheduled test or test the reserve specimens at a time that has been approved by the Engineer.

2. Maturity Method testing.

a. Contractor has the option to use the Maturity Method for estimating the in-place UHPC strength in lieu of destructive testing. Use of this method requires the development of the strength-maturity relationship according to Materials I.M. 383.

b. If using the Maturity Method, cast one set of cubic specimens, as described above, for each day of UHPC placement. These shall be treated as reserves.

15092.04 METHOD OF MEASUREMENT.

Measurement of Ultra High Performance Concrete (UHPC) will be the quantity shown in the contract documents in cubic yards.

15092.05 BASIS OF PAYMENT.

Payment will be for the contract unit price of Ultra High Performance Concrete (UHPC). Payment is full compensation for furnishing all submittals, materials, labor, testing, results, formwork and incidental work for completion of the UHPC joint as indicated in this developmental specification and the contract documents.

DS-15093
(New)

DEVELOPMENTAL SPECIFICATIONS
FOR
ULTRA HIGH PERFORMANCE CONCRETE OVERLAY

Effective Date
March 15, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

15093.01 DESCRIPTION.
This specification consists of supplying, mixing, transporting, placing, finishing, curing, and diamond grinding of Ultra High Performance Concrete (UHPC) for use as an overlay and riding surface in accordance with the Contract Documents and as directed by the Engineer.

15093.02 MATERIALS.

A. Material Properties.
Provide materials as follows. All materials in Items 1 and 2 below must be premixed and proportioned in bags or supersacks and come from the same batch or lot.

1. Fine Aggregate - Crushed Quartz with 100% passing the No. 30 sieve and a maximum of 3% passing the No. 200 sieve.

2. Cementitious Material - Meet all applicable ASTM specifications.

3. Steel Fibers - ASTM A 820, Type 1, cold drawn high-carbon steel with a minimum tensile strength of 300 ksi, length of 12 mm to 13 mm, and diameter of 0.220 mm to 0.225 mm. Minimum steel fiber content will be 3.25% of the mix's dry volume.

4. Water - Water for Mixing Portland Cement per Standard Specifications and as specified by the manufacturer for use in the UHPC mix.

5. Admixtures - Only as specified by the manufacturer.

B. UHPC Mix Design.

1. Submit UHPC mix design to the Engineer 60 days prior to first placement of UHPC. Results of all compressive tests, conducted by an AASHTO accredited testing lab, shall be submitted to the Engineer for review and approval with the mix design. The Engineer may waive the tests of

the UHPC mix if these tests have been previously performed for material supplied by the manufacturer.

2. A minimum of 16 cylinders 3 inches by 6 inches shall be cast for mix design compressive strength testing.

3. All compressive test cylinders shall be cured using the same method of curing proposed to be used in the field. The temperature during curing shall be within 18°F of the low end of the proposed temperature range for curing in the field. Testing times are at 12 hours, 18 hours, 24 hours, 48 hours, 72 hours, 96 hours, 7 days and 28 days. Two cylinders shall be tested for each testing day. The compressive strength shall be measured by ASTM C39 and shall meet 12 ksi minimum at 48 hours and 18 ksi minimum at 28 days. Only a UHPC mix design that passes these tests may be used.

C. Material Requirements

The UHPC mixture shall meet the material properties listed in Table DS-15093.02-1: UHPC Material Properties after 28 days, unless otherwise noted in the contract documents or as directed by the Engineer. Material properties listed below will be verified by the manufacturer and submitted for approval in the Placement Plan.

Table DS-15093.02-1: UHPC Material Properties after 28 days

Description	Test Method	Acceptance Criteria
Compressive Strength *Ends of cylinders must be ground flush prior to testing.* *Saw cutting, capping, and use of neoprene pads are not permitted.*	AASHTO T 22 (3"x6" cylinders and 2"x2" Cubes) * (150 psi/sec loading rate)	≥14 ksi at 28 days
Long-Term Shrinkage	AASHTO T160 (64 weeks)	≤ 800 micro-strain
Chloride Ion Penetrability	AASHTO T 259 (1/2" depth)	< 0.1183 lbs/yd^3
Scaling Resistance	ASTM C672	Y < 3
Freeze-Thaw Resistance	AASHTO T 161 / ASTM C666A (300 cycles)	Relative Dynamic Modulus of Elasticity > 95%
Alkali-Silica Reaction	ASTM C1260	Innocuous

* Additionally cast 2 inch by 2 inch cubes for 28 day acceptance testing by Construction and Materials Bureau, Ames, Iowa.

15093.03 CONSTRUCTION.

A. Surface Preparation

1. To prepare the bridge deck surface for UHPC overlay, use hydrodemolition in accordance with Developmental Specification for Partial Removal of Existing Bridge Deck Using Hydrodemolition.

2. When hydrodemolition and final cleaning are complete, the deck surface shall be thoroughly saturated to the point that the surface does not dry out, and any excess water shall be removed with compressed air.

3. Clean polyethylene sheeting shall be used to cover the deck completely until such time that the overlay is poured.

B. Storage.
Assure proper storage of all materials including but not limited to cement, aggregate, steel fibers and additives, as required by the supplier's recommendation to protect the integrity of the materials against the loss of physical and mechanical properties.

