Iowa Department of Transportation

MINUTES
OF
IOWA DOT SPECIFICATION COMMITTEE MEETING

March 13, 2014

Members Present:	Mark Brandl	District 6 - Davenport RCE
	Donna Buchwald	Office of Local Systems
	Eric Johnsen, Secretary	Specifications Section
	Greg Mulder	Office of Construction & Materials
	Wes Musgrove	Office of Contracts
	Gary Novey	Office of Bridges & Structures
	Dan Redmond	District 4 - Materials
	Tom Reis, Chair	Specifications Section
	Brian Smith	Office of Design
	Willy Sorensen	Office of Traffic & Safety
Members Not Present:	Darwin Bishop	District 3 - Construction
	Mitch Dillavou	Project Delivery Bureau
Advisory Members Present:	Lisa McDaniel	FHWA
Others Present:	Mark Bortle	Office of Construction & Materials
	Daniel Harness	Office of Design
	Adam Kemper	Office of Contracts
	Scott Marler	Office of Location and Environment
	Scott Schram	Office of Construction & Materials

Tom Reis, Specifications Engineer, opened the meeting. The following items were discussed in accordance with the agenda dated March 6, 2014:

1. Article 1105.03, G, Paper Submittals (Working Drawings).

The Office of Bridges and Structures requested to remove the item “Safety grates for RCB culverts” from the list of working drawings requiring review.

2. Section 2303, Flexible Paving Mixtures.

The Office of Construction and Materials requested various revisions to update the flexible paving mixtures specifications.

3. Article 2318.03, H, Placement of Surface Course (CIP Recycled Asphalt Pavement).

The Office of Construction and Materials requested to increase the allowable moisture content of CIR pavement layer before the surface layer is placed.

4. Article 2320.02, B, 1, a, Friction Classification L-2 (Polymer-Modified Microsurfacing).

The Office of Construction and Materials requested to allow slag to be used for non-interstate microsurfacing.

5. Article 2433.03, D, 1, General (Concrete Drilled Shaft).

The Office of Construction and Materials requested to not allow the dry method of construction when shale is present.

6. Section 2523, Highway Lighting.

Section 4185, Highway Lighting Materials.

The Offices of Design and Traffic & Safety requested to update the highway lighting specifications.

7. Article 2528.03, L, 5, Limitations (Traffic Control).

The Office of Construction and Materials requested to add requirements for shin reflectors/gaiters to be worn during night construction.

8. Article 4127.01, B, Description (Aggregate for HMA).

The Office of Construction and Materials requested to revise the dividing line between coarse and fine aggregate for HMA.

9. DS-12003, Transverse Joint Leveling for HMA Pavements.

The Office of Construction and Materials requested revisions to the Developmental Specifications for Transverse Joint Leveling for HMA Pavements.

10. DS-12041, Partial Depth PCC Finish Patches.

The Office of Construction and Materials requested revisions to the Developmental Specifications for Partial Depth PCC Finish Patches.

11. DS-12XXX, Portable Dynamic Message Sign.

The Specifications Section requested approval of Developmental Specifications for Portable Dynamic Message Sign.

12. SS-12XXX, Hot Mix Asphalt Interlayer.

The Office of Construction and Materials requested approval of Supplemental Specifications for Hot Mix Asphalt Interlayer.

13. SS-12XXX, Hot Mix Asphalt Thin Lift Overlay.

The Office of Construction and Materials requested approval of Supplemental Specifications for Hot Mix Asphalt Thin Lift Overlay.

14. SS-12XXX, Evaluation of Longitudinal Joint Quality for Flexible Paving Mixtures.

The Office of Construction and Materials requested approval of Supplemental Specifications for Evaluation of Longitudinal Joint Quality for Flexible Paving Mixtures.

15. Article 1105.14, C, 12, Indiana Bats.

Article 2101.01, A, Clearing.

The Offices of Construction and Materials and Location and Environment requested to add a date restriction for tree cutting and add the northern long-eared bat to the Indiana bat note.

Additional Discussion

The Office of Contracts requested that the Specification Revision Submittal Form include a section for bid item revisions. The submitting office would indicate if the specification revision would involve a new bid item(s), a modified bid item(s), or obsoleting a bid item(s). The Specifications Section will bring a revised Specification Revision Submittal Form to the next meeting for consideration.

The District 4 Office asked about the printing of the next Specification Book. Currently, it is expected that a new Specification Book will be printed for the October 2015 letting. This may be the last hardcopy Specification Book to be printed. Paper copies of the GS will continue to be printed until the next Specification Book after the 2015 edition is released.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Gary Novey	**Office:** Bridges and Structures	**Item 1**
Submittal Date: February 21, 2014	**Proposed Effective Date:** October 2014	
Article No.: 1105.03 **Title:** Working Drawings	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: The District 6 office asked if shop drawings are required at all. The Office of Bridges and Structures believes that the shop drawings will act as an "as-built" for future reference.

The Office of Construction and Materials will review Materials I.M. 204 to clarify shop drawing submittal.

The Offices of Construction and Materials and Design will review the Road Standard and Materials I.M. 204 to make sure that they are in agreement with each other and the elimination of shop drawing approval.

Specification Section Recommended Text:

1105.03, G, Paper Submittals.

Delete the following line from Table 1105.03-1: Review Offices for Working Drawings:

~~Safety grates for RCB culverts~~	~~Bridges and Structures~~	~~2 (7)~~	~~30~~

Comments:

Member's Requested Change: **(DO NOT USE "Track Changes," or "Mark-Up". Use ~~Strikeout~~/Highlight)**

Remove the item "Safety grates for RCB culverts" from Table 1105.03-1: Review Offices for Working Drawings.

Reason for Revision: The review process for this item adds unnecessary time to the fabrication process. The RF-29 road standard clearly states the material type and size necessary for these installations. Acceptance of the material at the site can be based on the RF-29 requirements. Shop drawings will still be required as noted on the RF standard. These shop drawings can be added to the file to document the specific component arrangement for the installation as well as the material type and size. Shop drawing approval will not be required.

County or City Input Needed (X one)	**Yes**	**No** X
Comments:		

Industry Input Needed (X one)			**Yes**	**No** X	
Industry Notified:	**Yes**	**No** X	**Industry Concurrence:**	**Yes**	**No**
Comments:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Scott Schram	**Office:** Materials	**Item 2**
Submittal Date: 2014.02.28	**Proposed Effective Date:** Oct 2014	
Section No.: 2303 **Title:** Flexible Paving Mixtures	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text:

2303.02, C, 6, c, Unclassified RAP.

Replace Note 2 and **Add** Note 3 to Table 2303.02-1: Allowable RAP Usage:

2. Certified RAP meeting Type A quality for alumina per Section 4127 (by a lab designated by the Engineer) shall have the same maximum allowable usage as Classified RAP for all mixes, and credit for crushed particles shall be the percent of aggregate retained on the #8 (2.36 mm) sieve from Engineer's extraction test.

3. Certified RAP meeting Type B quality for alumina per Section 4127 (by a lab designated by the Engineer) shall have the same maximum allowable usage as Classified RAP for mixes allowing Type B aggregate quality.

2303.03, A, 3

Replace the first sentence:

Apply Quality Management - Asphalt (QM-A) to asphalt mixture bid items when the plan quantity is greater than 1000 tons (1000 Mg) ~~and all Interstate contracts~~.

2303.03, D, 4, b, Longitudinal Joint Compaction.

Delete the Article:

~~**b. Longitudinal Joint Compaction.**~~

~~**1)** When PWL is used for Class I field voids acceptance, obtain and test samples from the centerline joint using a nominal 6 inch (150 mm) diameter bit as follows:~~

~~**a)** When two lanes forming a centerline joint are paved in separate operations (cold joint present):~~

~~**(1) Unconfined Edge:** Sample so entire core is within 6 inches (150 mm) of unconfined edge.~~

~~**(2) Confined Edge:** Sample so entire core is within 6 inches (150 mm) of visible line between the two lanes.~~

~~**b)** When two lanes forming a centerline joint are paved concurrently (cold joint eliminated), take samples centered directly on the visible line between the two lanes.~~

~~**2)** Using random core locations determined for field voids lot, Engineer will randomly select four of these locations to be sampled for joint density.~~

~~**3)** Informational joint cores may be waived by Engineer when conditions are not ideal or conditions are not suitable for continuous paving.~~

~~**4) Deleted.**~~

~~**4)** Include results on daily plant report.~~

2303.03, D, 5, b, 8.

Replace the first sentence:

When sampling for moisture susceptibility testing, obtain ~~a 70 pound (35 kg)~~ samples according to Materials I.M. 204, Appendix F and 322.

Comments: The District 4 Office noted that there is not Materials I.M. 204F, it should be Material I.M. 204, Appendix F.

Specification Section Recommended Text:

2303.02, C, 6, c, Unclassified RAP.

Replace Note 2 and **Add** Note 3 to Table 2303.02-1: Allowable RAP Usage:

2. Certified RAP meeting Type A quality for alumina per Section 4127 (by a lab designated by the Engineer) shall have the same maximum allowable usage as Classified RAP for all mixes, and credit for crushed particles shall be the percent of aggregate retained on the #8 (2.36 mm) sieve from Engineer's extraction test.

3. Certified RAP meeting Type B quality for alumina per Section 4127 (by a lab designated by the Engineer) shall have the same maximum allowable usage as Classified RAP for mixes allowing Type B aggregate quality.

2303.03, A, 3

Replace the first sentence:

Apply Quality Management - Asphalt (QM-A) to asphalt mixture bid items when the plan quantity is greater than 1000 tons (1000 Mg) ~~and all Interstate contracts~~.

2303.03, D, 4, b, Longitudinal Joint Compaction.

Delete the Article:

~~**b. Longitudinal Joint Compaction.**~~

~~**1)** When PWL is used for Class I field voids acceptance, obtain and test samples from the centerline joint using a nominal 6 inch (150 mm) diameter bit as follows:~~

~~**a)** When two lanes forming a centerline joint are paved in separate operations (cold joint present):~~

~~**(1) Unconfined Edge:** Sample so entire core is within 6 inches (150 mm) of unconfined edge.~~

~~**(2) Confined Edge:** Sample so entire core is within 6 inches (150 mm) of visible line between the two lanes.~~

~~**b)** When two lanes forming a centerline joint are paved concurrently (cold joint eliminated), take samples centered directly on the visible line between the two lanes.~~

~~**2)** Using random core locations determined for field voids lot, Engineer will randomly select four of these locations to be sampled for joint density.~~

~~**3)** Informational joint cores may be waived by Engineer when conditions are not ideal or conditions are not suitable for continuous paving.~~

~~**4) Deleted.**~~

~~**4)** Include results on daily plant report.~~

2303.03, D, 5, b, 8.

Replace the first sentence:

When sampling for moisture susceptibility testing, obtain ~~a 70 pound (35 kg)~~ samples according to Materials I.M. 204F and 322.

Comments:

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

- **Table 2303.02-1: Allowable RAP Usage**

  Revise Note 2 and Add Note 3

  2. Certified RAP meeting Type A quality for alumina per Section 4127 (by a lab designated by the Engineer) shall have the same maximum allowable usage as Classified RAP for all mixes, and credit for crushed particles shall be the percent of aggregate retained on the #8 (2.36 mm) sieve from Engineer's extraction test.

  3. Certified RAP meeting Type B quality for alumina per Section 4127 (by a lab designated by the Engineer) shall have the same maximum allowable usage as Classified RAP for mixes allowing Type B aggregate quality.

- **2303.03, A, 3**

3. Apply Quality Management - Asphalt (QM-A) to asphalt mixture bid items when the plan quantity is greater than 1000 tons (1000 Mg) ~~and all Interstate contracts~~. Follow the procedures and meet the criteria established in Articles 2303.02 and 2303.03, B; Section 2521; and Materials I.M. 510 and 511.

- **2303.03, D, 4, b**
  REMOVE ARTICLE
  ~~**b. Longitudinal Joint Compaction.**~~
  ~~**1)** When PWL is used for Class I field voids acceptance, obtain and test samples from the centerline joint using a nominal 6 inch (150 mm) diameter bit as follows:~~
  ~~**a)** When two lanes forming a centerline joint are paved in separate operations (cold joint present):~~
  ~~**(1) Unconfined Edge:** Sample so entire core is within 6 inches (150 mm) of unconfined edge.~~
  ~~**(2) Confined Edge:** Sample so entire core is within 6 inches (150 mm) of visible line between the two lanes.~~
  ~~**b)** When two lanes forming a centerline joint are paved concurrently (cold joint eliminated), take samples centered directly on the visible line between the two lanes.~~
  ~~**2)** Using random core locations determined for field voids lot, Engineer will randomly select four of these locations to be sampled for joint density.~~
  ~~**3)** Informational joint cores may be waived by Engineer when conditions are not ideal or conditions are not suitable for continuous paving.~~
  ~~**4) Deleted.**~~
  ~~**4)** Include results on daily plant report.~~
- **2303.03, D, 5, b, 8**
  8) When sampling for moisture susceptibility testing, obtain ~~a 70 pound (35 kg) sample~~ samples according to Materials I.M. 204F and Materials I.M. 322. Each sample shall constitute a separate lot and include all quantities placed from beginning of bid item's production (or previous sampling point) to next sampling point (or 10,000 tons, whichever is less). The Engineer will select, at random, the sample location. Split the sample and deliver half to the Central Materials Laboratory.

Reason for Revisions:

- When certified RAP results are coming back as a Type B, the specification unnecessarily restricts the use to 20% where Type B is allowed. If consistency is demonstrated, then the pile can be treated as classified RAP for the appropriate aggregate quality type (A or B).
- Small quantities may also apply to interstate projects if the tonnage requirement is met.
- Longitudinal joint construction is now an SS.
- The sample size is defined in IM 204F

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**

Comments: The industry is in support of defining crushed content for XRF samples. They are also in support of the changes to the longitudinal joint data collection process.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Scott Schram	**Office:** Materials	**Item 3**
Submittal Date: 2014.02.28	**Proposed Effective Date:** Oct 2014	
Article No.: 2318.03, H **Title:** Placement of Surface Course (Cold In-Place Recycled Asphalt Pavement)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

2318.03, H, Placement of Surface Course.

Replace the first sentence:

Subsequent HMA overlay or surface treatment will not be allowed until moisture content of the CIR layer is no more than 0.3% above the residual moisture content or ~~2.0~~ 2.5%, whichever is greater.

Comments:

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

- **2318.03, H Placement of Surface Course**
  Subsequent HMA overlay or surface treatment will not be allowed until moisture content of the CIR layer is no more than 0.3% above the residual moisture content or 2.5% ~~2.0%,~~ whichever is greater. The Engineer may adjust this drying period depending on field conditions. The CIR shall be retested until the moisture content is at or below the limits stated above.

Reason for Revisions:

The DMEs agree that in practice, the 2.0% criterion is rarely met. They agreed 2.5% is more commonly used.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**
Comments:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Scott Schram	**Office:** Materials	**Item 4**
Submittal Date: 2014.02.28	**Proposed Effective Date:** Oct 2014	
Article No.: 2320.02, B, 1, a **Title:** Friction Classification L-2 (Polymer-Modified Microsurfacing)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

2320.02, B, 1, a, Friction Classification L-2.

Replace the first sentence:

Use Friction Type 2 crushed stone (for non-Interstate mixes steel slag may also be used) complying with the following:

Comments:

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

12006.02, B, 1

a. Friction Classification L-2.

Use Friction Type 2 crushed stone (for non-interstates steel slag may also be used) complying with the following:

- Table 4124.03-1 of the Standard Specifications with the following exceptions:
  - Maximum abrasion loss of 30%, and
  - Sand equivalence of not less than 60.
- Objectionable materials limits in Table 12006.02-01.

Reason for Revisions: Specifications and performance requirements can be met using slag. This revision will allow slag to be used locally with significant savings.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**
Comments:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Kyle Frame	**Office:** Construction and Materials	**Item 5**
Submittal Date: 01/13/2014	**Proposed Effective Date:** October 2014	
Article No.: 2433.03, D, 1 **Title:** General (Concrete Drilled Shaft)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: The District 6 Office asked about drilled shafts for piling placement and a project that used the dry method. The Office of Bridges and Structures indicated that this is a special use and should be handled as such. A specification for this instance may be necessary in the future if this method is used more often.

Specification Section Recommended Text:

2433.03, D, 1, General.

Add the Article:

g. The dry method of construction will not be allowed for drilled shafts with shale identified in the bearing strata of the soil profile.

Comments:

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

Add Article 2433.03 D 1 g:

g. The dry method of construction will not be allowed for drilled shafts with shale identified in the bearing strata of the soil profile.

Reason for Revision: Recent slaking tests identified that some types of shale may degrade when allowed to dry out and then are resaturated. Not allowing the dry method of construction when shale is present will prevent the shale from drying and will minimize degradation.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes**	**No** X	
Industry Notified:	**Yes**	**No** X	**Industry Concurrence:**	**Yes**	**No**
Comments:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Brian Smith / Willy Sorenson	**Office:** Design / Traffic and Safety	**Item 6**
Submittal Date: 2014.02.28	**Proposed Effective Date:** 10/14/2014	
Section No.: 2523 **Title:** Highway Lighting **Section No.:** 4185 **Title:** Highway Lighting Materials	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: Article 4185.02, D, 4 was deleted as this is covered by the previous Article which states that it must meet or exceed NCHRP Report 350 or AASHTO MASH criteria. The Offices of Construction and Materials and Design will investigate creating a Materials I.M. for approved sources of breakaway transformer bases. This I.M. could reference the FHWA list of crash tested bases.

The District 4 Office asked about requiring shop drawings for anchor bolts, nuts, and washers. This was a supplier requested item so that they know what they are submitting is approved. The Office of Bridges and Structures indicated that they also require shop drawings for anchor bolts, nuts, and washers for bearing assemblies and overhead sign structures.

Specification Section Recommended Text:

2523, Highway Lighting.

Replace the Section:

2523.01 DESCRIPTION.

Furnish all work, apparatus, and materials to construct, install, and place in operation, to the Engineer's satisfaction, a complete highway lighting system as shown in the contract documents.

2523.02 MATERIALS.

A. Install lighting materials that meet the requirements of Division 41.

B. Use cast-in-place concrete that meets the requirements of Section 2403.

C. For granular base for handholes and preformed junction boxes, provide material meeting Gradation No. 3 or 5 of the Aggregate Gradation Table.

2523.03 CONSTRUCTION.

A. General.

1. Furnish and install all components of the lighting system not furnished by the utility company serving the installation, including all incidental items appurtenant to the operation of the system.

2. Ensure all apparatus, materials, and work comply with the contract documents and with standards, practices, and codes of the electrical industry. Particular attention is directed to the following:

- NEC, latest edition, including amendments.
- IEEE Standards and Practices.
- ANSI Standards and Practices.
- NEMA Standards.
- UL Standards.

3. Ensure the completed lighting installation complies with all local and special laws, codes, or ordinances of all Federal, State, and municipal authorities with due jurisdiction.

4. The Contracting Authority will be responsible for the cost of electric power used during installation and testing of lighting equipment and prior to final acceptance of the work. Do not put the installation into use prior to final acceptance without the Engineer's approval.

B. Shop Drawings.

1. Before any items are ordered or installation is started, the following list of shop drawings shall be submitted for approval according to Article 1105.03:

a. Required Shop Drawings:

1) Lighting poles and mastarms.
2) Transformer bases.
3) Slip bases.
4) Roadway luminaires with lamps.
5) ~~Iowa DOT Standard Road Plan RM-41, Underdeck Lighting (High Pressure Sodium Luminaire)~~ Underdeck luminaires with lamps.
6) Control cabinet components.
a) Enclosure.
b) Door latch mechanism.
c) Contactor.
d) Circuit breaker (main).
e) Circuit breaker (branch).
f) Photoelectric control.
g) Test switch(es).
h) Breather drain.
i) Wiring diagram, showing wire type and size
j) Component placement drawing.
k) Control fuse holder.
l) Surge ~~suppressor~~ protection device (SPD).
7) ~~Iowa DOT Standard Road Plan RM-40,~~ Cable Splices and Connectors.
8) Insulated wire and cable.
9) Anchor bolts, nuts, and washers.
~~9~~ **10)** Additional drawings may be required on a project specific basis in accordance with the contract documents.

b. Shop Drawings Not Required:

1) Wood pole.
2) Concrete.
3) Reinforcing steel.
~~**4)** Anchor bolts, nuts, and washers.~~
~~5~~ **4)** Other bolts, nuts, and washers.
~~6~~ **5)** Ground rods and clamps.
~~7~~ **6)** ~~Iowa DOT Standard Road Plan RM-42, Type 1~~ Handholes and junction boxes.
~~8~~ **7)** Rigid steel conduit and fittings.
~~9~~ **8)** Rigid aluminum conduit and fittings.
9) Rigid non-metallic conduit and fittings.
10) Plastic conduit and fittings.
11) Plastic warning tape.
12) Bare copper ground wire.

2. Meet the following provisions for shop drawings:

a. Submit all drawings simultaneously for each project.
b. Include catalog cuts, diagrams, drawings, brochures, or other descriptive data required by the Engineer.
c. Include a schematic diagram and a component placement diagram of the control cabinet and panel.
d. Ensure all wire and cable sizes, placement of components, and dimensions are shown on the diagrams.
e. Ensure all drawings are completely legible and contain adequate information to identify that the described components comply with the contract documents.
f. Ensure identification markings on the described items correspond to like markings shown on the drawings to provide easy identification of the item.
g. Ensure apparatus or materials are not installed until the Engineer has reviewed and concurred with descriptive data.

h. Ensure each sheet or bound pamphlet is imprinted with the county and project number.
i. Ensure each set is assembled and contains one copy of the required data for each item listed on the schedule.

3. Incorrect or incomplete submittals will be returned to the Contractor for correction. The Engineer may require certified test results and samples of materials for consideration of all items including those described by reviewed drawings.

C. Cooperation with Utility Companies.

1. The utility company is to provide secondary service to the project in the vicinity indicated. Consult and cooperate with the utility company in locating the distribution lines and service poles so lines will be as short and direct as possible. If the utility company is unable to perform the required work, furnish and install the service poles (payment will be according to Article 1109.03). The Contracting Authority will be responsible for the cost for extension of power lines and for furnishing and installing meter sockets and meter loops as required in the contract documents.

2. The entire transformer pole installation, when required, including all accessories and appurtenances, is to be installed by the utility company that is to supply service according to their agreement for service. Cooperate with the utility company so that connections may be made in the proper manner and at the proper time.

3. Furnish all apparatus and material for the pole mounted control ~~station~~ cabinet, as shown in the contract documents. Upon acceptance of the project, they will become the Contracting Authority's property.

4. If concrete pad(s) and other incidental work for ~~mounted~~ transformers ~~and control stations~~ are specified, follow the utility company's guidelines. If utility company has no guidelines, ~~ensure they are~~ furnish~~ed~~ and install~~ed~~ as specified in the contract documents. Ensure they are approved by the designated utility company.

D. Excavation.

1. Foundations.
Drill the holes for pole footings and direct embedded poles.

2. Trenches.
a. Details of trenching for underground circuits will be shown in the contract documents.

~~**3**~~ **b.** Pile the excavated material away from the trench to prevent cave-ins.

~~**4**~~ **c.** Accurately grade the trench bottom to provide for placement of cable or duct work at a uniform depth.

~~**5**~~ **d.** Ensure surface water does not enter the trench. Remove water that is present before duct work is installed, unless directed otherwise by the Engineer.

3. Handholes and Preformed Junction Boxes.
Excavate as necessary to accommodate handhole (or preformed junction box) and granular base.

E. Placing Backfill.

1. After inspection of the completed trench, duct work, and cables, place backfill consisting of the material that was removed into the trench, unless stated otherwise in the contract documents or directed by the Engineer. Place backfill material in layers with the first layer not exceeding 2 feet (0.6 m) of loose thickness and each succeeding layer not exceeding 1 foot (0.3 m) of loose thickness. Compact each layer using hand or mechanical tampers. Do not use material containing glass, metal, concrete, brick, cinders, or any other abrasive material for backfill within 6 inches (150 mm) of the cable or conduit. Install approved plastic warning tape in all trenches.

2. Use the removed material to place backfill around direct embedded poles and handholes. Place the material in layers not exceeding 6 inches (150 mm) of loose thickness. Compact using hand or mechanical tampers.

3. Shape excess material to original contours as directed by the Engineer.

4. Shape all other disturbed areas to the original contours as directed by the Engineer.

F. Seeding and Fertilizing.
In locations where erosion control work has been completed or turf has been established, restore the areas disturbed by application of seed and fertilizer as indicated in the contract documents.

G. ~~Footings~~ Foundations.

1. Construct cast-in-place concrete ~~footings~~ foundations for all lighting units not located on structures or barriers. Form and pour the top portion of all ~~footings~~ foundations in form work to at least 6 inches (150 mm) below the finished ground level. Ensure the ~~footings~~ foundations conform in all respects to the details, including reinforcement and alignment to provide the correct overhang, as indicated in the contract documents. Ensure maximum exposed concrete above finished grade does not exceed 4 inches (100 mm) on all sides of finished foundation.

2. Ensure finished surfaces are smooth and free from stains and foreign material.

3. Construct an alternate ~~footing~~ foundation, as directed by the Engineer, when shale, sandstone, broken ~~and~~ or shattered rock, solid rock, or other similar materials are encountered.

4. Place anchor bolts to provide for placement of nuts and washers on the top and bottom of the transformer base or pole flange, leaving ample room for adjustment and plumbing the pole. When slip bases are used, position anchor bolts so that they do not interfere with the operation of the slip base. Place anchor bolts according to Article 2405.03, H, 3.

H. Breakaway and Slip Bases.

1. Furnish and install breakaway bases or slip bases of the size and type specified in the contract documents for each light pole not mounted on a roadway bridge. Use the same type and manufacturer for all bases for a project. Install a commercially available product. Comply with the details of bases shown in the contract documents.

2. Ensure each breakaway base has a nonmetallic spacer impervious to galvanic action placed between the breakaway base and pole base mounting flange.

I. Aluminum Transformer Bases.
~~Ensure the bottom flange of aluminum transformer bases are painted on the inside and outside surfaces with two coats of zinc-rich paint.~~ Install transformer base according to manufacturer's recommendations and the contracts documents.

J. Poles and Mastarms.

1. Furnish and install poles at all locations indicated in the contract documents. Install poles of the lengths shown in the contract documents.

2. Carefully erect all poles and mastarms. Check for vertical alignment, mounting height, and overhang, after installation, with mastarm and luminaire installed.

3. Rake single mastarm poles so the side of the shaft opposite the mastarm is plumb. Erect poles without mastarms, or with more than one mastarm, so the center line of the pole shaft is plumb within a tolerance of 1/32 inch per foot (3 mm/m).

4. Check the pole posture at no less than three radial locations on the shaft. For poles required to have plumb shaft center lines, space the checking positions approximately 120 degrees apart, as viewed from above. For raked poles required to have one side plumb, space the check points on the side to be plumbed at 90 degrees in either direction, as viewed from above.

5. Plumb the poles ~~using double nuts on each anchor bolt. Locate the nuts~~ as follows:

- ~~Above and below the bottom mounting flange of the breakaway base, or~~ Transformer base: use

base leveling shims.

- ~~Above and below the pole base or slip base mounting flange where breakaway bases are not required.~~ Slip base: use base leveling shims or leveling bolts, whichever is appropriate for the slip base furnished.

6. Install anchor bolt washers according to the details in the contract documents.

~~**7.** Base leveling shims or alternate pole mounting methods will be permitted only when indicated.~~

~~**8.** After the erection has been inspected and approved, fill the space between the mounting flange and the concrete footing with an approved non-shrink grout and finish as detailed.~~

9. Install mastarms of the type and length specified. Unless shown otherwise in the contract documents, mastarms greater than 8 feet (2.4 m) in length are to be Type B, and all others Type A. Use the same type and material for all lighting poles and mastarms on a project.

10. Install insect barriers in the ends of all mastarms at the point of luminaire attachment.

11. Install wood poles of the length and class specified. Set them plumb in drilled holes as directed by the Engineer. Embed the poles no less than 8 feet (2.5 m). Additional embedment may be required by the Engineer if warranted by soil conditions.

K. Luminaires.

1. Furnish and install luminaires of the type and rating specified.

2. All roadway luminaires shall be leveled after installation unless a tilt is specified.

3. When light distribution is specified, ensure the luminaire has the necessary components and is adjusted properly.

4. Provide the Engineer with printed instructions regarding luminaire components and adjustment.

L. Circuits.

1. Unless specified otherwise, install an underground, multiple system roadway lighting circuit that is totally encased in conduit. Construct circuits and control ~~stations~~ cabinets according to the contract documents.

2. Ensure circuits are complete with all necessary accessories for proper operation. Thoroughly coordinate disconnecting devices, protective devices, and all other equipment to secure a safe operating lighting system. If any changes in arrangement of the circuit system are considered necessary by the Contractor, submit details of changes and reasons to the Engineer for approval. Obtain the Engineer's approval prior to making changes.

3. For line circuit conductor sizes, comply with NEC requirements based on the total load current ratings of the branch circuit breakers supplied by the respective circuit segments, with a minimum size of No. 8 AWG. Minimum size allowed for control circuit conductors will be No. 12 AWG.

M. Grounding.

1. General Requirements.

a. A component of the lighting system will be defined to be grounded when it is electrically bonded to a driven ground rod or a multiple system of ground rods producing a resistance to ground of 25 ohms or less when installed and tested according to the contract documents.

b. Use ground rods and connections described in Article 4185.04 to ground major components of the lighting system, such as control stations, lighting units, and sign structures, and all metal duct work in exposed locations or installed on roadway bridges. Refer to the contract documents for details of these and other locations to be grounded.

2. Grounding Installations.

a. Whenever the ground rod installation does not have a resistance to ground of 25 ohms or less,

couple additional rods to the first, and drive to the full depth until the required resistance is obtained. If a maximum depth of 50 feet (15 m) is reached, or if obstacles to further driving are encountered, install additional ground rods until the required resistance to ground is obtained.

b. Permissible grounding installations are as follows:

1) Ensure that in no case is any portion of the ground rod closer than 18 inches (0.5 m) to the finished earth surface. Drive all rods as nearly vertical as possible. Whenever possible, drive a full length ground rod.

2) When rock or other obstructions prevent driving the rod to full depth, two half-length sections may be driven, with the Engineer's approval. The two half-length sections are considered as a minimum length rod when additional rods are required to obtain the specified resistance to ground.

3) Where two half-length rods can not be driven to the required depth, place full length rods horizontally at a depth of no less than the adjacent trench depth.

4) The minimum horizontal clearance between all rods in a multiple ground installation is to be 6 feet (2 m).

N. Electrical Ducts.

1. General Requirements.

a. Refer to the contract documents for details of duct installations. Ensure the completed duct systems are watertight. Use expansion fittings where duct runs cross structural expansion joints and elsewhere as direct by the Engineer.

b. Thread metal conduit joints. Treat the mating threads with pipe joint compound. Treat all other threads with an approved rustproofing compound. For plastic conduits, use solvent welded, socket type joints.

c. After the duct runs are installed, demonstrate that the runs are clear by pulling an approved brush or conduit swab through the entire length of each run. Ensure no deleterious material remains in the duct. Securely cap terminal ends until cable is installed. Before the wire and cable is installed, fit terminal ends of metal conduit with threaded insulating bushings. Fit terminal ends of plastic conduit with socket type, bell end fittings.

d. Do not embed aluminum conduit in concrete.

2. Underground Ducts.

a. Lighting Circuit Ducts.

Fabricate lighting circuit ducts using Schedule 40 plastic conduit. As field conditions permit, install the runs to avoid adding bends or total bend angle to the design layout. Limit the total bend angle between pulling points to no more than 360 degrees.

b. Crossing Ducts.

1) Unless shown otherwise in the contract documents, use HDPE SDR 13.5 or Schedule 80 PVC conduit for crossing ducts.

2) If crossings are to be placed without disturbing the existing surface, install by jacking or boring methods approved by the Engineer. Do not use jetting. No access to duct or jacking of duct from median will be allowed without Engineer's approval.

3) After cable is installed, seal duct terminal ends in handholes, transformer bases, pole foundations, or similar locations (as directed by the Engineer) against moisture. Use either approved sealing bushings or a non-hardening sealing compound.

c. ~~Primary~~ Other Service Ducts.

Apply installation requirements for lighting circuit ducts and crossing circuit ducts to other service ducts including, but not limited to, ducts required for a complete installation that are not covered under the Utility Company service agreement.

3. Exposed Exterior Ducts.

a. Unless shown otherwise in the contract documents, use rigid steel conduits for all ducts for exposed installations.

b. When not shown in the contract documents, support exposed ducts at intervals of 6 feet (1.8 m) or less. Anchor the hangers or clamps to be attached to concrete structures by means of expanding anchors in drilled holes. The use of driven or explosive set anchors will not be permitted.

O. Handholes.

Install handholes of the size and type and at locations shown in the contract documents.

1. ~~Construct handholes of the size and type and at locations shown in the contract documents, unless the Engineer specifies otherwise.~~ Do not ~~construct~~ install handholes in the following areas:

- Ditch bottoms,
- Low areas where ponding of water may occur, or
- Where they will be subject to normal vehicular traffic.