C. Placement Plan.

1. Submit a placement plan with a detailed construction work schedule to the Engineer for review and approval at least 30 days prior to the scheduled UHPC placement pour. The following list is intended as a guide and may not address all the means and methods the Contractor may elect to use. The Contractor is expected to assemble a comprehensive list of all necessary items for executing the placement of UHPC.
- Responsible personnel and hierarchy.
- Equipment – including but not limited to mixers, holding tanks, generators, wheelbarrows, scales, meters, thermometers, floats, screeds, burlap, plastic, heaters, blankets, etc.
- Quality Control of batch proportions - including dry ingredients, steel fibers, water, and admixtures.
- Quality Control of mixing time and batch times.
- Batch procedure sequence.
- Form work – including materials and removal.
- Placement procedure – including but not limited to surface preparation of existing concrete surfaces and pre-wetting of the existing concrete interface to a saturated-surface-dry (SSD) condition before the placement of UHPC, spreading, finishing, and curing protection. Include provisions for acceptable ambient conditions and batch temperatures and corrective measures as appropriate.
- Threshold limits for ambient temperature, ambient relative humidity, batch consistency, batch temperature, batch times and related corrective actions.

2. Pumping of UHPC is not allowed.

3. Addition of mix water or surface water to improve workability or aid in placement is not allowed. Do not allow water to pond on the surface of the prepared deck prior to placement.

4. Construction loads applied to the bridge during UHPC placement and curing are the responsibility of the Contractor. Submit the weight and placement of concrete buggies, grinding equipment or other significant construction loads for review as part of the proposed Placement Plan.

D. Pre-Pour Meeting.
Prior to the initial placement of UHPC, arrange for an onsite meeting with the UHPC representative and the Engineer. The Contractor's staff and the Contracting Authority's inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for mixing, transporting, finishing, and curing of the UHPC material. Arrange for a representative of the UHPC supplier to be on site during the placement of all UHPC. The UHPC representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

E. Forming, Mixing, Transporting, Placing and Curing.

1. If required in the contract documents and as directed by the Engineer, complete and cure all bridge deck repairs per the Standard Specification before placing UHPC.

2. Design and fabricate formwork if required to adhere to Standard Specifications and the recommendations of the UHPC manufacturer. Construct forms from nonabsorbent material

that are properly sealed and capable of resisting the hydrostatic pressures from UHPC in the unhardened state. Do not remove formwork until the UHPC overlay achieves a minimum compressive strength of 11.0 ksi, except as required to prepare the surface at construction joints for placement of the following stage. Use of a concrete set retarder followed by high-pressure water wash is required at construction joints to achieve satisfactory bond.

3. A curing compound shall be applied to the UHPC overlay surface immediately after placement of the UHPC. Apply plastic sheeting to the surface following placement of curing compound for the duration of the minimum curing period.

4. Forming, batching, placing, and curing will be in accordance with the UHPC manufacturer's recommendations and as submitted and accepted by the Engineer.

5. Representatives of the UHPC manufacturer knowledgeable in supplying, mixing, transporting, placing, finishing, and curing of the UHPC material must be present during mixing, transporting, and placing of the UHPC. The Contractor will arrange for two manufacturer's representatives to be on site for the duration of the UHPC construction; one representative will remain with the mixing operations and the second representative will remain with the placement operations. Do not start mixing or placing UHPC until the manufacturer's representatives are on-site. Place UHPC in accordance with the approved Placement Plan using one continuous pour per each stage of construction. The use of bulkheads will not be permitted. Keep UHPC from freezing until it has achieved a minimum compressive strength of 11.0 ksi minimum.

6. Provide a minimum of three portable batching units for mixing of the UHPC. Mixing equipment, which is not supplied by the UHPC manufacturer, must be reviewed by the UHPC manufacturer for adequacy. During batching keep the temperature of the UHPC below 80°F; ice may be added to the mix as recommended by the UHPC manufacturer's representative.

F. Acceptance Testing.

1. The Construction and Materials Bureau will be on site during the placement of UHPC. To schedule a representative, contact Construction and Materials a minimum of 48 hours prior to the anticipated UHPC placement. Final acceptance will be based upon 28 day strength. Field coring of UHPC for dispute resolution will not be allowed.

2. Contractor is responsible for providing an adequate location to place acceptance specimens for initial curing prior to transport to the lab. Curing boxes will be equipped with supplemental heat or cooling as necessary to cure specimens in accordance with ASTM C31. Testing shall be performed by the Contractor and approved by the Engineer. Testing is summarized in Table DS-15093.03-1: UHPC Acceptance Testing. Performance frequencies of each test listed in Table DS-15093.03-1 are minimum values and tests may be performed at more frequent intervals, at the discretion of the Engineer.

3. Contractor may use Maturity Method for estimating the in-place UHPC strength in lieu of destructive testing. Use of this method requires the development of the strength-maturity relationship according to Materials I.M. 383. If using Maturity Method, one set of cylindrical specimens shall be cast, as described, for each day of UHPC placement. These shall be treated as reserves.