2. Granular Base.
~~Provide access ducts for each general direction of the circuit branch run. Position them for ease of cable installation.~~ Install 8 inch (200 mm) thick granular base extending a minimum of 6 inches (150 mm) beyond the outside walls of the handhole.

3. Placement.

a. ~~Position handholes so that the top is at the same inclination as the adjacent grade.~~ In paved areas, install handhole at an elevation so lid or casting is level and flush with the pavement. In unpaved areas, install handhole approximately 1 inch (25 mm) above final grade.

b. For precast handholes, verify ring placement. Invert rings when installed in paved areas.

4. Conduit.

a. Remove knockouts as necessary to facilitate conduit entrance.

b. Extend conduit into handhole, through a knockout, approximately 2 inches (50 mm) beyond inside of the wall. Slope conduit to down and away from the handhole.

c. Place non-shrink grout (complying with Materials I.M. 491.13) in the opening of the knockout area after placement of conduit.

5. Cable Hooks.
Install cable hooks centered between the knockouts and the top of the handhole.

6. Backfill.
Place suitable backfill material according to Section 2552.

7. Casting.
Place casting on the manhole. Ensure final elevation meets handhole placement requirements.

P. Junction Boxes.
Furnish junction boxes of the type specified and install as indicated in the contract documents.

Q. Wire or Cable.

1. Furnish and install wire or cable of the size and type specified. When installing wire or cable in a conduit system, provide equipment to demonstrate to the Engineer that at no time will a pulling tension of 0.008 pound per circular mil (70 N/mm^2) of conductor be exceeded.

2. Ensure unreeled wire or cable is not left on the ground surface or exposed to mechanical abrasion. Replace all wire or cable that is stressed or damaged in any way at no additional cost to the Contracting Authority. Do not install wire or cable with dirt or any other abrasive material adhering to it.

3. Use a lubricant when pulling wire or cable. Use a UL listed lubricant designed for use with the specified cable and conduit. The use of graphite or petroleum lubricants will not be permitted. Ensure the pulling device is attached to each conductor and all wire or cable within a single duct is pulled simultaneously.

R. Connectors.
Furnish and install connectors of the type specified at the locations shown in the contract documents. ~~Ensure connector assemblies are supplied with a disposable mounting pin, when required, and sufficient silicone compound to lubricate the metal parts and rubber housings. Ensure complete instructions are supplied with each connector.~~

S. Splices.
Use approved connector assemblies to make splices. Splices in the system will only be allowed in pole shafts, handholes, pull boxes, breakaway bases, and other specified locations.

T. Control ~~Station~~ Cabinet.

Furnish ~~the components specified and construct~~ and install the control ~~station~~ cabinet as indicated in the contract documents. Furnish and install meter sockets and meter loops unless an agreement for unmetered service has been secured at the time of construction. A meter loop is defined as the conduit, cable, enclosures, meter socket (if required), and other necessary components needed to form a complete system ready for connection as defined in either the Utility Company service agreement or the meter application.

1. General.

Meet the following requirements:

a. Load circuits within the control panel shall be connected phase-to-phase, with neutral connections to grounds only.

b. Internal wiring for line and control circuits shall meet the requirements for single conductor cable. Thermoplastic cable may be used with the Engineer's approval.

c. Minimum interrupting ratings for branch circuit breakers identical to line circuit breakers. Provide one branch breaker for each active circuit and specified spare.

d. Unless shown otherwise, load current ratings of
- 30 amperes for branch circuit breakers.
- 100 amperes for main circuit breakers.

e. Interrupting ratings for the contactor not less than the load current rating for the line circuit breaker.

f. Minimum working voltage rating of 240 volts for the control fuse. Use cartridge type fuse with dimensions 13/32 inch (10 mm) by 1 1/2 inch (38 mm). Current ratings as recommended by the manufacturer.

g. Double-break contact block test switch.

h. The control cabinet electrically bonded to the ground rod(s) with a copper wire or jumper equivalent to No. 6 AWG or larger.

2. Pole Mounted.

a. The utility company is to furnish aerial service drop and required meters according to either their service agreement or the meter application.

b. Provide control cabinets with components within arranged to provide access for maintenance and space for four branch circuit breakers without disturbing other components or wiring.

c. Provide risers consisting of rigid conduit of the type shown on the plans. Use conduit with a nominal inside diameter of 2 inches (53 mm) or larger for top risers. Provide 2 inch (53 mm) nominal inside diameter bottom ducts for all bottom risers, unless shown otherwise on the plans. Use weatherproof threaded hubs or compression glands for riser connections into cabinet.

3. Pad Mounted.

a. The utility company is to furnish primary service cable, pad mounted transformer, and required meters according to either their service agreement or the meter application.

b. Photoelectric control may be mounted on or in control cabinet if cabinet is equipped with photocell window. If plans call for remotely mounted photocell, connect photoelectric control socket to nearest accessible grounding connection, or where indicated on detail plans, by means of a No. 12 AWG copper wire.

c. Use weatherproof threaded hubs or compression glands for all duct connections into the top or side of the cabinet.

d. Construct concrete pad according to the contract documents. Slope the top surface of the concrete pad 1/4 inch per foot (20 mm per meter) in the direction of the natural ground. Place concrete pads as directed by the Engineer.

e. Terminate all ducts extending up from the concrete pad with bell ends or bushings.

U. Final Acceptance.

1. Perform electrical tests of all systems after the circuit installation work is complete, and at any other stage of construction when directed by the Engineer. Include the following tests:
- Insulation resistance measurement for all underground circuit cable,
- Voltage measurements, and
- Ground resistance test for each individual grounding installation.

2. Perform insulation resistance measurements with all lamps or ballasts disconnected from the circuit and all neutral lines properly grounded. Measure with a properly calibrated 500 volt megaohmmeter.

Ensure insulation resistance is no less than 100 megaohms.

3. Measure and record the voltages in the cabinet from phase to phase and phase to neutral at no load and at full load. Measure and record the voltage readings at the last termination of each circuit.

4. Measure ground resistance with the ground rod, or system of ground rods as described in Article 2523.03, ~~K~~ M, 2, disconnected from the circuit neutral wire. Measure with a Wheatstone bridge type ground resistance tester according to the manufacturer's instructions. Ensure the ground resistance of each individual grounding installation is no greater than 25 ohms.

5. Perform electrical tests and demonstrate to the Engineer that the lighting system complies with requirements of the contract documents.

6. Provide the Engineer with a written report of all test results for a permanent record.

7. In the insulation resistance report, include measurements from each insulated line to ground, and between all combinations of lines in a given circuit or contained in a single duct.

8. In the voltage measurement report, include measurements for each cabinet and each circuit.

9. In the ground resistance report, include measurements for each grounding installation identified by a lighting unit number and at other grounding locations by a means approved by the Engineer.

10. All components of the lighting system shall be in satisfactory operation according to the ratings and requirements specified.

11. After satisfactory completion of required testing, the complete lighting system is to be placed in operation for a 30 calendar day trial period, and final approval of the installation will not be made until the trial period ends. During the trial period, service and maintain the installation and make all necessary adjustments or replacements as are required, at no additional cost to the Contracting Authority. The Contractor will not be required to pay for energy consumed by the system, and working days will not be charged, during this trial period.

12. Where the existing ground has been disturbed by the Contractor, reshape to original contours or as directed otherwise by the Engineer.

13. Final acceptance of all lighting installations will be based on:

- Satisfactory results of electrical tests the Contractor has performed, and
- Satisfactory completion of the 30 calendar day trial period.

2523.04 METHOD OF MEASUREMENT.

Measurement for the quantities of the various items involved in the construction of highway lighting will be as follows:

A. Lighting Poles.
By count.

B. Electrical Circuits.
Linear feet (meters) shown in the contract documents.

C. Handholes and Junction Boxes.
By count.

D. Control Cabinet.
By count.

E. ~~Under Deck~~ Underdeck Lighting.
By count.

2523.05 BASIS OF PAYMENT.

Payment for the quantities of the various items involved in constructing highway lighting will be the contract unit price as follows:

A. Lighting Poles.

1. Each.

2. Payment is full compensation for materials, equipment, excavation, and installation of the pole, luminaire, mastarm, ~~footing~~ foundation, base, ground rod, wiring within the pole, and connectors within the pole, according to the contract documents.

B. Electrical Circuits.

1. Per linear foot (meter).

2. Payment is full compensation for materials, equipment, excavation, and installation of the conduit and the wiring/cables between the connectors in the poles, including switches.

C. Handholes and Junction Boxes.

1. Each.

2. Payment is full compensation for materials, equipment, excavation, and installation of the handholes and junction boxes.

D. Control Cabinet.

1. Each.

2. Payment is full compensation for materials, equipment, excavation, meter socket, meter loop, control cabinet pole, and installation of control cabinet and all line and internal circuitry ~~y~~ wiring.

E. ~~Under Deck~~ Underdeck Lighting.

1. Each.

2. Payment for ~~Under Deck~~ Underdeck Lighting is full compensation for luminaires ~~shall be~~ complete ~~including~~ with lamps, ballast, and mounting device.

4185, Highway Lighting Materials.

Replace the Section:

4185.01 DESCRIPTION.

A. Furnish materials for highway lighting of the size and type specified.

B. When more than one unit of any item is required for installation, furnish units that are all the same make and design. Furnish apparatus and materials that meet the following:

- Are new products of manufacturers regularly engaged in production of items of this type,
- Are the manufacturer's latest approved design,
- Carry the UL seal of approval, if listed, and
- Are recommended by the manufacturer for the intended use.

4185.02 POLES AND SUPPORTS.

A. General.

1. Furnish steel, aluminum, or wood poles of the size and type specified.

2. Each lighting pole is to include provisions for supporting the luminaire or luminaires. If furnishing metal poles, furnish poles consisting of:

- A tapered round shaft, complete with a base, and removable pole top,
- Nameplate or other identification displaying the manufacturer's name, type, height, and shop order number, and
- Appurtenant supporting devices.

3. Dimensions and other details will be shown in the contract documents. Furnish poles and mastarms meeting the mounting height and mastarm length shown in the contract documents. Ensure the structural design of the light pole is based on the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

4. The assembled lighting unit, consisting of the pole and all attachments including mastarms, luminaires, and breakaway base or slip base, as specified, complete and in place in the footing anchor bolts, is required to withstand windloading equal to a wind of 80 mph (130 km/h) without fracture or apparent deformation of components. Furnish poles in one section. Ensure each standard is designed for a luminaire dead load of 75 pounds (35 kg) and a projected area of 1.5 square feet (0.10 m^2), except that in the case of twin mastarms, these values are applied to each mastarm.

5. Furnish castings incidental to poles that are smooth and clean, with all details well defined and true to pattern.

6. Furnish pole bases that telescope the pole shaft and are attached to the pole shaft by two welds (top and bottom) subject to approval of the Engineer. Ensure bases other than slip base poles have four anchor bolt holes located 90 degrees apart in the bolt circle. If slip bases are furnished, ensure they have three anchor bolt holes located 120 degrees apart in the bolt circle, oriented as shown in the contract documents. For poles with mastarms, ensure the centers of two adjacent anchor bolt holes are on a line parallel with the neutral plane of the pole shaft with respect to one mastarm, designated as the standard mastarm.

7. Obtain a template from the manufacturer for placement of anchor bolts.

8. With the pole, furnish metal ornamental covers for the upper ends of the anchor or attachment bolts for breakaway base poles.

9. Provide a wiring handhole, no less than 4 inches by 6 inches (100 mm by 150 mm), with a weatherproof metal cover, for all metal poles not mounted on transformer bases, or as shown in the contract documents. Center the handhole on a point no less than 14 inches (350 mm) or no more than 18 inches (450 mm) above the bottom surface of the pole base mounting flange, and 90 degrees clockwise from the center line of the standard mastarm, as viewed from above. Ensure the pole shaft has a J-hook at the top for supporting cables.

10. Ensure each pole has an approved grounding lug. When a handhole is furnished, ensure the grounding lug is readily accessible through the handhole. Ensure grounding lugs for breakaway base poles are accessible from the bottom of the pole shaft.

B. Anchor Bolt and Slip-Base Plate Fasteners for Lighting Poles.

1. Furnish all bolts, nuts, and washers for pole attachment and anchoring according to the details in the contract documents. Ensure assembled fasteners are capable of withstanding the forces corresponding to a moment that will cause failure of the pole, transformer base, or other applicable mounting device.

2. Furnish anchor bolts that:

- Meet the requirements of ASTM F 1554, Grade 105 (724 MPa),
- Are full-length galvanized according to ASTM F 2329, and
- Are Unified Coarse Thread Series with Class 2A tolerance.

3. Color code the end of each anchor bolt intended to project from the concrete in red to identify the grade.

4. If slip bases are furnished, furnish 1 inch by 4 1/2 inch (25 mm by 112 mm) bolts that:

- Are high-strength bolts meeting the requirements of ASTM A 325, and
- Are fully mechanically galvanized to ASTM B 695, Class 55, Type I.

5. Furnish washers that:

- Meet the requirements of ASTM F 436, and
- Are galvanized.

6. Furnish nuts that:
- Meet the requirements of ASTM A 563, ~~DH,~~
- Are grade DH,
- Are heavy hex, and
- Are galvanized according to the requirements of ASTM F 2329, or ASTM B 695, Class 55, Type I.

7. Nuts may be over-tapped according to the allowance requirements of ASTM A 563. Nuts may be tapped oversize only enough to provide a finger free fit.

C. Mastarms and Accessories.

1. When indicated in the contract documents, furnish single or twin mastarms as luminaire supports. The contract documents will show the horizontal span of the mastarm and the included angle between the center lines of twin mastarms. Such angles are defined as rotating from the standard mastarm, as viewed from above.

2. Furnish mastarms meeting the following requirements:
- **a.** Aluminum tube or galvanized steel to match the pole, with smooth openings into the pole shaft to provide an electrical raceway.
- **b.** Capable of accommodating a 2 inch (50 mm) slipfitter type luminaire.
- **c. Type A mastarms:** no braces or truss members.
- **d. Type B mastarms:** a single underbrace attached to the mastarm at no less than two locations.

3. Furnish mastarm bolts, nuts, and washers that are stainless steel and meet the requirements of Article 4187.01.

D. Breakaway (Transformer) Base.
Furnish bases meeting the following requirements:

1. ~~Cast aluminum meeting requirements of ASTM B 108, 356-T6 or B 26, 356-T6 aluminum alloy.~~ Two piece weldments with internally welded inside corners/material 356 T6 complying with ASTM B 108-87 aluminum alloy permanent mold castings.

2. ~~Compliance with AASHTO breakaway criteria.~~ Designed according to AASHTO Standards and Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

3. Meet or exceed NCHRP Report 350, or AASHTO MASH criteria for any assembly system evaluated after January 1, 2011.

~~**3**~~ **4.** ~~Capable of withstanding an applied moment at the top equal to the design moment of the applicable pole, and no less than 35,000 foot-pounds (47,500 N•m).~~ Capable of supporting the pole mounting height and mastarm length shown in the contract documents.

~~**4.** Yields to an applied momentum of 1,100 pound-seconds (4.9 kNs) when tested with an automobile or 400 pound-seconds (1.8 kN•s) when tested with a solid mass. The manufacturer should conduct the tests and certify the results to comply with requirements of current AASHTO requirements for breakaway luminaire supports.~~

5. Equipped with a ~~weatherproof~~ manufacturer furnished, other than aluminum (in other words, having no scrap value), access door with door opening area of no less than 100 square inches (0.065 m^2), unless shown otherwise.

E. Steel Poles and Mastarms.

1. Furnish poles meeting the following requirements:
- **a.** Shafts manufactured with a taper of approximately 0.14 inch per foot (12 mm/m) of length.
- **b.** Steel that is no less than 11 gage (3.03 mm), with a minimum yield strength of 48,000 psi (330 MPa), after fabrication.
- **c.** Steel galvanized according to ASTM A 123. Steel 1/8 inch (3 mm) thick or less shall be galvanized to comply with requirements for 1/8 inch (3 mm) thick steel as described in ASTM A

123.

2. Furnish Type A and B mastarms meeting the following:
- **a.** Fabricated from standard weight, welded steel, 2 inch (50 mm) pipe meeting the requirements of ASTM A 53, Grade B, and galvanized according to ASTM A 123.
- **b.** Underbrace for a Type B mastarm complying with requirements of the mastarm and connected to the mastarm by welded steel braces to form a truss type assembly.
- **c.** Mastarm to shaft brackets that provide a water tight connection.

F. Aluminum Poles and Mastarms.

1. Furnish poles meeting the following requirements:
- **a.** Fabricated from ASTM B 221 6063-T6 or 6061-T6 aluminum alloy tube or ASTM B 209 5086-H34 aluminum sheet.
- **b.** Minimum nominal wall thickness of 3/16 inch (5 mm) unless indicated otherwise in the contract documents.
- **c.** Shafts tapered approximately 0.14 inch per foot (12 mm/m) of length.
- **d.** Castings of ASTM A 356/A 356M-T6 aluminum alloy meeting the requirements of Article 4187.01.
- **e.** Approved dampening device included.
- **f.** Blocked and paper-wrapped prior to shipment.

2. Furnish Type A and B mastarms meeting the following:
- **a.** Fabricated from alloy complying with requirements for the pole shaft.
- **b.** Types A and B mastarms fabricated from tubing or pipe with a minimum outside diameter of 2.375 inches (60.325 mm), and swaged, when required, to accommodate a 2 inch (50 mm) slipfitter type luminaire.
- **c.** Welded braces used to connect the underbrace for a Type B mastarm to the mastarm in order to form a truss type assembly.

G. Wood Poles.

1. Furnish poles meeting the following requirements:
- **a.** ANSI ~~05.1~~ (ATIS) O5.1, Group D.
- **b.** Pressure treated with pentachlorophenol according to AASHTO M 133.

2. The size and class of wood poles will be specified in the contract documents.

4185.03 LUMINAIRES.

A. Roadway Luminaire.

1. Furnish roadway luminaire assemblies consisting of the following:
- **a.** A weatherproof, die cast aluminum or aluminum alloy housing and slipfitter with internally mounted ballast.
- **b.** A hinged, detachable, glass refractor manufactured from high-transmission-factor, highly shockproof, prismatic glass.
- **c.** A snap-in aluminum reflector.
- **d.** A high grade porcelain enclosed socket and terminal block with pressure type terminals for connecting leads entering from the mounting bracket or mastarm.

2. Fit a heat resistant gasket between the reflector and a shoulder in the socket support plate to seal the optical system at this point.

3. Furnish a slipfitter that consists of bracket clamps and provides for vertical adjustment and horizontal leveling of the luminaire. Arrange the slipfitter to accommodate a 2 inch (50 mm) standard pipe bracket.

4. Furnish a weatherproof, hinged, access door for quick access to the terminal block and mounting arrangement. Ensure exposed metal parts are made from nonferrous metal or stainless steel.

5. With the high pressure sodium lamp, furnish a regulated high-power-factor type ballast with starting

current lower than operating current. Ensure it will maintain lamp wattage within 10% variation with a line voltage regulation of ± 10%, with no less than 90% power factor. Ballast for use with other light sources will be specified in the contract documents.

6. The contract documents will specify the luminaire according to the type of lamp to be used and its size in watts. Unless specified otherwise, furnish only the light sources for roadway luminaires listed in Table 4185.03-1:

Table 4185.03-1: High Pressure Sodium Lamp

Wattage	ANSI C78.42-2009 Designation	Bulb
400 Watt	~~ANSI Code S51WA 400~~ S51/O-EJ	E18
250 Watt	~~ANSI Code S50VA 250~~ S50/O-EJ	E18
200 Watt	~~ANSI Code S66MN 200~~ S66/O-EJ	E18
150 Watt	~~ANSI Code S55SC 150~~ S55/O-NV	~~E23.5~~
100 Watt	~~ANSI Code S54SB 100~~ S54/O-NV	~~E23.5~~
70 Watt	~~ANSI Code S62ME 70~~ S62/O-NV	~~E23.5~~
Furnish high pressure sodium lamps for appropriate burning positions, as required by the luminaire.		

B. Underdeck Lighting and Low Mounting Height Luminaires.

1. Furnish complete low mounting height luminaires consisting of the following:
- **a.** An optical train which includes a single piece, prismatic refractor mounted in an aluminum door assembly.
- **b.** An asymmetric, specular processed aluminum reflector.
- **c.** An anodized aluminum visor.
- **d.** An attached or integral ballast housing.
- **e.** A cast aluminum luminaire housing.
- **f.** When specified, an adaptor mount and shield for sign lighting.

2. Furnish a door assembly equipped with noncorrosive metal pressure latches, hinges, and safety chain.

3. Furnish a luminaire housing complete with:
- Captive neoprene and felt double gasketing,
- A rear access hole in a gasketed aluminum cover plate, and
- Tapped conduit entries as shown in the contract documents.

4. Furnish a refractor that meets the following:
- **a.** Fabricated from molded, high-transmission-factor, thermal shock resisting, crystal glass.
- **b.** Is of adequate size to properly house the specified lamp and to produce the required light distribution.
- **c.** Inner and outer surface are covered with an array of reflecting and refracting prisms and diffusing flutes which are designed to provide an asymmetric light distribution.

5. With a high pressure sodium lamp, furnish a regulated high-power-factor type ballast with starting current lower than operating current. Ensure it will maintain lamp wattage within 10% variation with a line voltage regulation of ± 10%, with no less than a 90% power factor. The contract documents will specify the ballast for use with other light sources.

6. Ensure maximum luminous intensity (candela) output occurs at 60 degrees from the vertical. Ensure the unit provides a 180 degree horizontal spread in the maximum luminous intensity (candela) plane.

7. Ensure entire luminaire is designed to be attached to a wall outlet box mounted to a stud, a metal channel framing, or a sign lighting adaptor and shield. Unless specified otherwise in the contract documents, furnish the light source for the luminaire listed in Table 4185.03-2:

Table 4185.03-2: High Pressure Sodium Lamp (Underdeck Lighting and Low Mounting Height Luminaires)

Wattage	ANSI C78.42-2009 Designation	Bulb
250 Watt	~~ANSI Code S50VA 250~~ S50/O-EJ	E18
150 Watt	~~ANSI Code S55SC 150~~ S55/O-NV	E23.5
100 Watt	~~ANSI Code S54SB 100~~ S54/O-NV	E23.5
70 Watt	~~ANSI Code S62ME 70~~ S62/O-NV	E23.5
Furnish high pressure sodium lamps for appropriate burning positions, as required by the luminaire.		

4185.04 GROUND RODS.

A. Furnish approved, copper clad, steel rods of the diameter and length designated in the contract documents.

B. Unless designated otherwise, furnish rods of a minimum nominal 5/8 inch (16 mm) diameter, and a minimum length of 12 feet (3.6 m) for control ~~stations~~ cabinets and 8 feet (2.4 m) for installations at lighting units.

C. Include pressure type clamps and bonding jumpers as required. Unless shown otherwise in the contract documents, furnish bare solid conductor copper wire, No. 6 AWG or larger, bonding jumpers.

4185.05 CONTACTORS.

A. Lighting contactors may be housed within control cabinets as shown in the contract documents.

B. Meet the following requirements for contacts:

1. Two pole, single throw, magnetically held, normally open relays rated at 480 volts AC or greater.

2. Double break, self cleaning type with interrupting ratings as shown in the contract documents.

3. Material designed for lighting ballast loads and requiring no maintenance, such as filing, burnishing, or dressing at any time the contactor is in service.

4. A permanent instruction contained within the cabinet housing stating, "Contacts shall not be filed, burnished, or dressed".

5. Movable contact holders of one piece, molded construction. Opening action obtained by free fall from gravitational forces or by use of noncorrosive springs. The Contractor may use pivots of the hardened, knife edge type.

C. Meet the following requirements for operating coils:

1. A 60 hertz frequency supply.

2. Removable from the front of the contactor assembly without disturbing other components or wiring.

3. Each designed to prevent any expansion, bubbling, or melting that would render the remainder of the unit inoperative in event of a coil burnout.

4185.06 PHOTO-ELECTRIC CONTROL.

Furnish controls meeting the following requirements:

A. Weatherproof.

B. Fits the standard 3 prong EEI/NEMA twist-lock socket.

C. Operates with a 60 hertz frequency control circuit.

D. Designed so that any failure under normal conditions will cause the lighting circuits to be energized.

E. All ratings in compliance with the control requirements of the contactor.

F. Time delay type set to turn on at 2.0 footcandles (20 lux) and off at 6.0 footcandles (60 lux).

4185.07 CONTROL CABINETS.

A. Furnish cabinets meeting the following requirements:

1. Type 304 stainless steel minimum 14 gage, or 0.125 inch (3.17 mm) aluminum, weatherproof NEMA Type 3R enclosures.

2. Full-sized door gasket.

3. Drip shield.

4. Top-mounted 3 prong photo-electric control socket.

5. Insect-proof breather.

6. Labyrinth type breather drain.

7. An internal back panel for component mounting.

8. Door with a single external padlock handle to operate a door latch. Latch mechanism to include no less than two approved roller latches.

9. Cabinet size adequate to provide access to all components for maintenance and replacement without disturbing other components or wiring.

10. Unless detailed otherwise in the contract documents, space provided for no less than one line (main) circuit breaker and four branch circuit breakers, one contactor, two surge ~~suppressors~~ protection devices, and a test switch.

11. Each pole-mounted cabinet equipped with pole mounting brackets, conduit, and hubs.

12. Each pad-mounted cabinet equipped with a removable bottom plate and an internal flange with hold-down clamps for attachment to a concrete base.

B. The contract documents will show the location, type, and other details of control cabinets.

C. Include the following appurtenances:

1. A line circuit breaker that may also serve as main disconnect means.

2. A photo-electric control.

3. Two surge ~~suppressors~~ protection devices.

4. A maintained contact, three position switch (with all functions labeled as shown in the contract documents) to provide a means of overriding automatic operation of the lighting system for testing purposes.

D. The contract documents will show the quantity and ratings of circuit breakers and other details of individual installations.

E. Apply all requirements for a pad mounted control cabinet with contactor. Provide cabinets with continuously welded seams and minimum interior dimensions of 2 feet 6 inches high by 3 feet wide by 2 feet deep (760 mm high by 600 mm wide by 200 mm wide).

4185.08 HANDHOLES AND JUNCTION BOXES.

Provide four galvanized steel cable hooks with a minimum diameter of 3/8 inch (10 mm) and a minimum length of 5 inches (125 mm).

A. Precast Concrete Handholes.

The contract documents will show locations and other details. Meet the following requirements:

1. Pipe.

~~Ensure the body of the precast handhole meets the requirements for Class 1500D (75D) concrete pipe.~~ Comply with ASTM C 76. Minimum 2000D (Class III), Wall B. Four 8 inch (200 mm) knockouts (conduit entrance points) equally spaced around the handhole.

2. Casting.

~~For the handhole cover, furnish a heavy duty cast iron frame and lid that sits inside the pipe end.~~ Gray cast iron and certified according to requirements of AASHTO M 306 for a 16,000 pound (7260 kg) proof load (HS-20).

3. Cover.

~~The contract documents will show handhole locations and other details.~~ Include “ELECTRIC” as a message on the cover unless specified otherwise in the contract documents.

B. ~~Preformed~~ Precast Concrete Composite Handholes and Junction Boxes.

~~Furnish handholes boxes meeting~~ The contract documents will show locations and other details. Meet the following requirements:

~~**1. Constructed to the dimensions shown in the contract documents.**~~

~~2~~ 1. ~~Constructed with~~ Handhole (or junction box) and cover fabricated using mortar consisting of sand, gravel, and polyester resin reinforced by a woven glass fiber mat or of resin mortar and fiberglass. Include “ROADWAY LIGHTING” as a message on the cover unless specified otherwise in the contract documents.

~~3~~ 2. ~~Constructed~~ Fabricated to withstand a load of 20,000 pounds (9,000 kg).

4 3. ~~Each handhole equipped with a bolt-down cover of the same material.~~ Provide two 3/8-16 UNC stainless steel hex head bolts with washers.

~~**5. Lock down bolts of stainless steel with penta head.**~~

C. Cast Iron Junction Boxes.

The contract documents will show locations and other details. Meet the following requirements:

1. Cast iron boxes and covers galvanized according to ASTM A 153.

2. Boxes classified by the manufacturer as meeting the requirements for NEMA 4, Watertight.

3. UL approved boxes.

4. Apply applicable provisions of Article 314 of the current NEC.

5. Raised buttons (blind drilled, tapped, and fitted with screws as specified) of the specified size and location cast into the surface of the box floor and cover for grounding purposes.

6. Neoprene gaskets used.

~~**4185.09 JUNCTION BOXES.**~~

~~**A. Preformed Junction Boxes.**~~

~~Furnish boxes meeting the following requirements:~~

~~**1. Constructed to the dimensions shown in the contract documents.**~~

~~**2.** Constructed with mortar consisting of sand, gravel, and polyester resin reinforced by a woven glass fiber mat or of resin mortar and fiberglass.~~

~~**3.** Each junction box equipped with a bolt-down cover of the same material.~~

~~**4.** Stainless steel screws.~~

~~**B. Cast Iron Junction Boxes.**~~

~~**1.** Furnish boxes meeting the following requirements:~~
~~**a.** Cast iron boxes and covers galvanized according to ASTM A 153.~~
~~**b.** Boxes classified by the manufacturer as meeting the requirements for NEMA 4, Watertight.~~
~~**c.** UL approved boxes.~~
~~**d.** Apply applicable provisions of Article 370 of the current NEC.~~
~~**e.** Raised buttons (blind drilled, tapped, and fitted with screws as specified) of the specified size and location cast into the surface of the box floor and cover for grounding purposes.~~
~~**f.** Neoprene gaskets used.~~

~~**2.** The contract documents will show locations and other details.~~

4185.10 CONDUIT AND FITTINGS.

A. General.

1. The type, size, and location of all conduit will be indicated in the contract documents. Do not substitute types of conduit material.

2. Furnish weatherproof fittings of identical or compatible material to the conduit. Use standard factory elbows, couplings, and other fittings when possible.

3. Limit the inside radius of all field bends to no less than 6 times the internal diameter of the conduit. Bend so as not to kink, flatten, or otherwise significantly reduce the effective cross sectional area of the conduit.

B. Rigid Steel Conduit.
Furnish conduit meeting the following requirements:

1. Compliance with ~~ANSI~~ NEMA C80.1.

2. Identified with the manufacturer's name and trade mark and the words "rigid steel conduit" or "rigid metal conduit."

3. Weatherproof expansion fittings with galvanized, malleable iron, fixed and expansion heads jointed by rigid steel conduit sleeves. As an option, the fixed head may be integral with the sleeve, forming a one piece body of galvanized malleable iron.

C. Rigid Aluminum Conduit.
Furnish conduit meeting the requirements of ~~ANSI~~ NEMA C80.5.

D. Plastic Conduit and Fittings.
Furnish conduit and fittings meeting the following requirements:

1. PVC Schedule 40 and 80 plastic conduit and fittings meeting the requirements of NEMA TC-2, TC-3, and UL 651 for Schedule 40 heavy wall type.

2. Solvent welded, socket type fittings, except where indicated otherwise in the contract documents.

3. Threaded adaptors for jointing plastic conduit to rigid metal ducts.

4. Compliance with applicable requirements of NEMA TC-3 and UL 514B and the manufacturer's recommendation for all materials and methods for attaching and making fittings. Obtain the Engineer’s approval.

4185.11 CONNECTOR ASSEMBLIES.

~~Details of connector assemblies will be shown in the contract documents.~~ Furnish connectors with complete instructions, assembly devices, a disposable mounting pin (when required), and silicone lubricant for all mating surfaces. Ensure connector assemblies are: 1) waterproof; 2) designed for both direct burial in the earth and exposure to sunlight; and 3) are capable of repeated disconnections without damage to the watertight seals and terminals or reduction of conductivity below specifications. Furnish connectors recommended for the required cable sizes. Meet the following requirements for the type specified:

A. Type Y-1 Connector.

1. Furnish fused Y-1, quick disconnecting type tap connectors consisting of:

a. Two spring loaded, fully annealed copper contacts of 90% minimum conductivity suitable for gripping a 13/32 inch by 1 1/2 inch (10.3 mm by 38 mm) midget fuse, two terminal lugs, a bolt, and a locknut.

- One contact adapted to be crimped to the cable and retained securely within a rubber load side tap housing.
- The second contact preassembled and retained in a rubber Y-insert-body with provision for connecting the terminal lugs securely in place.

b. A permanently marked, load side tap housing, a Y-insert-body, and a Y-housing, each made of water resistant synthetic rubber. Ensure the load side housing:

- Provides a section to form a watertight seal around the cable,
- Has an interior arrangement to suitably receive and retain one fuse contact,
- Is constructed to retain the fuse when disconnected, and
- Has a section to provide a watertight seal between itself and the Y-insert-body at the point of disconnection.

2. Ensure the Y-insert-body retains the second fuse contact and provides a watertight seal for the load side housing at the point of disassembly. Ensure the Y-housing provides sections to form a watertight seal around two cables and for Y-insert-body. When both through legs of the connection are not to be used, furnish an insulated plug with the same diameter as the cable to maintain an equivalent watertight seal.