4. When test data shows specified strength requirements are not achieved, notify the Engineer. Wait until the next scheduled test for the material in question or perform a test at a time that has been approved by the Engineer.

Table DS-15093.03-1: UHPC Acceptance Testing

Description	Test Method	Acceptance Criteria	Frequency

Compressive Strength	AASHTO T 22 **	≥ 14 ksi (at 28 days) (3"x6" cylinders) (150 psi/sec loading rate)	12 tests in 1st day at intervals specified by engineer, 2 day, 3 day, 4 day, 8 day, 14 day, & 28 day
Slump Flow and Visual Stability	ASTM C 1856	8 inches (Min.) 10 inches (Max.) No bleed water Consistent fiber distribution	1 per batch

** In lieu of AASHTO T 22, the Maturity Method in accordance with Materials I.M. 383 is allowed.

G. Surface Profile and Finish

1. The UHPC shall have a formulated rheology to be thixotropic so that the finished surface of the UHPC overlay will match the proposed roadway profile to within a tolerance specified in Article 2413.03, E of the Standard Specifications. After curing, the entire UHPC overlay will be grooved in accordance with Article 2413.03, E of the Standard Specifications. The extent of the required diamond grinding will be described in the contract documents or as directed by the Engineer. Grinding and Grooving of the UHPC surface can be performed after the UHPC overlay achieves a minimum compressive strength of 11.0 ksi, unless otherwise approved by the Engineer.

2. Traffic or other loading will not be permitted directly on the UHPC overlay until the UHPC undergoes the aforementioned curing process and achieves a minimum compressive strength of 11.0 ksi, unless otherwise approved by the Engineer.

15093.04 METHOD OF MEASUREMENT.

The quantity of Ultra High Performance Concrete will be measured as the number of square yards of UHPC placed and accepted. The volume will be computed using the dimensions shown on the plans. The quantity of grinding will not be measured.

15093.05 BASIS OF PAYMENT.

A. The quantity of UHPC overlay will be paid at the Contract unit price per square yards. Price and payment will constitute full compensation for surface preparation, supplying, mixing, transporting, placing, finishing, curing, grinding, grooving, and for furnishing all equipment, tools, labor, and incidentals required to complete the work.

B. Additional quantity of material used for areas where the removals went below the planned depth shall be paid for separately. The additional quantity shall be based on the volume computed from the dimensions shown on the plans deducted from the total volume placed during the overlay operation.

C. Additional quantity of material used in the determination of material properties and for acceptance testing as described herein will be furnished at no additional cost to the Contracting Authority. No additional payment will be made for surface preparation or for grinding procedures.

D. If the UHPC does not meet the minimal material properties as described herein, the UHPC will be removed and replaced or remediated to the satisfaction of the Engineer at the Contractor's expense. No additional payment will be made for remedial solutions to insufficient bonding between the UHPC and underlying bridge elements.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Mike Nop / Steve Seivert	**Office:** Bridges and Structures	**Item 21**
Submittal Date: November 2021	**Proposed Effective Date:** April 2022	
Article No.: **Title:**	**Other:** New DS-15XXX, Partial Removal of Existing Bridge Deck Using Hydrodemolition	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 03/15/2022

Specification Committee Approved Text: See attached Developmental Specifications for Partial Removal of Existing Bridge Deck Using Hydrodemolition.

Comments: Controller for this DS will be Mike Nop.

Specification Section Recommended Text: See attached Developmental Specifications for Partial Removal of Existing Bridge Deck Using Hydrodemolition.

Comments: This DS could be approved for use earlier if the Bridges and Structures Bureau would like.

Member's Requested Change: **(Do not use 'Track Changes', or 'Mark-Up'. Use ~~Strikeout~~ and Highlight.)**
Request that BSB SS 1069 be converted to a Developmental Specification and applied to all new projects using hydrodemolition for partial removal of existing bridge decks.

Reason for Revision: The Bridges and Structures Bureau has used hydrodemolition of several bridge deck overlay projects. With no specification for hydrodemolition, Standard Sheet 1069 has been used in the past. Due to the exceptional surface produced, the Bureau will use hydrodemolition on all new UHPC bridge deck overlay projects. With more frequent use, the next logical step is to develop a Developmental Specification of using hydrodemolition. The new DS can also be used on partial deck removals for traditional deck overlays.

New Bid Item Required (X one)	**Yes x**	**No**
Bid Item Modification Required (X one)	**Yes**	**No x**
Bid Item Obsoletion Required (X one)	**Yes**	**No x**

Comments: New bid item for: "Hydrodemolition Removal" SY

County or City Comments:

Industry Comments:

HYDRODEMOLITION NOTES:

IT IS THE INTENT TO USE THE HYDRODEMOLITION PROCESS TO REMOVE ALL UNSOUND CONCRETE AS DIRECTED BY THE ENGINEER BY USING A HIGH PRESSURE WATER STREAM. REMOVALS SHALL CREATE A VERY ROUGH, BONDABLE SURFACE FOR NEW CONCRETE TO ADHERE TO. ALL HMA PATCH MATERIAL SHALL BE REMOVED PRIOR TO HYDRODEMOLITION. CONCRETE PATCH MATERIAL CAN REMAIN IF DETERMINED TO BE SOUND.

THE COMPLETE BRIDGE DECK SURFACE SHALL BE MILLED TO A DEPTH OF ¼ INCH BEFORE HYDRODEMOLITION BEGINS.

THE CONTRACTOR SHALL USE SELF-PROPELLED HYDRODEMOLITION EQUIPMENT THAT PROVIDES A HIGH PRESSURE WATER JET STREAM FOR CONCRETE REMOVALS. THIS EQUIPMENT SHALL BE CAPABLE OF REMOVING ANY UNSOUND CONCRETE, AS WELL AS REMOVING RUST AND CONCRETE PARTICLES FROM EXPOSED REINFORCING STEEL.

CLEAN POTABLE WATER SHALL BE PROVIDED FOR HIGH PRESSURE REMOVALS AND THE EXCESS WATER RECLAIMED USING VACUUM METHODS OF COLLECTION, THEN FILTERED AND REUSED AS MUCH AS PRACTICAL.

OPERATION OF THE HYDRODEMOLITION EQUIPMENT SHALL BE PERFORMED AND SUPERVISED BY QUALIFIED PERSONNEL CERTIFIED BY THE EQUIPMENT MANUFACTURER.

THE CONTRACTOR SHALL ENSURE CONTAINMENT OF ALL DISLODGED MATERIAL, FLYING DEBRIS AND EXCESS WATER WITHIN THE EXISTING ROADWAY AND NOT ALLOW DEBRIS OR WATER TO ENTER ADJACENT TRAVEL LANES OR TRAFFIC, OR BELOW THE WORK AREA.

CALIBRATING HYDRODEMOLITION:

PRIOR TO THE COMMENCEMENT OF THE REMOVAL OPERATION WITH HYDRODEMOLITION, THE EQUIPMENT SHALL BE CALIBRATED ON TWO SECTIONS DESIGNATED BY THE ENGINEER TO DEMONSTRATE THAT EQUIPMENT, PERSONNEL AND METHODS OF OPERATION ARE CAPABLE OF PRODUCING RESULTS SATISFACTORY TO THE ENGINEER. THE TRIAL SECTIONS WILL BE APPROXIMATELY 100 SQUARE FEET EACH, CONSISTING OF ONE SECTION OF SOUND CONCRETE THEN ONE SECTION OF DETERIORATED CONCRETE. THE CALIBRATION SHALL NOT INCLUDE ANY AREAS OF EXISTING OVERLAY OR PATCH MATERIAL. THE CONTRACTOR WILL DOCUMENT THE FOLLOWING INITIAL SETTINGS:

1. WATER PRESSURE GAUGE (13,000 PSI MINIMUM)
2. WATER USAGE (55 GALLONS PER MINUTE, MINIMUM) - VERIFY NEED FOR THIS VALUE
3. MACHINE STAGING CONTROL (STEP)
4. NOZZLE SIZE
5. NOZZLE SPEED (TRAVEL)

AFTER THE INITIAL TEST ON SOUND CONCRETE, THE EQUIPMENT SHALL THEN BE MOVED TO THE DETERIORATED AREA TO VERIFY THAT INITIAL SETTINGS WILL FULLY REMOVE UNSOUND CONCRETE WITHIN THE DESIGNATED AREA. THE INITIAL SETTINGS MAY NEED TO BE ADJUSTED, WITHIN THE LIMITS ESTABLISHED ABOVE, IN ORDER TO ACHIEVE TOTAL REMOVAL OF UNSOUND CONCRETE. THE CONTRACTOR SHALL DOCUMENT THE FINAL EQUIPMENT SETTINGS RESULTING FROM THE CALIBRATION PROCESS.

CONCRETE BRIDGE DECK REMOVAL BY HYDRODEMOLITION:

AFTER CALIBRATION OF THE EQUIPMENT, CONCRETE REMOVAL BY HYDRODEMOLITION SHALL BE CONDUCTED ON THE BRIDGE DECK. THE REMOVAL SETTINGS WILL BE VERIFIED AS NECESSARY. THE EQUIPMENT SETTINGS WILL BE DOCUMENTED BY THE CONTRACTOR AND PROVIDED TO THE ENGINEER. CALIBRATION OF THE HYDRODEMOLITION EQUIPMENT SHALL BE CONDUCTED FOR EVERY DAY OF OPERATION AND, IF NECESSARY, RE-CALIBRATED TO INSURE REMOVAL OF KNOWN AREAS OF DELAMINATED CONCRETE AS WELL AS TO GUARD AGAINST EXCESSIVE REMOVAL OF SOUND CONCRETE. HANDCHIPPING MAY BE USED IN AREAS THAT ARE INACCESSIBLE TO THE SELF-PROPELLED OR HAND OPERATED HYDRODEMOLITION EQUIPMENT. HANDCHIPPING TOOLS (15 LBS. MAXIMUM) MAY BE HAND OR MECHANICALLY DRIVEN.