B. Type Y-2 Connector.

1. Furnish unfused Y-2, quick disconnecting type tap connectors consisting of:

a. A copper pin to be crimped to the cable and a spring loaded copper receptacle, both of 90% minimum conductivity, two terminal lugs, a bolt, and a locknut. The receptacle and the crimping portion of the pin are to be fully annealed. The pin is to be adapted to be retained securely within a rubber load side tap housing. The receptacle is to be preassembled and retained on a rubber Y-insert-body with provision for bolting the terminal lugs securely in place.

b. A permanently marked load side tap housing, a Y-insert-body, a Y-housing, each made of water resistant synthetic rubber. Ensure the load side housing:

- Provides a section to form a watertight seal around the cable,
- Has an interior arrangement to suitably receive and retain the pin, and
- Has a section to provide a watertight seal between itself and the Y-insert-body at the point of disconnection.

2. Ensure the Y-insert-body retains the receptacle and provides a watertight seal for the load side housing at the point of disconnection and a watertight seal for the Y-housing at the point of disassembly. Ensure the Y-housing provides sections to form a watertight seal around two cables and for the Y-insert-body. When both through-legs of the connection are not to be used, provide an insulated plug with the same diameter as the cable to maintain an equivalent watertight seal.

C. Type Y-3 Connector.

Furnish semi-permanent Y-3 tap connectors consisting of:

1. Three terminal lugs (each provided with a mounting hole by which all lugs are bolted securely together), a bolt, and a locknut.

2. A tap housing and a Y-housing, each made of water resistant synthetic rubber. Ensure the tap

housing: 1) provides a section to form a watertight seal around the cable; and 2) includes a section to provide a watertight seal between itself and the Y-housing at the point of disassembly. Ensure the Y-housing provides sections to form a watertight seal around two cables and for the tap housing. When all legs of the connection are not to be used, provide an insulated plug with the same diameter as the cable to maintain an equivalent watertight seal.

D. Type L-1 Connector.
Furnish fused L-1, quick disconnecting in-line connectors consisting of:

1. Two spring loaded, fully annealed copper contacts of 90% minimum conductivity suitable for gripping a 13/32 inch by 1 1/2 inch (10.3 mm by 38 mm) midget fuse. Both contacts are to be adapted to be crimped to the cable and retained securely within rubber housings.

2. A permanently marked, load side and line side housing, each made of water resistant, synthetic rubber. Ensure each housing:
- Provides a section to form a watertight seal around the cable,
- Has an interior arrangement to suitably receive and retain the fuse contact, and
- Has a section to provide a watertight seal between the two housings at the point of disconnection.

E. Type L-2 Connector.
Furnish L-2, unfused, quick disconnecting in-line connectors consisting of:

1. A copper pin and a spring loaded copper receptacle, both fully annealed and of 90% minimum conductivity, to be crimped to the cable. Both the pin and receptacle are to be adapted to be retained securely in rubber housings.

2. A permanently marked, load side and line side housing, each made of water resistant, synthetic rubber. Ensure each housing:
- Provides a section to form a watertight seal around the cable,
- Has an interior arrangement to suitably receive and retain the pin or receptacle, and
- Has a section to provide a watertight seal between the two housings at the point of disconnection.

4185.12 WIRE AND CABLE.
Wire and cable construction types, conductor sizes, and working voltage ratings will be specified in the contract documents.

A. Single Conductor Wire and Cable.
Furnish wire and cable meeting the following requirements:

1. Insulation.
- Rated for 600 volts.
- Thermosetting, cross linked polyethylene meeting the requirements of ICEA ~~S-66-524~~ S-95-658 (ANSI/NEMA ~~WC-7~~ WC 70).
- Thickness meeting the requirements of Table No. ~~3-1 Column "A"~~ 3-3.
- ~~Unless specified otherwise in the contract documents, comply with applicable requirements of UL Standard No. 44.~~
- UL listed for use at conductor temperatures of 167°F (75°C) or higher in wet or dry locations.
-

~~**2. Wire and Cable.**~~
- Bears required UL labeling repeated throughout their length.
- UL Listed Type USE-2 per UL Standard 854 and Type RHH or RHW-2 per UL Standard 44.

~~3~~ **2. Conductors.**
- Annealed copper meeting the requirements of ASTM B 3.
- Sizes smaller than No. 8 AWG, may be solid or stranded.
- Sizes No. 8 AWG and larger are to be stranded and are to meet the requirements of ASTM B 8, Class B.

B. Aerial Power Cable.

Furnish cable consisting of an assembly of individually insulated conductors with a messenger cable. The insulated conductors may be either laid about the messenger or secured to the messenger with a flat binding strip. Meet the following requirements:

1. **Conductors.**
   Stranded aluminum or steel reinforced aluminum (ACSR).

2. **Messenger.**
   Steel or ACSR. If using steel, use steel protected with copper, aluminum, or zinc coating.

3. **Binding strip.**
   Copper, bronze, or steel. If using steel, use steel protected with copper, aluminum, or zinc coating.

4. **Insulation.**
   Meet the requirements of Article 4185.12, A.

C. Thermoplastic Wire and Cable.
Use only where specified in the contract documents. Use conductors that meet the requirements of UL Standard No. 83 and are UL listed for Type THW or Type THHN (THWN).

D. Control Cable.

1. Use only where specified in the contract documents. Furnish cable consisting of either:
   - An assembly of conductors individually covered with polyethylene insulation, or
   - Polyethylene insulation with polyvinyl chloride jacket together with suitable fillers covered overall with polyester tape and a polyvinyl chloride jacket.

2. Ensure the cable complies with requirements for ~~Type~~ Class B Control Cable as described in ANSI/ICEA ~~S-61-402~~ S-73-532 (NEMA ~~WC-5~~ WC 57).

E. Flexible Cord.
Use cord that is UL listed for Type SO and complies with applicable requirements of UL Standard No. 62 ~~(Table 3.14)~~.

F. Bare Copper Ground Wire.

1. Use soft drawn wire meeting the requirements of ASTM B 3, or medium hard drawn wire meeting requirements of ASTM B 2.

2. For direct burial installation, use solid wire for sizes smaller than No. 4 AWG and stranded wire for sizes of No. 4 AWG and larger. For installation in raceways or ducts, use solid wire for sizes smaller than No. 8 AWG and stranded wire for sizes of No. 8 AWG and larger. Ensure stranding meets the requirements of ASTM B 8, Class B.

4185.13 SURGE ~~SUPPRESSOR~~ PROTECTION DEVICE.
Furnish ~~suppressors~~ surge protection devices (SPDs) meeting the following requirements:

A. Metal oxide varistor (MOV) type ~~suppressor~~ SPD, suitable for 120/240 volt single-phase line voltage, with an ANSI/UL1449 ~~Category B3 voltage rating of 500 volts (line-neutral)~~ 3rd edition Type 1 with 20kA I-Nominal and voltage protection rating (VPR) of 700 volts (line-neutral).

B. Single-pulse (8/20 microsecond) maximum surge current rating of 50,000 amperes per mode.

C. NEMA 1 ~~enclosure included~~ rating that is suitable for mounting inside a lighting control cabinet.

D. Each ~~line~~ MOV fused and an ~~visual indication light~~ LED installed to ~~show~~ indicate power and suppression status.

4185.14 TEST SWITCH.
Furnish switches meeting the following requirements:

A. Heavy duty maintained contact, three position switch.

B. 600V, 10 amperes, double break type contact.

4185.15 CIRCUIT BREAKER.
Furnish breakers meeting the following requirements:

A. Rated for 240 volts and 480 volts, with minimum interrupting ratings of 25,000 amperes, symmetrical, at 240 volts, and 18,000 amperes, symmetrical, at 480 volts.

B. Thermal magnetic trip mechanism with a trip-free toggle operator.

C. Frame and trip ratings as shown in the contract documents.

Comments:

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

2523.02, C.

Add as a new article:

For granular base for handholes and preformed junction boxes, provide material meeting Gradation No. 3 or 5 of the Aggregate Gradation Table.

2523.03, B, 1, a, 5.

Replace the article:

~~Iowa DOT Standard Road Plan RM-41, Underdeck Lighting (High Pressure Sodium Luminaire)~~ Underdeck luminaires with lamps.

2523.03, B, 1, a, 6, l.

Replace the article:

Surge ~~suppressor~~ protection device.

2523.03, B, 1, a, 7.

Replace the article:

~~Iowa DOT Standard Road Plan RM-40,~~ Cable Splices and Connectors.

2523.03, B, 9, Required Shop Drawings.

Renumber existing Article 9 as Article 10.

Add as Article 9:

9. Anchor bolts, nuts, and washers.

2523.03, B , 1, b, Shop Drawings not Required.

Delete Article 4:

~~Anchor bolts, nuts, and washers.~~

Renumber existing Articles 5 through 9 as 4 through 8.

Replace existing Article 6:

~~Iowa DOT Standard Road Plan RM-42, Type 1~~ Handholes and junction boxes.

Add as Article 9:

9. Rigid non-metallic conduit and fittings.

2523.03, C, 3.

Replace the first sentence:

Furnish all apparatus and material for the pole mounted control ~~station~~ cabinet, as shown in the contract documents.

2523.03, C, 4.

Replace the first sentence:

If concrete pad(s) and other incidental work for ~~mounted~~ transformers ~~and control stations~~ are specified, follow the utility company's guidelines. If the utility company has no guidelines, ~~ensure they are~~ furnish~~ed~~ and install~~ed~~ as specified in the contract documents.

2523.03, D. Excavation.

Replace the article:

1. Foundations.

Drill the holes for pole ~~footings~~ foundations and direct embedded poles.

2. Trenches.

a. Details of trenching for underground circuits will be shown in the contract documents.

~~3~~b. Pile the excavated material away from the trench to prevent cave-ins.

~~4~~c. Accurately grade the trench bottom to provide for placement of cable or duct work at a uniform depth.

~~5~~d. Ensure surface water does not enter the trench. Remove water that is present before duct work is installed, unless directed otherwise by the Engineer.

3. Handholes and Preformed Junction Boxes.

Excavate as necessary to accommodate the handhole (or preformed junction box) and granular base.

2523.03, G, Footings.

Replace the title and Article:

~~Footings~~ Foundations.

1. Construct cast-in-place concrete ~~footings~~ foundations for all lighting units not located on structures or barriers. Form and pour the top portion of all ~~footings~~ foundations in form work to at least 6 inches (150 mm) below the finished ground level. Ensure the ~~footings~~ foundations conform in all respects to the details, including reinforcement and alignment to provide the correct overhang, as indicated in the contract documents. Ensure maximum exposed concrete above finished grade does not exceed 4" (100 mm) on all sides of finished foundation.

2. Ensure finished surfaces are smooth and free from stains and foreign material.

3. Construct an alternate ~~footing~~ foundation, as directed by the Engineer, when shale, sandstone, broken ~~and~~ or shattered rock, solid rock, or other similar materials are encountered.

4. Place anchor bolts to provide for placement of nuts and washers on the top and bottom of the transformer base or pole flange, leaving ample room for adjustment and plumbing the pole. When slip bases are used, position anchor bolts so that they do not interfere with the operation of the slip base. Place anchor bolts according to Article 2405.03, H, 3.

2523.03, I, Aluminum Transformer Bases.

Replace the article:

~~Ensure the bottom flange of aluminum transformer bases are painted on the inside and outside surfaces with two coats of zinc-rich paint.~~ Install transformer base according to the manufacturer's recommendation and the contracts documents.

2523.03, J, 3.

Replace the article:

~~Rake~~ Install single mastarm poles so the side of the shaft opposite the mastarm is plumb. Erect poles ~~without mastarms~~ with more than one mastarm, or ~~with more than one mastarm~~ without mastarms, so the center line of the pole shaft is plumb within a tolerance of 1/32 inch per foot (3 mm/m).

2523.03, J, 5.

Replace the article:

Plumb the poles as follows~~using double nuts on each anchor bolt. Locate the nuts~~:

Transformer base: use base leveling shims. ~~Above and below the bottom mounting flange of the breakaway base, or~~

Slip base: use base leveling shims or leveling bolts, whichever is appropriate for the slip base furnished. ~~Above and below the pole base or slip base mounting flange where breakaway bases are not required.~~

2523.03, J, 7.

Delete the article:

~~Base leveling shims or alternate pole mounting methods will be permitted only when indicated.~~

2523.03, J, 8.

Delete the article:

~~After the erection has been inspected and approved, fill the space between the mounting flange and the concrete footing with an approved non-shrink grout and finish as detailed.~~

2523.03, L, 1.

Replace the second sentence:

Construct circuits and control ~~stations~~ cabinets according to the contract documents.

2523.03, L, 3.

Add as a new article:

3. For line circuit conductor sizes, comply with NEC requirements based on the total load current ratings of the branch circuit breakers supplied by the respective circuit segments, with a minimum size of No. 8 AWG. Minimum size allowed for control circuit conductors will be No. 12 AWG.

2523.03, N, 2, b, Crossing Ducts.

Replace the article:

1) Unless shown otherwise in the contract documents, use HDPE SDR 13.5 or Schedule 80 PVC conduit for crossing ducts.

2) If crossings are to be placed without disturbing the existing surface, install by jacking or boring methods approved by the Engineer. Do not use jetting. No access to duct or jacking of duct from median will be allowed without the Engineer's approval.

3) After cable is installed, seal all duct terminal ends in handholes, transformer bases, pole foundations, or similar locations (as directed by the Engineer) against moisture. Use either approved sealing bushings or a non-hardening sealing compound.

2523.03, N, 2, c, Primary Service Ducts.

Replace the title and article:

~~**Primary**~~ **Other Service Ducts.**

Apply installation requirements for lighting circuit ducts and crossing circuit ducts to other service ducts including, but not limited to, ducts required for a complete installation that are not covered under the Utility Company service agreement.

2523.03, O, Handholes.

Replace the article:

Install handholes of the size and type and at locations shown in the contract documents, unless the Engineer specifies otherwise.

1. Locations.

~~Construct handholes of the size and type and at locations shown in the contract documents, unless the Engineer specifies otherwise.~~ Do not ~~construct~~ install handholes in the following areas:

- Ditch bottoms,
- Low areas where ponding of water may occur, or
- Where they will be subject to normal vehicular traffic.

2. Granular Base.

~~Provide access ducts for each general direction of the circuit branch run. Position them for ease of cable installation.~~ Install 8 inch (200 mm) thick granular base extending a minimum of 6 inches (150 mm) beyond the outside walls of the handhole.

3. Placement.

a. ~~Position handholes so that the top is at the same inclination as the adjacent grade.~~ In paved areas, install the handhole at an elevation so the lid or casting is level and flush with the pavement. In unpaved areas, install the handhole approximately 1 inch (25 mm) above the final grade.

b. For precast handholes, verify ring placement. Invert rings when installed in paved areas.

4. Conduit.

a. Remove knockouts as necessary to facilitate conduit entrance.

b. Extend conduit into handhole, through a knockout, approximately 2 inches (50 mm) beyond the inside of the wall. Slope conduit to down and away from the handhole.

c. Place non-shrink grout (complying with Materials I.M. 491.13) in the opening of the knockout area after placement of conduit.

5. Cable Hooks.

Install cable hooks centered between the knockouts and the top of the handhole.

6. Backfill.

Place suitable backfill material according to Section 2552.

7. Casting.

Place the casting on the manhole. Ensure the final elevation meets the handhole placement requirements.

2523.03, R, Connectors.

Delete the second and third sentences:

~~Ensure connector assemblies are supplied with a disposable mounting pin, when required, and sufficient silicone compound to lubricate the metal parts and rubber housings. Ensure complete instructions are supplied with each connector.~~

2523.03, T, Control Station.

Replace the title and article:

Control ~~Station~~ Cabinet.

Furnish ~~the components specified and construct~~ and install the control ~~station~~cabinets as indicated in the contract documents. Furnish and install meter sockets and meter loops unless an agreement for unmetered service has been secured at the time of construction. A meter loop is defined as the conduit, cable, enclosures, meter socket (if required), and other necessary components needed to form a complete system ready for connection as defined in either the Utility Company service agreement or the meter application.

1. General.

Meet the following requirements:

a. All load circuits within the control panel connected phase-to-phase, with neutral connections to grounds only.

b. All internal wiring for line and control circuits meet the requirements for single conductor cable. Thermoplastic cable may be used with the Engineer's approval.

c. Minimum interrupting ratings for branch circuit breakers identical to line circuit breakers. Provide one branch breaker for each active circuit and specified spare.

d. Unless shown otherwise, load current ratings of

- 30 amperes for branch circuit breakers.
- 100 amperes for main circuit breakers.

e. Interrupting ratings for the contactor not less than the load current rating for the line circuit breaker.

f. Minimum working voltage rating of 240 volts for the control fuse. Use cartridge type fuse with dimensions 13/32 inch (10 mm) by 1 1/2 inch (38 mm). Current ratings as recommended by the manufacturer.

g. Double-break contact block test switch.

h. The control cabinet electrically bonded to the ground rod(s) with a copper wire or

jumper equivalent to No. 6 AWG or larger.