ADDITIONAL REMOVAL:

AFTER CONCRETE BRIDGE DECK REMOVAL BY HYDRODEMOLITION HAS BEEN COMPLETED FOR THE CONSTRUCTION PHASE, THE DECK WILL UNDERGO FINAL SOUNDING TO ASSURE THAT ALL UNSOUND CONCRETE HAS BEEN REMOVED. THE PREPARED DECK SURFACE WILL BE COMPLETELY DRY PRIOR TO FINAL SOUNDING AND WILL CONSIST OF AS MANY SUCCESSIVE SOUNDINGS AS REQUIRED TO ENSURE THAT ALL DELAMINATED OR DEBONDED CONCRETE HAS BEEN REMOVED. ADDITIONAL CONCRETE REMOVAL SHALL BE PERFORMED BY HANDCHIPPING AND/OR HYDRODEMOLITION. HANDCHIPPING TOOLS MAY BE HAND OR MECHANICALLY DRIVEN AND OPERATED IN ACCORDANCE WITH ARTICLE 2413.03 OF THE STANDARD SPECIFICATIONS.

IN ADDITION, WHERE REINFORCING STEEL IS EXPOSED AND CONCRETE AND STEEL ARE NO LONGER BONDED, REMOVE ANY CONCRETE TO CLEAR AT LEAST ¾ INCH AROUND THE EXPOSED BARS. UN-BONDED BARS SHALL DETERMINED BY THE ENGINEER, MORE THAN ONE-HALF OF THE BAR PERIMETER MAY BE EXPOSED AND STILL DETERMINED TO BE "BONDED". DO NOT USE CHIPPING HAMMERS HEAVIER THAN 15 LBS. TO REMOVE CONCRETE. EXTREME CARE SHALL BE TAKEN TO ENSURE THAT NO DAMAGE IS DONE TO ANY REINFORCING BARS EXPOSED DURING THE REMOVAL PROCESS. ANY DAMAGE DONE SHALL BE REPAIRED BY THE CONTRACTOR AS APPROVED BY THE ENGINEER AT NO ADDITIONAL COST TO THE STATE.

FULL DEPTH REPAIR OF BRIDGE DECK:

WHERE THE DECK IS SOUND FOR LESS THAN HALF OF ITS ORIGINAL DEPTH, THE CONCRETE SHALL BE REMOVED FULL DEPTH (DESIGNATED AS CLASS B REPAIR) EXCEPT FOR LIMITED AREAS AS DETERMINED BY THE ENGINEER.

PREPARATION OF BRIDGE DECK PRIOR TO OVERLAY PLACEMENT:

VACUUMING OF DEBRIS AND WATER SHALL BE DONE IMMEDIATELY AFTER ANY HYDRODEMOLITION WORK. CONTRACTOR IS TO ENSURE ALL WATER RUN-OFF AND RESIDUAL MATERIAL IS CONTAINED WITHIN THE WORK AREA AND COLLECTED FOR DISPOSAL. DISPOSE OF EXCESS WATER AND DEBRIS AS APPROVED BY THE ENGINEER.

CLEANING OF THE HYDRODEMOLITION DEBRIS AND SLURRY SHALL BE PERFORMED WITH A VACUUM SYSTEM EQUIPPED WITH DUST CONTROL DEVICES AND CAPABLE OF REMOVING WET DEBRIS AND WATER IN THE SAME PASS. THE VACUUM EQUIPMENT SHALL BE CAPABLE OF WASHING THE DECK WITH PRESSURIZED WATER DURING THE VACUUM OPERATION TO DISLODGE ALL DEBRIS AND SLURRY FROM THE BRIDGE DECK SURFACE. CLEANING SHALL BE DONE BEFORE DEBRIS AND SLURRY IS ALLOWED TO DRY ON THE BRIDGE DECK SURFACE.

AFTER COMPLETION OF HYDRODEMOLITION AND ADDITIONAL REMOVALS, BUT NOT MORE THAN 24 HOURS PRIOR TO PLACEMENT OF THE OVERLAY, THE ENTIRE DECK SHALL BE SANDBLASTED OR WATER BLASTED TO EXPOSE FINE AND COARSE AGGREGATES AND TO REMOVE LAITANCE FROM THE SURFACE. EXPOSED REINFORCING STEEL AND THE CONCRETE UNDER AND AROUND THE EXPOSED STEEL SHALL BE THOROUGHLY CLEANED BY SANDBLASTING OR WATER BLASTING. THE SURFACE SHALL BE CLEANED USING COMPRESSED AIR TO REMOVE ALL DUST, CHIPS AND WATER. AIR LINES FOR SANDBLASTING AND COMPRESSED AIR CLEANING SHALL BE EQUIPPED WITH OIL TRAPS.

BID ITEM INFORMATION:

THE BID ITEM "HYDRODEMOLITION REMOVAL" SHALL INCLUDE ALL COSTS FOR HYDRODEMOLITION, CLEAN-UP, WATER CONTROL, DISPOSAL, AND FINAL CLEAN-UP IN PREPARATION FOR "CONCRETE REPAIR, REPLACE VARIABLE DEPTH CONCRETE".

THE BID ITEM "CONCRETE REPAIR, REPLACE VARIABLE DEPTH CONCRETE", CUBIC YARDS, SHALL INCLUDE THE ADDITIONAL CONCRETE TO REPAIR THE DECK FROM THE HYDRO-DEMOLITION REMOVAL AND HAND REMOVAL. FOR THE FIELD MEASUREMENT OF THIS ITEM, THE CONCRETE REQUIRED FOR THE DECK OVERLAY (_____ CUBIC YARDS) WILL BE DEDUCTED FROM THE TOTAL CONCRETE VOLUME PLACED DURING THE OVERLAY OPERATION. THE _____ CUBIC YARD QUANTITY WAS DETERMINED USING A 2¼ INCH OVERLAY THICKNESS (1¾ INCH NOMINAL PLUS ½ INCH ALLOWABLE VARIATION). IT IS ASSUMED THE OVERLAY OPERATION WILL PLACE ALL DECK CONCRETE (EXCLUDING AREAS OF CLASS B REPAIR) IN ONE OPERATION.

THE BID ITEM "DECK OVERLAY (CLASS O PPC)" OR "DECK OVERLAY (CLASS HPC-O PCC)" SHALL INCLUDE THE COST OF THE _____ CUBIC YARDS OF CONCRETE MATERIAL NOTED AS A DEDUCTION WHEN CALCULATING THE "CONCRETE REPAIR, REPLACE VARIABLE DEPTH CONCRETE" PAY QUANTITY.

THE BID ITEM "REMOVALS, CLASS A" SHALL INCLUDE COST OF LABOR AND EQUIPMENT REQUIRED TO REMOVE UNSOUND CONCRETE AND UNBONDED CONCRETE AROUND EXPOSED REINFORCING BARS AFTER HYDRODEMOLITION. REMOVALS WILL INVOLVE HAND CHIPPING TOOLS AND BE PAID FOR BY CONTRACT UNIT PRICE PER SQ. YD.

THE ENGINEER WILL DETERMINE THE SQ. YD. OF "REMOVALS, CLASS A" BY MEANS OF SURFACE DIMENSIONS OF THE AREAS TO BE REMOVED TO THE NEAREST 0.1 SQ. YD.

CONCERNING ADJUSTMENT OF PRICE FOR OVERRUN OR UNDERRUN OF THE CONTRACT QUANTITY, "REMOVALS, CLASS A" WILL NOT BE CONSIDERED A MAJOR ITEM OF WORK.

DEFECTS IN EMBEDDED REINFORCING STEEL DUE TO CORROSION, WHICH HAS REDUCED THE CROSS SECTIONAL AREA OF THE STEEL BY 25% OR GREATER, SHALL HAVE NEW REINFORCING STEEL OF THE SAME SIZE OR GREATER CROSS SECTIONAL AREA LAPPED TO EACH SIDE OF THE DAMAGED AREA. 2'-2" LAP LENGTHS SHALL BE USED. NEW REINFORCEMENT SHALL BE EPOXY COATED. NEW REINFORCEMENT SHALL BE PAID FOR AS AN EXTRA WORK ORDER.

WHERE THE DECK IS UNSOUND FOR MORE THAN HALF OF ITS ORIGINAL DEPTH AS DETERMINED BY THE ENGINEER, THE CONCRETE SHALL BE REMOVED FULL DEPTH. FOR THESE AREAS OF FULL DEPTH REMOVAL (DESIGNED AS CLASS B REPAIR), THE WORK SHALL BE PAID FOR AS EXTRA WORK.

HYDRODEMOLITION NOTES

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

DESIGN SHEET NO. ___ OF ___ FILE NO. _____ DESIGN NO. _____

REVISED 06-2017 - UPDATED REFERENCES TO BRIDGE DECK (WAS BRIDGE FLOOR).
ENGLISHMISCELLANEOUSBRIDGES.DGN - 1069 - THIS SHEET ISSUED 01-14.

DESIGN TEAM	HYDRODEMOLITION NOTES	STANDARD SHEET 1069	COUNTY	PROJECT NUMBER	SHEET NUMBER

7/1/2019 2:41:39 PM bkloss W:\Highway\Bridge\Standards\Bridges\EnglishMiscellaneousBridges.dgn 1069 11x17_pdf.pltcfg

DS-15094
(New)

DEVELOPMENTAL SPECIFICATIONS
FOR
PARTIAL REMOVAL OF EXISTING BRIDGE DECK USING HYDRODEMOLITION

Effective Date
March 15, 2022

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

15094.01 DESCRIPTION.
This specification consists of bridge deck preparation using hydrodemolition for removal of sound concrete to a minimum depth of removal as shown on the plans, and for selective removal of unsound concrete at variable depths to provide a rough, bondable surface. Final surface roughness profile of 1/8 inch or greater is required, equivalent to International Concrete Repair Institute (ICRI) CSP 7 or greater.

15094.02 QUALIFICATIONS.
Operation of the hydrodemolition equipment shall be performed and supervised by an operator trained and certified by the equipment manufacturer and having a minimum of two years of experience with the equipment being used.

15094.03 CONSTRUCTION.

A. General.

1. Mill the complete bridge deck surface before hydrodemolition begins. Milling depth shall be between 1/4 inch (minimum) and 1/2 inch (maximum).

2. Contractor shall ensure all water run-off and debris associated with hydrodemolition and cleaning is contained within the work area and collected for disposal.