2. Pole Mounted.

a. The utility company is to furnish aerial service drop and required meters according to either their service agreement or the meter application.

b. Provide control cabinets with components within arranged to provide access for maintenance and space for four branch circuit breakers without disturbing other components or wiring.

c. Provide risers consisting of rigid conduit of the type shown on the plans. Use conduit with a nominal inside diameter of 2 inches (53 mm) or larger for top risers. Provide 2 inch (53 mm) nominal inside diameter bottom ducts for all bottom risers, unless shown otherwise on the plans. Use weatherproof threaded hubs or compression glands for riser connections into cabinet.

3. Pad Mounted.

a. The utility company is to furnish primary service cable, pad mounted transformer, and required meters according to either their service agreement or the meter application.

b. Photoelectric control may be mounted on or in control cabinet if cabinet is equipped with photocell window. If plans call for remotely mounted photocell, connect photoelectric control socket to nearest accessible grounding connection, or where indicated on detail plans, by means of a No. 12 AWG copper wire.

c. Use weatherproof threaded hubs or compression glands for all duct connections into the top or side of the cabinet.

d. Construct concrete pad according to the contract documents. Slope the top surface of the concrete pad 1/4 inch per foot (20 mm per meter) in the direction of the natural ground. Place concrete pads as directed by the Engineer.

e. Terminate all ducts extending up from the concrete pad with bell ends or bushings.

2523.03, U, 4.

Replace the first sentence:

Measure ground resistance with the ground rod, or system of ground rods as described in Article 2523.03, ~~K~~ M, 2, disconnected from the circuit neutral wire.

2523.04, E, Under Deck Lighting.

Replace the title:

Under ~~D~~deck.

2523.05, A, 2.

Replace the article:

Payment is full compensation for materials, equipment, excavation, and installation of the pole, luminaire, mastarm, ~~footing~~ foundation, base, ground rod, wiring within the pole, and connectors within the pole, according to the contract documents.

2523.05, D, 2, Control Cabinet.

Replace the article:

Payment is full compensation for materials, equipment, excavation, meter socket, meter loop, control cabinet pole, and installation of control cabinet and all line and internal circuit~~ry~~ wiring.

2523.05, E, Under Deck Lighting.

Replace the title and article:

Under ~~D~~deck

1. Each.

2. Payment for Under ~~D~~deck Lighting is full compensation for luminaires ~~shall be~~ complete ~~including~~ with lamps, ballast, and mounting device.

4185.02, B, 6.

Replace the first bulleted item an add as the second bulleted item:

- Meet the requirements of ASTM A 563, ~~DH~~
- Are grade DH,

4185.02, D, Breakaway (Transformer) Base.

Replace the article:

Furnish bases meeting the following requirements:

1. ~~Cast aluminum meeting requirements of ASTM B 108, 356-T6 or B 26, 356-T6 aluminum alloy.~~ Two piece weldments with internally welded inside corners/material 356 T6 complying with ASTM B108-87 aluminum alloy permanent mold castings.

2. ~~Compliance with AASHTO breakaway criteria.~~ Designed according to AASHTO Standards and Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

3. Meet or exceed NCHRP Report 350, or AASHTO MASH criteria for any assembly system evaluated after January 1, 2011.

4. FHWA approved.

~~3~~ 5. ~~Capable of withstanding an applied moment at the top equal to the design moment of the applicable pole, and no less than 35,000 foot-pounds (47,500 N•m).~~ Capable of supporting the pole mounting height and mastarm length shown in the contract documents.

~~**4.** Yields to an applied momentum of 1,100 pound-seconds (4.9 kNs) when tested with an automobile or 400 pound-seconds (1.8 kN•s) when tested with a solid mass. The manufacturer should conduct the tests and certify the results to comply with requirements of current AASHTO requirements for breakaway luminaire supports.~~

~~5~~ 6. Equipped with a ~~weatherproof~~ manufacturer furnished, other than aluminum (in other words, having no scrap value), access door with door opening area of no less than 100 square inches (0.065 m^2), unless shown otherwise.

4185.02, E, Steel Poles.

Replace the title:

Steel Poles and Mastarms.

4185.02, F, Aluminum Poles.

Replace the title:

Aluminum Poles and Mastarms.

4185.02, G, 1, a.

Replace the article:

~~ANSI 05.1~~ ANSI (ATIS) O5.1, Group D.

4185.03, A, 6.

Replace the second sentence and Table 4185.03-1:

Unless specified otherwise, furnish only the light sources for roadway luminaires listed in Table 4185.03-1:

Table 4185.03-1: High Pressure Sodium Lamp

Wattage	ANSI C78.42-2009 Designation	Bulb
400 Watt	~~ANSI Code S51WA 400~~ S51/O-EJ	E18
250 Watt	~~ANSI Code S50VA 250~~ S50/O-EJ	E18
200 Watt	~~ANSI Code S66MN 200~~ S66/O-EJ	E18
150 Watt	~~ANSI Code S55SC 150~~ S55/O-NV	E23.5
100 Watt	~~ANSI Code S54SB 100~~ S54/O-NV	E23.5
70 Watt	~~ANSI Code S62ME 70~~ S62/O-NV	E23.5
Furnish high pressure sodium lamps for appropriate burning positions, as required by the luminaire.		

4185.03, B, Low Mounting Height Luminaires.

Replace the title:

Underdeck Lighting and Low Mounting Height Luminaires.

4185.03, B, 7.

Replace Table 4185.03-2:

Table 4185.03-2: High Pressure Sodium Lamp (Underdeck Lighting and Low Mounting Height Luminaires)

Wattage	ANSI C78.42-2009	Bulb

	Designation	
250 Watt	~~ANSI Code S50VA 250~~ S50/O-EJ	E18
150 Watt	~~ANSI Code S55SC 150~~ S55/O-NV	E23.5
100 Watt	~~ANSI Code S54SB 100~~ S54/O-NV	E23.5
70 Watt	~~ANSI Code S62ME 70~~ S62/O-NV	E23.5
Furnish high pressure sodium lamps for appropriate burning positions, as required by the luminaire.		

4185.04, B.

Replace the article:

Unless designated otherwise, furnish rods of a minimum nominal 5/8 inch (16 mm) diameter, and a minimum length of 12 feet (3.6 m) for control ~~stations~~ cabinets and 8 feet (2.4 m) for installations at lighting units.

4185.07, A, 10.

Replace the article:

Unless detailed otherwise in the contract documents, space provided for no less than one line (main) circuit breaker and four branch circuit breakers, one contactor, two surge ~~supressors~~ protection devices, and a test switch.

4185.07, C, 3.

Replace the article:

Two surge ~~suppressors~~ protection devices.

4185.07, E.

Add as a new article:

E. Apply all requirements for a pad mounted control cabinet with contactor. Provide cabinets with continuously welded seams and minimum interior dimensions of 2 feet 6 inches high by 3 feet wide by 2 feet deep (760 mm high by 600 mm wide by 200 mm wide).

4185.08, Handholes.

Replace title and article:

Handholes and Junction Boxes.

Provide four galvanized steel cable hooks with a minimum diameter of 3/8 inch (10 mm) and a minimum length of 5 inches (125 mm).

A. Precast Concrete Handholes.

The contract documents will show locations and other details. Meet the following requirements:

1. Pipe.

~~Ensure the body of the precast handhole meets the requirements for Class 1500D (75D) concrete pipe.~~ Comply with ASTM C 76. Minimum 2000D (Class III), Wall B. Four 8 inch (200 mm) knockouts (conduit entrance points) equally spaced around the handhole.

2. Casting.

~~For the handhole cover, furnish a heavy duty cast iron frame and lid that sits inside the pipe end.~~ Gray cast iron and certified according to requirements of AASHTO M 306 for a 16,000 pound (7260 kg) proof load (HS-20).

3. Cover.

~~The contract documents will show handhole locations and other details.~~ Include "ELECTRIC" as a message on the cover unless specified otherwise in the contract documents.

B. ~~Preformed~~ Precast Concrete Composite Handholes and Junction Boxes.

~~Furnish handholes boxes meeting~~ The contract documents will show locations and other details. Meet the following requirements:

~~**1.** Constructed to the dimensions shown in the contract documents.~~

~~2~~1. ~~Constructed with~~ Handhole (or junction box) and cover fabricated using mortar consisting of sand, gravel, and polyester resin reinforced by a woven glass fiber mat or of resin mortar and fiberglass. Include "ROADWAY LIGHTING" as a message on the cover unless specified otherwise in the contract documents.

~~3~~2. ~~Constructed~~ Fabricated to withstand a load of 20,000 pounds (9,000 kg).

~~4~~3. ~~Each handhole equipped with a bolt-down cover of the same material.~~ Provide two 3/8-16 UNC stainless steel hex head bolts with washers.

~~**5.** Lock down bolts of stainless steel with penta head.~~

C. Cast Iron Junction Boxes.

The contract documents will show locations and other details. Meet the following requirements:

1. Cast iron boxes and covers galvanized according to ASTM A 153.

2. Boxes classified by the manufacturer as meeting the requirements for NEMA 4, Watertight.

3. UL approved boxes.

4. Apply applicable provisions of Article 314 of the current NEC.

5. Raised buttons (blind drilled, tapped, and fitted with screws as specified) of the specified size and location cast into the surface of the box floor and cover for grounding purposes.

6. Neoprene gaskets used.

4185.09, A, 1.

Delete the article:

~~**JUNCTION BOXES.**~~

~~**A. Preformed Junction Boxes.**~~

~~Furnish boxes meeting the following requirements:~~

~~**1.** Constructed to the dimensions shown in the contract documents.~~

~~**2.** Constructed with mortar consisting of sand, gravel, and polyester resin reinforced by a woven glass fiber mat or of resin mortar and fiberglass.~~

~~**3.** Each junction box equipped with a bolt-down cover of the same material.~~

~~**4.** Stainless steel screws.~~

~~**B. Cast Iron Junction Boxes.**~~

~~**1.** Furnish boxes meeting the following requirements:~~

~~**a.** Cast iron boxes and covers galvanized according to ASTM A 153.~~

~~**b.** Boxes classified by the manufacturer as meeting the requirements for NEMA 4, Watertight.~~

~~**c.** UL approved boxes.~~

~~**d.** Apply applicable provisions of Article 370 of the current NEC.~~

~~**e.** Raised buttons (blind drilled, tapped, and fitted with screws as specified) of the specified size and location cast into the surface of the box floor and cover for grounding purposes.~~

~~**f.** Neoprene gaskets used.~~

~~**2.** The contract documents will show locations and other details.~~

4185.10, B, 1.

Replace the article:

Compliance with ~~ANSI~~ NEMA C80.1.

4185.10, C, Rigid Aluminum Conduit.

Replace the article:

Furnish conduit meeting the requirements of ~~ANSI~~ NEMA C80.5.

4185.10, D, 4.

Replace the first sentence:

Compliance with applicable requirements of NEMA TC-3 and UL 514B and the manufacturer's recommendation for all materials and methods for attaching and making fittings.

4185.11, Connector Assemblies.

Delete the first sentence of the first paragraph. **Replace** the second sentence of the first paragraph and add as the third and fourth sentences:

~~Details of connector assemblies will be shown in the contract documents.~~ Furnish connectors with complete instructions, assembly devices, a disposable mounting pin (when required), and silicone lubricant for all mating surfaces. Ensure connector assemblies are: 1) waterproof; 2) designed for both direct burial in the earth and exposure to sunlight; and 3) are capable of repeated disconnections without damage to the watertight seals and terminals or reduction of conductivity below specifications. Furnish connectors recommended for the required cable sizes.

4185.12, A, Single Conductor Wire and Cable.

Replace the article:

Furnish wire and cable meeting the following requirements:

1. Insulation.

- Rated for 600 volts.
- Thermosetting, cross linked polyethylene meeting the requirements of ~~ICEA S-66-524 (NEMA WC-7)~~ ICEA S-95-658 (ANSI/NEMA WC 70).
- Thickness meeting the requirements of Table No. 3-~~1 Column "A"~~ 3-3.
- ~~Unless specified otherwise in the contract documents, comply with applicable requirements of UL Standard No. 44.~~
- UL listed for use at conductor temperatures of 167°F (75°C) or higher in wet or dry locations.

~~**2. Wire and Cable.**~~

- Bears required UL labeling repeated throughout their length.
- UL Listed Type USE-2 per UL Standard 854 and Type RHH or RHW-2 per UL Standard 44.

~~**3**~~ **2. Conductors.**

- Annealed copper meeting the requirements of ASTM B 3.
- Sizes smaller than No. 8 AWG, may be solid or stranded.
- Sizes No. 8 AWG and larger are to be stranded and are to meet the requirements of ASTM B 8, Class B.

4185.12, D, 2.

Replace the article:

Ensure the cable complies with requirements for ~~Type~~ Class B Control Cable as described in ~~ICEA S-61-402 (NEMA WC-5)~~ ANSI/ICEA S-73-532 (NEMA WC 57).

4185.12, E, Flexible Cord.

Replace the article:

Use cord that is UL listed for Type SO and complies with applicable requirements of UL Standard No. 62~~ (Table 3.14)~~.

4185.13, Surge Supressor.

Replace the title and article:

Surge ~~Supressor~~ Protection Device (SPD)

Furnish ~~suppressors~~ SPDs meeting the following requirements:

A. Metal oxide varistor (MOV) type suppressor, suitable for 120/240 volt single-phase line voltage, with an ANSI/UL1449 ~~Category B3 voltage rating of 500 volts (line-neutral)~~ 3rd edition Type 1 with 20kA I-Nominal and voltage protection rating (VPR) of 700 volts (line-neutral).

B. Single-pulse (8/20 microsecond) maximum surge current rating of 50,000 amperes per mode.

C. NEMA 1 ~~enclosure included~~ rating that is suitable for mounting inside a lighting control cabinet.

D. Each ~~line~~ MOV fused and a visual LED indication light installed to show power and suppression status.

Reason for Revision: Section was reviewed by lighting consultant to bring section up to date with current practice.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes**	**No**
Comments: Industry had comments related to updating code references and changes related to introduction of new equipment since this section was last revised.					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Mark Bortle	**Office:** Construction and Materials	**Item 7**
Submittal Date: 2014.01.21	**Proposed Effective Date:** October 2014 GS	
Article No.: 2528.03, L, 5 **Title:** Limitations (Traffic Control)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: The Office of Design asked if there are any restrictions on the condition of the pants/shin reflectors/gaiters. The Office of Construction and Materials indicated that the RCE/inspector will have final decision when any of these items is no longer meeting its purpose.

Specification Section Recommended Text:

2528.03, L, 5.

Replace the Article:

~~All p~~Personnel in the highway right-of-way ~~are required to~~ shall wear orange or strong yellow green ANSI 107 Class 2 apparel ~~at all times~~ when exposed to traffic or construction equipment. Orange or strong yellow green ANSI 107 Class E pants or shin reflectors/gaiters are also required to be worn at night. Shin reflectors/gaiters shall have a minimum of two 2 inch (50 mm) bands of retroreflective material spaced at least 6 inches (150 mm) apart. Background material shall extend at least 2 inches (50 mm) above and below retroreflective bands and continue through the length of shin reflector/gaiter. Shin reflector/gaiter shall completely encircle the leg and be worn on lower leg between knee and ankle.

Comments: This revision has been included as a proposal note on Department projects starting with the February letting.

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

2528,03,L,5. All personnel in the highway right-of-way are required to wear orange or strong yellow green ANSI 107 Class 2 apparel at all times when exposed to traffic or construction equipment. Orange or strong yellow green ANSI 107 Class E pants or shin reflectors/gaiters are also required to be worn at night. Shin reflectors/gaiters shall have a minimum of two, 2 inch bands of retroreflective material spaced at least 6 inches apart. Background material shall extend at least 2 inches above and below the retroreflective bands and continue through the length of the shin reflector/gaiter. The shin reflector/gaiter shall completely encircle the leg and be worn on the lower leg between the knee and the ankle.

Reason for Revision: Colors included in the specification for clarity. Addition of Class E pants or shin reflectors/gaiters per directive from Mr. Trombino.