3. Clean potable water shall be provided for high pressure removals and the excess water reclaimed using vacuum methods of collection, then filtered and reused as much as practical.

4. Disposal of excess water, run-off, and debris shall meet all applicable federal, state, and local regulations.

5. HMA patch material shall be removed prior to hydrodemolition. Concrete patch material can remain if determined to be sound.

6. All areas of Class B deck repair identified in the plans are to be removed and repaired prior to starting hydrodemolition operations.

B. Equipment.

1. At least 10 working days before start of work, submit to the Engineer a Method Statement including a list of all equipment to be used in the hydrodemolition process and certification from the manufacturer that the hydrodemolition equipment is intended for use on bridge decks and can complete the work as described in a single pass. Hydrodemolition shall not begin until the Engineer has provided approval of the Method Statement.

2. Hydrodemolition equipment shall consist of a water supply system, a high-pressure water pumping system, a demolition unit, and a vacuum system capable of quickly removing all debris generated by the demolition unit and water supply system.

3. Equipment shall be a self-propelled robotic machine that utilizes a high-pressure water jet stream capable of selectively removing the unsound concrete and the sound concrete to the minimum depth specified and attaining pressures in the range of 13,000 to 20,000 PSI.

4. The equipment shall be capable of cleaning rust and concrete particles from all exposed reinforcing steel.

5. The machine shall have forward and backward motion that can move the water jet transversely across the concrete surface.

6. The equipment shall be capable of removing all unsound concrete at variable depths and all sound concrete to the depth of removal specified in the plans. All removal shall be achieved in a single pass.

C. Calibration.

1. Prior to the commencement of the removal operation with hydrodemolition, the equipment shall be calibrated on two sections designated by the engineer to demonstrate the equipment, personnel and methods of operation can produce results satisfactory to the Engineer.

2. The trial sections will be approximately 100 square feet each, consisting of one section of sound concrete then one section of deteriorated concrete. The calibration shall not include any areas of existing overlay or patch material. Document the following initial settings:
   - Water Pressure Gauge (13,000 PSI minimum).
   - Water usage (Anticipated 55 gallons per minute, minimum).
   - Machine Staging Control (Step).
   - Nozzle Size.
   - Nozzle Speed (Travel).

3. After the initial test on sound concrete, to achieve adequate depth of removal and surface roughness profile, the equipment shall then be moved to the deteriorated area to verify that initial settings will fully remove unsound concrete within the designated area.

4. The initial settings may need to be adjusted within the established above, to achieve total removal of unsound concrete. Document the final equipment settings resulting from the calibration process.

5. Calibration of the hydrodemolition equipment shall be conducted for every day of operation and, if necessary, re-calibrated to ensure removal of known areas of delaminated concrete as well as to guard against excessive removal of sound concrete.

D. Wastewater Disposal

1. The wastewater generated by all hydrodemolition and cleaning processes shall become the property of the Contractor and shall be contained, collected, and disposed of at a facility properly permitted to accept hydrodemolition wastewater.

2. Prevent wastewater generated by hydrodemolition and cleaning from entering surface waters, storm sewers, floodplains, wetlands, and railroad right-of-way.

3. At least 30 days prior to the beginning of the work, submit to the Engineer details for a collection and disposal plan.
   a. Define how the wastewater will be contained, stored, and disposed of.
   b. Define the process for preventing wastewater from leaving the deck surface including through deteriorated joints, deck drains, and holes in the deck.
   c. Define method for creating a watertight seal at the hole when removals blow completely through the deck.

4. For circumstances indicating surface water contamination caused by wastewater, the stop the hydrodemolition equipment and notify the Engineer.

E. Traffic Considerations.

1. Traffic shall be allowed to operate through the project site as shown on the project plans.

2. Provide shielding, as necessary, to ensure containment of all dislodged concrete and water spray within the removal area to protect the traveling public from flying debris both on and under the work site during hydrodemolition and cleaning.

3. If nighttime work is approved by the Engineer, provide adequate lighting as required for nighttime removal.

4. Care shall be taken to avoid any hazardous glare in the direction of oncoming traffic.

F. Hydrodemolition.

1. After calibration of the equipment, conduct concrete removal by hydrodemolition on the bridge deck.

2. Verify the removal settings as necessary.

3. Document the equipment settings and provide to the Engineer.

4. Remove sound concrete to the depth shown in the plans to achieve a rough and bondable surface.

5. In areas of concrete girders and diaphragms, do not remove concrete below the bottom of the slab, unless otherwise called for in the plans.

6. Repair all reinforcing steel damaged or replace at the Contractor’s expense.

7. Prevent damage to existing reinforcing that has been exposed and do not allow equipment on exposed bars that have been left unsupported by the removal process.

8. Hand powered or mechanically driven chipping tools (15 pounds maximum), operated in accordance with Article 2413.03 of the Standard Specifications, may be used in areas that are inaccessible to the self-propelled or hand operated hydrodemolition equipment such as adjacent to the gutterline. These removals shall be considered incidental to the hydrodemolition bid item.

9. If removal blows completely through the bridge deck, immediately stop the equipment, plug the hole, and notify the Engineer.