County or City Input Needed (X one)			**Yes**	**No**	
Comments:					
Industry Input Needed (X one)			**Yes**	**No**	
Industry Notified:	**Yes**	**No**	**Industry Concurrence:**	**Yes**	**No**
Comments:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Scott Schram	**Office:** Materials	**Item 8**
Submittal Date: 2014.02.28	**Proposed Effective Date:** Oct 2014	
Article No.: 4127.01, B **Title:** Description (Aggregate for HMA)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

4127.01, B.

Replace the Article:

If a gravel aggregate has ~~less than 5% retained on the No. 4 sieve (6 mm)~~ 100% passing the 3/8 inch (9.5 mm) sieve, the Engineer may replace the requirements of Table 4127.02-1 with the requirements of Article 4127.03.

Comments:

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

- **4127.01, B**

B. If a gravel aggregate has 100% passing the 3/8-inch sieve (9.5 mm) ~~less than 5% retained on the No. 4 sieve (6 mm)~~, the Engineer may replace the requirements of Table 4127.02-1 with the requirements of Article 4127.03.

Reason for Revisions: In practice we find mixtures that contain coarse sands and gravels that violate the fine aggregate definition. A better cutoff point is to require coarse aggregate quality testing on material containing particles larger than 3/8-inch size.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**
Comments:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Scott Schram	**Office:** Materials	**Item 9**
Submittal Date: February 28, 2014	**Proposed Effective Date:** Oct 2014	
Article No.: **Title:**	**Other:** DS-12003, Developmental Specifications for Transverse Joint Leveling for HMA Pavements	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 5/20/2014

Specification Committee Approved Text: See attached DS for Transverse Joint Leveling for HMA Pavements.

Comments: None.

Specification Section Recommended Text: See attached DS for Transverse Joint Leveling for HMA Pavements.

Comments:

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

12003.02 MATERIAL.
ADD TO APPROVED PRODUCTS
. Pave Patch by Right Pointe

Reason for Revisions:
This product has been deemed an equal of those shown in the specification.

County or City Input Needed (X one)	**Yes**	**No** X
Comments:		

Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**
Comments: The producer has been informed they are approved.					

DS-12XXX
(Replaces DS-12003)

Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATIONS
FOR
TRANSVERSE JOINT LEVELING FOR HMA PAVEMENTS

Effective Date
May 20, 2014

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

12XXX.01 GENERAL.

A. Fill shallow depressions in the pavement and adjacent to cracks with an approved hot-applied, pourable, self-adhesive material that has a uniform texture, and adheres to the pavement surface. Fill all cracks in the application area. The intended purpose is to level the surface of the depression and improve the ride of the pavement.

B. When crack cleaning and filling is a part of the contract, that work will be covered by a separate specification.

12XXX.02 MATERIAL.
Use material consisting of an approved hot blended aggregate filled polymer mastic repair product for leveling, sealing, filling, and making thin bonded repairs to pavements. Use mastic specifically formulated to repair distresses which are larger than those typically repaired by crack and joint sealing, but do not requiring milling or patching methods for the repair. Use material that is flexible, self-adhering, and resistant to deformation by vehicle loadings. The following is a list of approved products. The Contractor has the option of using an approved equal product.

- PolyPatch mixtures manufactured by CRAFTO, INC.
- Mastic One manufactured by PAVETECH International
- Level and Go Repair Mastic manufactured by Deery American Corporation
- Pave Patch by Right Pointe

12XXX.03 CONSTRUCTION.

A. Equipment.

1. Furnish:
- Equipment to prepare the pavement, including the removal of loose, deteriorated, or undesirable material from the joint to be repaired,
- Heating and application equipment, and
- Equipment needed to perform the leveling work.

2. Standard cleaning methods used to clean pavements, such as power brooms, compressed air, high-pressure water, and hand tools will be acceptable. Water flushing will not be permitted in areas where considerable cracks are present in the pavement surface.

3. Use equipment, tools, and machines recommended by the product manufacturer for heating and distributing the leveling material. Maintain equipment in satisfactory working order at all times.

B. Construction.

1. Immediately prior to applying the leveling material, clean the surface and cracks of all loose material, vegetation, and other objectionable material. Obtain the Engineer's approval for surface preparation prior to applying material.

2. Ensure the pavement surface is dry prior to spreading the material across the joint or crack to be leveled.

3. Place the leveling material so the finish elevation is level with, or no more than 0.25 inch (5 mm) above, the surrounding pavement surface.

4. Heat and apply leveling material as recommended by the product manufacturer.

C. Limitations of Operations.

1. Conduct the work on one lane at a time unless the road is closed to traffic. If the road is not closed, conduct all operations to provide a minimum of inconvenience to traffic. Do not open the roadway with placed leveling material until the material is properly cured and will not track or be damaged by traffic.

2. Adjust the work schedule so that all work of transverse joint leveling will be completed in one working day if the road is not closed to traffic.

3. Apply Articles 1107.08, 1107.09, and 1108.03 of the Standard Specifications.

12XXX.04 METHOD OF MEASUREMENT.
Measurement will be as follows:

A. Transverse Joint Cleaning and Sealing.

1. Calculated based on centerline miles (kilometers) measured to the nearest 0.1 mile (0.1km). The calculations will be based on two-lane pavement, corrected for main line pavement of more than two lanes, including climbing lanes.

2. At intersections, rest areas, and interchanges designated for transverse joint leveling, the additional areas of widened pavement, ramps, storage lanes, turning lanes, paved medians, and parking in rest areas will not be separately measured for payment.

3. Between limits for which transverse joint cleaning and sealing is intended for either pavement or shoulders, no deductions will be made for bridges, intersections, or other interruptions where transverse joints are not to be cleaned and sealed.

B. Transverse Joint Leveling.
Pounds (kilograms) of material placed for Transverse Joint Leveling on the project. The Engineer will deduct unused quantities based on actual scaled weight (mass), product carton (container) content weight, or estimates.

12XXX.05 BASIS OF PAYMENT.
Payment will be the contract unit price as follows:

A. Transverse Joint Cleaning and Sealing.

1. Per mile (kilometer).

2. Payment is full compensation for furnishing all equipment, tools, labor, surface preparation, mixing, and placing the leveling material except for the leveling material.

B. Transverse Joint Leveling.
Per pound (kilogram).

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Kevin Merryman			**Office:** Construction and Materials		**Item 10**
Submittal Date: January 28, 2014			**Proposed Effective Date:** May 2014		
Article No.: **Title:**			**Other:** DS-12041, Partial Depth PCC Finish Patches		
Specification Committee Action: Approved as recommended.					
Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014		**Effective Date:** 5/20/2014	
Specification Committee Approved Text: See attached DS for Partial Depth PCC Finish Patches.					
Comments: None.					
Specification Section Recommended Text: See attached Draft DS for Partial Depth PCC Finish Patches.					
Comments:					
Member's Requested Change (Redline/Strikeout): See attached DS.					
Reason for Revision: The primary change in the DS is to require a minimum patch width of 12 inches instead of 10. The reason for the change is that the 10 inch width does not allow much room for wandering of a mill as it travels down the road during removals. This then results in less than desirable contact area at the bottom of the patch on either side of a joint. Performance problems in patches placed with this DS have been noted on recent projects. The 12 inch width will allow some room for wandering of the mill while maintaining adequate contact area on either side of a joint.					
County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes**	**No** X	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes**	**No**
Comments: The changes have been forwarded to industry representatives.					

DRAFT DS-12XXX
(Replaces DS-12041)

Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATION
FOR
PARTIAL DEPTH PCC FINISH PATCHES

Effective Date
May 20, 2014

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

This specification replaces Section 2530 of the Standard Specifications for Partial Depth Portland Cement Concrete Patches.

2530.01 DESCRIPTION.

A. This specification contains requirements for Partial Depth PCC Patches, Partial Depth PCC Joint and Crack Repair Patches, and Overdepth Patches.

B. Remove pavement in areas designated in the contract documents. This includes furnishing and placing patching material to provide a new traffic surface, and restoring adjacent shoulder as shown in the contract documents. This work is in areas where the size, shape, and depth of patch depends on extent of pavement deterioration and shall be determined during removal operation.

C. Patches may be identified and constructed as one of the following types:

1. Finish Patches.
Finish patches are square or rectangular in shape. They will be less than 6 feet (2 m) in length when placed on a longitudinal or transverse joint or random crack. Patches will be identified by tabulation in the contract documents. The patch size and location for each lane will be shown. Patch size and locations may be adjusted by the Engineer to fit field conditions.

2. Joint and Crack Repair Patches.
Joint and crack repairs are square or rectangular in shape. They will be placed at a longitudinal or transverse joint or random crack. They will be a minimum of 6 feet (2 m) in length, and will be identified by tabulation in the contract documents. Size and location will be shown. Repair size and location may be adjusted to fit field conditions.

3. Overdepth Patches
Overdepth Patches are irregular in shape. They are placed to the full depth of existing pavement in areas of unsound concrete as designated by the Engineer. Repair size and location will be determined at time of construction.

2530.02 MATERIALS.
Meet the requirements for the type of material specified.

A. PCC Patching Material.

Meet one of the requirements below. When patching encroaches on an adjacent lane open to traffic or when there is patching on two lane pavements or other locations where overnight closures are not permitted, use Class A or Class B patching material. Pavements with three or more lanes and when overnight closure is permitted, use Class C patching material.

1. Class A Patching Material.

a. Use a modified Portland cement type manufactured to provide rapid set and high early strength. Meet requirements of Materials I.M. 491.20.

b. When a mortar is furnished, add the manufacturer's recommended quantity of coarse aggregate. Use pea gravel, minimum Class 2 durability, meeting requirements of Section 4112.

2. Class B Patching Material.

Use high early strength rapid set (5 hour) concrete meeting requirements of Materials I.M. 529 and the following requirements:

- Use Class M mixture patching material with calcium chloride. Class M mixtures with calcium chloride shall not contain fly ash.
- Place concrete within 30 minutes after introduction of calcium chloride.
- For coarse aggregate, use crushed carbonate stone chips or pea gravel, minimum Class 2 durability, meeting requirements of Section 4112.

3. Class C Patching Material.

Use mixture with an early set that will allow time of opening to traffic in 24 to 36 hours as directed by the Engineer. For coarse aggregate, meet requirements for Class B patching material. Use Class M mixture meeting requirements of Materials I.M. 529 without addition of calcium chloride.

4. Modifications to Mixtures for Class B and Class C Patching Material.

Apply the following modifications to mixtures for Class B and Class C patching material:

a. Slump.

1) Slump, measured according to Materials I.M. 317 prior to addition of calcium chloride solution, shall be between 1 and 2.5 inches (25 and 65 mm) as a target range, allowing a maximum of 3 inches (75 mm). If calcium chloride solution is not to be added, slump shall be between 1 and 3 inches (25 and 75 mm) as a target range, allowing a maximum of 4 inches (100 mm).

2) When a Type A Mid Range water reducing admixture is used, the slump, tested prior to the addition of calcium chloride, shall be between 1 and 4 inches (25 and 100 mm) as a target range, allowing a maximum of 5 inches (125 mm).

b. Air Entrainment.

Entrained air content of unconsolidated concrete will be determined according to Materials I.M. 318, prior to addition of calcium chloride if it is to be added. When calcium chloride is to be added, air entrainment shall be 5.0%, with a tolerance of ± 2.0%. When calcium chloride is not to be added, air entrainment shall be 6.5%, with a tolerance of ± 1.5%.

c. Temperature.

Temperature of Class B patching material, as delivered to job site, shall be as required in Article 2530.02, B, 4, d. Ensure temperature of Class C patching material, as delivered to the job site, is greater than 65°F (18°C). Heating water, aggregate, or both, may be necessary. Cost of heating is incidental to patching.

d. Cement.

1) For Class M concrete mixtures, meet requirements of Section 4101.

2) Refer to Table 2530.02-1 for cement types and maximum allowable substitution rates. Maximum substitution for Type IS shall not exceed 25%.

Table 2530.02-1: Cement Types and Maximum Allowable Substitution Rates

Patch Class	Cement Type	Maximum Allowable Substitution	Minimum Mix Temperature
B	Type I, Type II Type IS	0% Fly Ash 0% Fly Ash	75ºF (24ºC) 80ºF (27ºC)*
C	Type I, Type II Type IS	10% Fly Ash 0% Fly Ash	65ºF (18ºC) 70ºF (21ºC)*
* When Type A Mid Range water reducing admixture is used, limit the minimum mix temperature to that required when Type I/II cement is used.			

e. Calcium Chloride.

1) Where calcium chloride is required, furnish it in water solution form and add it to the mix at job site. Use a commercial 32% calcium chloride solution, or equivalent, prepared according to Table 2530.02-2:

Table 2530.02-2: Proportions for 32% Calcium Chloride Solutions

Type of Solid Calcium Chloride	Pounds (Grams) of Solid per Gallon (liter) of Water	Solution Produced per Gallon (liter) of Water
Type 1 – Regular Flake (77% material)	6 (720)	1.3
Type 2 – Concrete Flake or Pellets (94% material)	4.5 (540)	1.2

2) Engineer will check solution concentration using a hydrometer according to Materials I.M. 373. Add solution at the rate of 3.0 gallons per cubic yard (14.8 L/m^3) of concrete. Calcium chloride solutions of different concentrations may be approved by the Engineer, provided appropriate adjustments in the total concrete composition are made.

3) Agitate mixture until calcium chloride is completely in solution, and continue agitation as necessary to maintain uniformity.

4) Except when using continuous mixing equipment described in Article 2001.20, E, ensure calcium chloride solution is present in mix for at least 2 minutes of mixing.

f. Water Reducer.

Type A Mid Range water reducing admixture may be used. Use one listed in Materials I.M. 403, at manufacturer's recommended dosage.

g. Transit Mix Concrete.

Use mix from a plant which can be delivered and placed within 60 minutes from start of mixing. Time may be extended to 90 minutes when a retarding admixture, used according to Materials I.M. 403 including temperature dosage guidelines (and at no additional cost to Contracting Authority), is added at the plant. Continuous mixing equipment using volumetric proportioning may be used according to Article 2001.20, E.

h. Prepackaged Mixture.

A prepackaged mixture, proportioned as specified above for Class B or Class C matching material, may be furnished as a Class B or Class C patching material with the Engineer's approval. Coarse aggregate for prepackaged mixtures shall meet the requirements of Article 4115.05. Mix prepackaged mixtures in an on-site paddle type mixer; or proportion and mix with continuous mixing equipment using volumetric proportioning according to Article 2001.20, E.

B. Joint Boards.

Comply with the following:

1. Joint boards for recreating joints and cracks: use a resilient filler, cellulosic fiber, paraffin coated cardboard, or other nonabsorbent, compressible material of proper shape to recreate joint during placement of patch material.

2. Boards for recreating transverse joints: one piece. One piece boards will not be required in lengths exceeding 6 feet (1.8 m).

3. Boards for recreating longitudinal joints: one piece. One piece boards will not be required in lengths exceeding 6 feet (1.8 m).

4. Joints and open transverse cracks: use a board with a nominal width of 0.25 inch (5 mm). Metal strips may be used for narrow cracks.

5. Extend boards and metal strips into the pavement to bottom of patch; no horizontal joints permitted.

6. Use of a bond breaker on board surfaces is encouraged.

C. Joint Sealer.
Use hot poured joint sealer meeting requirements of Section 4136.

2530.03 CONSTRUCTION.

A. Equipment.

1. Remove using milling machine, jack hammer, or similar equipment. Equip milling machines to stop at preset depths to prevent damage to dowel bars and reinforcement. Hand equipment may be necessary to achieve designated shape.

2. The following additional equipment is required:
- **a.** Sandblasting equipment for cleaning prepared patch area.
- **b.** Air chisel, 15 pound (7 kg) (or less), to complete patch area preparation. Larger air chisel, not to exceed 30 pound (14 kg), may be used if it does not result in significant damage to patch area and edges.
- **c.** Air compressor that emits oil and moisture free air for cleaning prepared area.
- **d.** On-site paddle type concrete mixer for mixing Class A patching material or other prepackaged mixtures.

B. Patch Construction.

1. General.
- **a.** Tabulations for partial depth patches shown in the contract documents are for estimating purposes only. Engineer will designate location and limits of patches.
- **b.** Hand operated equipment may be necessary for all or some removal.
- **c.** Remove pavement within designated area to a minimum depth of 2 inches (50 mm) or to sound concrete as determined by the Engineer. Material removed and not designated for salvage becomes property of the Contractor and shall be removed according to Article 1104.08.

2. Preparation of Patch Area.
- **a.** Remove concrete in designated repair area using either of the following methods:
  - **1)** Mill transversely or longitudinally matching general alignment of patch. Use a mill that produces patch edges with a 30 to 60 degree angle or chip back patch edges to a 30 to 60 degree angle. Chip out secondary spalling resulting from milling at no additional cost to the Contracting Authority.