G. Additional Removal.

1. After concrete bridge deck removal by hydrodemolition has been completed for the construction phase, the deck will undergo sounding to assure that all unsound concrete has been removed.
- **a.** Sound the bridge deck for delamination in accordance with ASTM D4580 and mark the areas of deteriorated concrete to be removed as directed by the Engineer.
- **b.** There shall be no standing/ponding water present during sounding.
- **c.** Perform subsequent soundings and remove additional concrete as required to ensure that all delaminated and debonded concrete has been removed.

2. Perform additional concrete removal by hand chipping and/or hydrodemolition.

3. Where reinforcing steel is exposed and the concrete and the steel are no longer bonded, remove any concrete to clear at least 3/4 inch around the exposed bars.

4. Un-bonded bars shall be determined by the Engineer. More than one-half of the bar perimeter may be exposed and still be determined to be bonded.

5. Take extreme care to ensure that no damage is done to any reinforcing bars exposed during the removal process. Any damage done shall be repaired as approved by the Engineer at no additional cost to the Contracting Authority.

H. Full Depth Repair.
Where the deck is sound for less than half of its original depth, remove the concrete full depth (designated as Class B repair) except for limited areas as determined by the Engineer. The work shall be paid for separately.

I. Final Cleaning Prior to Overlay Placement.

1. Vacuuming.
- **a.** Vacuum debris and water immediately after any hydrodemolition work.
- **b.** Equipment shall be equipped with dust control devices and shall be capable of removing wet debris and water in the same pass.
- **c.** Equipment shall be capable of washing the deck with pressurized water during the vacuum operation to dislodge all debris and slurry from the bridge deck surface.
- **d.** Complete cleaning before debris and slurry can dry on the bridge deck surface.

2. Sandblasting or Water Blasting.
- **a.** After completion of the hydrodemolition and additional removals, but not more than 24 hours prior to the placement of the overlay, sandblast or water blast (at 7500 psi minimum) the entire deck to expose fine and coarse aggregates and to remove laitance from the surface.
- **b.** Thoroughly clean the exposed reinforcing steel and the concrete under and around the exposed steel by sandblasting or water blasting.
- **c.** Clean the surface using compressed air to remove all dust, chips, and water.
- **d.** Air lines for sand blasting and compressed air cleaning shall be equipped with oil traps.

15094.04 METHOD OF MEASUREMENT.
Measurement of Partial Removal of Existing Bridge Deck Using Hydrodemolition will be the quantity shown in the contract documents in square yards.

15094.05 BASIS OF PAYMENT.
Payment will be for the contract unit price of Partial Removal of Existing Bridge Deck Using Hydrodemolition. Payment is full compensation for furnishing all work, materials, water, and equipment required to prepare the bridge deck for overlay including milling and subsequent remaining removal by hydrodemolition including removal and disposal of debris and effluents, vacuuming, shielding, water quality control, and hand chipping of areas adjacent to the gutterline and other areas inaccessible to the milling or hydrodemolition equipment.

Form 510130 (08-15)

IOWA DOT

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Wes Musgrove / Jesse Peterson	**Office:** Construction & Materials	**Item 22**
Submittal Date: November 17, 2021	**Proposed Effective Date:** April 2022	
Article No.: 4195.02 **Title:** Neoprene Bearing Pads	**Other:**	

Specification Committee Action: Approved as submitted.

Deferred:	**Not Approved:**	**Approved Date:** 11/18/2021	**Effective Date:** 4/19/2022

Specification Committee Approved Text:
4195.02, A.

Replace Table 4195.02-1, Maximum Dimension Variations:

Table 4195.02-1: Maximum Dimension Variations

	Nonlaminated	Laminated
Thickness	- 0 inch, + ~~1/16~~ 0.1181 inch	- 0 inch, + ~~1/8~~ 0.125 inch
Width	- ~~1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch	- ~~1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch
Length	- ~~1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch	- ~~1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch

Comments: None

Specification Section Recommended Text:

Comments:

Member's Requested Change: (Do not use '**Track Changes**', or '**Mark-Up**'. Use ~~**Strikeout**~~ and **Highlight**.)

4195.02 NEOPRENE BEARING PADS.

A. Fabricate the elastomer portion of the pad from new neoprene. Cast pads under heat and pressure. They may be individually molded to the size and shape specified in the contract documents, or they may be cut from pressure cast stock. Ensure cut edges are at least as smooth as ANSI 250 finish. Variations in dimensions shown are not to exceed the values in Table 4195.02-1:

Table 4195.02-1: Maximum Dimension Variations

	Nonlaminated	Laminated
Thickness	~~+ 1/16 -~~0, +0.1181 inch	~~+ 1/8 -~~0, +0.125 inch
Width	~~- 1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch	~~- 1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch
Length	~~- 1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch	~~- 1/8~~ 0.125 inch, + ~~1/4~~ 0.25 inch

Reason for Revision:

To bring Nonlaminated thickness specification in line with AASHTO M 251-06 Standard.		
New Bid Item Required (X one)	**Yes**	**No** x
Bid Item Modification Required (X one)	**Yes**	**No** x
Bid Item Obsoletion Required (X one)	**Yes**	**No** x
Comments:		
County or City Comments:		
Industry Comments:		