2) Place 2 inch (50 mm) saw cuts along perimeter of patch area and chip back patch edges to a 30 to 60 degree angle.

b. If a joint or crack is within patch area, construct bottom edge of patch at least 3 inches (75 mm) beyond joint or crack. Minimum patch width will be ~~10~~ 12 inch (~~260~~ 300 mm).

c. Form or saw patch edges to prevent them from protruding beyond edge of existing pavement by more than 3/8 inch (10 mm).

d. Each patch will have a generally rectangular area. Remove concrete to a minimum depth of 2 inches (50 mm). Many areas will require removal of unsound concrete to a greater depth to reach sound concrete. Maximum depth is one half existing pavement thickness.

e. Do not damage steel reinforcement during removal process. Damaged steel will be the responsibility of the Contractor. If the end of a dowel bar is exposed, cut or remove dowel. Place duct tape, form oil, grease, or other method approved by the Engineer as a bond breaker on exposed dowels not removed.

f. When removal to a depth of one half existing pavement thickness leaves unsound concrete within patch area, the Engineer may designate part of the patch area as a Overdepth Patch. Remove concrete for the full depth of the pavement. Consolidate subgrade or subbase material using mechanical tamper or other compaction equipment as directed by Engineer. Furnish and install No. 4 (No. 15) tie bars at mid-depth of existing pavement using an approved non-shrink grout. Place bar to provide a minimum two inch concrete cover.

g. When it is necessary to go below reinforcing steel to reach sound concrete, cut reinforcing steel flush with perimeter patch edges and remove.

h. Clean patch area by sandblasting, followed by cleaning with compressed air. Completed surfaces shall appear surface dry to visual examination.

i. Recreate a joint or crack in patch area with a joint board of proper size and shape. Extend board to bottom of patch area to completely separate patching material on both sides. Use board of a width approximately equal to joint or crack. For wide openings, several thicknesses may be used. For patches 6 feet (2 m) or greater in length~~,~~:

1) ~~L~~longitudinal joints may be reestablished by sawing to a depth of 1/3 the pavement thickness.

2) 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.

3. Placing Patch Material.

a. Scrub cement-sand-water grout of creamy consistency onto patch surface, including edges. Grout shall consist of two parts of Type I or Type I/II Portland cement and one part sand mixed with water. Mix grout by mechanical means. Place patch material before grout dries. If grout dries before placement of patch material, clean patch area again by sandblasting and air blasting, then reapply grout.

b. Mix patching material and place in patch area. Consolidate and work into place in a manner ensuring good bonding. Level it with adjacent pavement to provide a smooth riding surface not varying from existing pavement surface by more than 1/8 inch (3 mm) when measured with a 10 foot (3 m) straightedge placed over patch. Replace or grind patch to correct deficiencies. Texture patches longer than 1 foot (0.3 m) in the manner of adjacent pavement surface.

c. For Class A patching materials, perform work according to patching manufacturer's recommendations and limitations, subject to approval of the Engineer. Furnish these recommendations to the Engineer.

4. Surface Finish.

Level partial depth patches with adjacent pavement. Trowel toward edge of the repair when finishing. Edge adjacent to joint boards or inserts in fresh concrete. Ensure they have a smooth riding surface.

5. Protecting and Curing.

a. Class A Patching Material.
Cure according to manufacturer's recommendations. Use minimum curing time according to Materials I.M. 491.20, Appendix A.

b. Class B Patching Material.

1) Cure as specified in Article 2529.03, H.

2) Cure for minimum time specified in Article 2529.02 for mixture used.

c. Class C Patching Material.

1) Cure patches with an approved white pigmented curing compound meeting the requirements of Section 4105. Apply curing compound within 30 minutes after placement of patching material.

2) Cure patches involving Class M concrete a minimum of 36 hours.

3) Cure according to Article 2529.03, H, when overnight low temperatures are forecast to be below 35°F (2°C).

6. Joint and Crack Sealing.
Where joints and cracks cross patches; saw, seal, and clean patch according to Article 2301.03, P. Complete sealing within 5 working days after patch is placed. When joint and crack sealing is included in the contract, perform sealing as part of that operation.

C. Limitations of Operations.

1. Unless road is closed, maintain traffic during construction operations. Conduct operations with minimum inconvenience to traffic. On two-lane roads, limit operations to one traffic lane at a time, except for minor encroachment in adjacent lane for sawing and installing forms when traffic is maintained. For multiple lane roadways, work area may include one lane in each direction.

2. Adjacent lane shall be opened to traffic prior to the pavement being removed from a patch area.

3. When approved by the Engineer, patch areas may extend up to 2 feet (0.6 m) into adjacent lane as allowed by the contract documents.

4. Place PCC patching material when ambient air and pavement temperatures are at least 45°F (7°C).

5. The Engineer may limit advance sawing.

6. If an emergency makes a DW joint necessary, temporarily fill excavated area following the joint with a suitable hot or cold paving mixture or stable granular material, as directed by the Engineer. The Engineer may direct the lane remain closed to traffic overnight. Provide traffic control.

D. Area Restoration.
When patch is completed, remove forms if they have been used. Fill excavated space along outside pavement edge with material similar to existing shoulder, satisfactory to the Engineer. Thoroughly compact material before section is opened to traffic.

E. Failure Repair.
Repair failed patches that appear within 30 calendar days of original construction or subsequent repair at no cost to Contracting Authority. Failures may include, but are not limited to, loss of bond between patch and underlying pavement or random cracking.

2530.04 METHOD OF MEASUREMENT.
Engineer will determine quantities involved in satisfactory construction of partial depth patches for areas specified as follows:

A. Partial Depth PCC Finish Patches.

1. Engineer will calculate area of each patch in square feet (square meters) from surface measurements. Area of each patch less than 1 square foot (0.1 m^2) will be counted as 1 square foot (0.1 m^2) for payment purposes. If patch area is increased by Contractor to accommodate milling equipment, only area designated by the Engineer will be measured for payment.

2. Removal and repair of areas up to one half existing pavement thickness will be included in this payment.

B. Partial Depth PCC Joint and Crack Repair Patches.

1. Measurement for Partial Depth PCC Joint and Crack Repair Patches will be to the nearest 0.1 linear foot (0.1 m) on the basis of ~~10~~ 12 inch (~~260~~ 300 mm) width of repair. Areas designated for repair outside the ~~10~~ 12 inch (~~260~~ 300 mm) repair width will be measured as Partial Depth PCC Finish Patches per Article 2530.04, A, 1.

2. Removal and repair of areas up to one half existing pavement thickness will be included in this payment.

C. Overdepth Patches.
Engineer will calculate area of each Overdepth Patch in square feet (square meters) at the mid-depth of the pavement. Area of each patch less than 1 square foot (0.1 m^2) will be counted as 1 square foot (0.1 m^2) for payment purposes.

2530.05 BASIS OF PAYMENT.
Payment for construction of various types of partial depth patches, satisfactorily constructed, at areas specified, will be the contract unit price as follows:

A. Partial Depth PCC Finish Patches.

1. Per square foot (square meter).

2. Payment is full compensation for repairs up to one half existing pavement thickness and includes removal of pavement, preparing patch area, furnishing and placing material, construction of joints, sawing, finishing, curing, and restoration of area.

B. Partial Depth PCC Joint and Crack Repair Patches.

1. Per linear foot (meter)

2. Payment is full compensation for repairs up to one half existing pavement thickness and includes removal of pavement, preparing the patch area, furnishing and placing material, construction of joints, sawing, finishing, curing, and restoration of area.

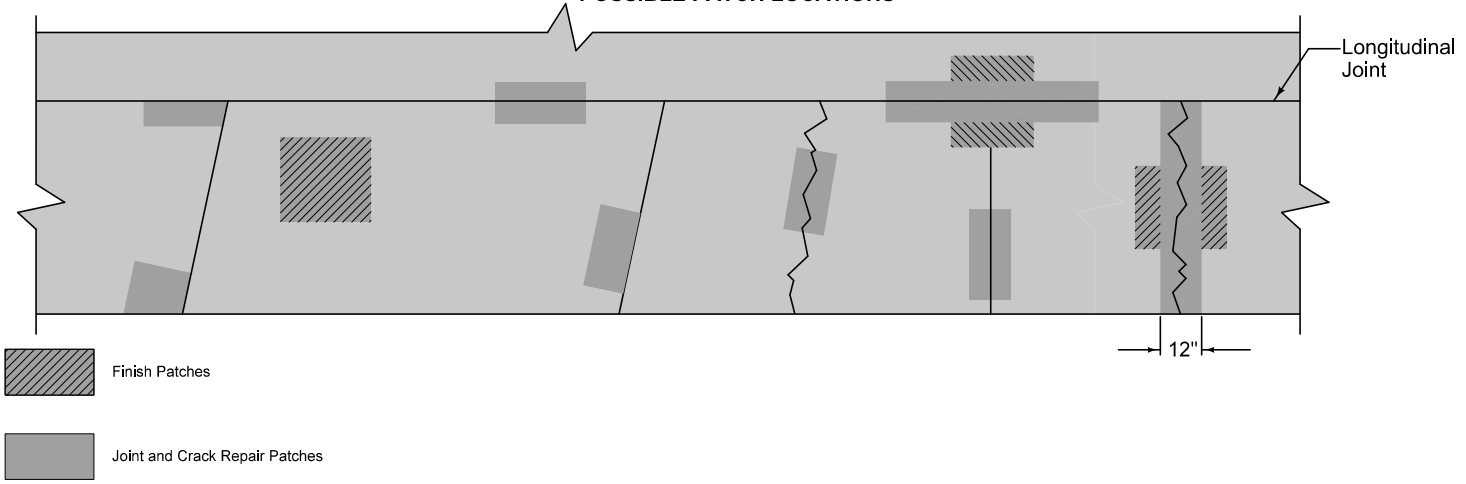
C. Overdepth Patches.

1. Per square foot (square meter). Payment for Overdepth Patches will be in addition to Partial Depth PCC Finish Patch or Partial Depth PCC Joint and Crack Repair Patch quantities for the same area.

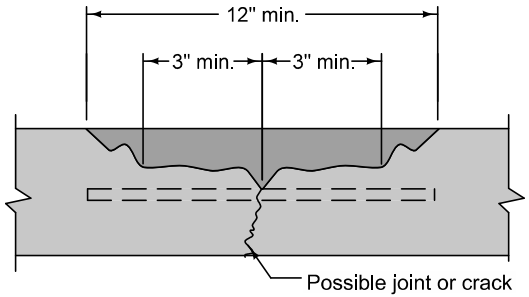
2. Payment is full compensation for repairs designated in lower half of existing pavement and includes removal of pavement, preparing the patch area, and furnishing and placing material.

D. When joint and crack sealing is included in the contract, it will be paid for as a part of that work.

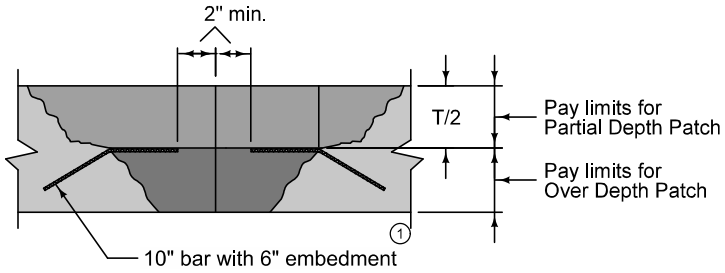
POSSIBLE PATCH LOCATIONS

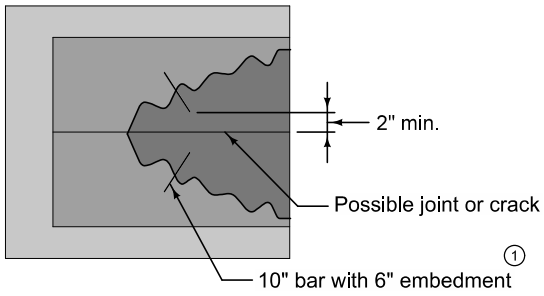


PARTIAL DEPTH PATCH



OVER DEPTH PATCH





Partial Depth

Overdepth

See PV-101 for jointing.

(1) One per panel.

Possible Contract Items:
- Partial Depth PCC Finish Patches
- Partial Depth PCC Joint and Crack Repair Patches
- Overdepth Patches

Possible Tabulation:
- 102-10

MODIFIED STANDARD ROAD PLAN

REVISION	
2	XXXXX

RR-27

SHEET 1 of 1

MODIFICATIONS: Changed 10" dimension to 12" and added additional patch on the the Possible Patch Locations.

PARTIAL DEPTH PCC FINISH PATCHES

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Tom Reis / Eric Johnsen	**Office:** Specifications	**Item 11**
Submittal Date: 2014.02.28	**Proposed Effective Date:** June 2014	
Article No.: **Title:**	**Other:** Developmental Specifications for Portable Dynamic Message Sign	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 6/17/2014

Specification Committee Approved Text: See attached DS for Portable Dynamic Message Sign.

Comments: The Office of Traffic and Safety requested to make changes to Article 12XXX.02, B, Cellular Communications to specify that the Contractor shall set up PDMS with the modem and make sure that it works before the DOT is given access.

The Office of Construction and Materials asked if this specification should be placed in the Standard Specifications to replace the existing Portable Changeable Message Sign specifications which we are no longer using. The Office of Local Systems asked how this would affect cities and counties, since we most likely aren't going to want the responsibility of controlling their portable dynamic message signs. The Office of Local Systems will address with local entities to figure out how they want to handle it. Once the locals have been addressed, the specification will be incorporated into the Standard Specifications.

There will not be a controller for this DS, as there are no restrictions on its use. The Office of Contracts will provide a report indicating which projects have the PDMS bid item for the Operations Center. This way they will have an idea of how many PDMS are being added.

Specification Section Recommended Text: See attached Draft DS for Portable Dynamic Message Sign.

Comments:

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

Reason for Revision: This specification has been used as an SP at least ten times in the past year. This specification provides for control of the PDMS by the Department.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes**	**No** X	
Industry Notified:	**Yes**	**No**	**Industry Concurrence:**	**Yes**	**No**
Comments:					

DRAFT DS-12XXX
(New)

Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATIONS
FOR
PORTABLE DYNAMIC MESSAGE SIGN

Effective Date
June 17, 2014

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

12XXX.01 DESCRIPTION.
Furnish, place, and maintain a Portable Dynamic Message Sign (PDMS) at locations specified on the plans. Contractor maintains possession of the PDMS upon completion of the project.

12XXX.02 MATERIALS.

A. Sign Design.

1. A PDMS is defined as all components working together to accomplish the requirements of the specification. These components include, but are not limited to, the LED pixel boards, on-board computer, cellular modem, trailer, mounting equipment, solar panels, batteries, charge controller, etc.

2. The message panel shall be trailer mounted. Message panel mounted at a height of at least 7 feet (2 m), measured from the bottom of the sign to the ground directly below. Sign presents a level appearance. Sign is capable of displaying three lines of up to eight characters at one time. Character height is 18 inches (450 mm) and configured using a 7 pixel tall by 5 pixel wide font. Message panel may be configured as character matrix, line matrix, or full matrix.

3. Message panel visible from 1/2 mile (800 m) under both day and night conditions. Letters legible from 750 feet (225 m). Message sign shall include automatic dimming for nighttime operation and a power supply capable of providing continuous service for 7 continuous days without recharging.

4. Message panel controlled by an onboard computer capable of:
- Storing a minimum of 99 programmed messages for instant recall,
- Being programmed to accept messages created by the operator via an alpha-numeric keyboard, and
- Being programmed remotely by the Department's National Transportation Communication for Intelligent Transportation Systems Protocols (NTCIP) DMS software.

5. Physical access to the onboard computer protected by a padlock or other locking handle mechanism. Electronic access to the onboard computer protected by a username and password.

B. Cellular Communications.

1. PDMS shall be equipped with a cellular modem for remote communications. The cellular service provider shall have data coverage within the project limits. The Contractor is responsible for integrating the cellular modem with the PDMS.

2. Upon confirmation that remote communication has been successfully setup, the IP address, communications port, software, and any username/password for web interface shall be supplied to the Engineer for integration into a statewide ITS control software.

3. The cellular modem shall be capable of obtaining its location by GPS. Current location from GPS coordinates shall be stored in the cellular modem's memory for retrieval by ITS control software. Modem shall have firewall security protections that limit who and what can communicate to it.

4. Typical monthly data usage by the Contracting Authority is 5 Mb when PDMS is in good working condition. Additional data usage is possible if PDMS requires remote troubleshooting or maintenance.

C. NTCIP Compliance.

PDMS onboard computer and operating firmware will be compliant with at least NTCIP 1203 v1.15 supplemented with NTCIP 1203 Amendment 1 v07, (dated July 3, 2001) for the following commands:

- Read configuration data from the sign,
- Send configuration data to the sign,
- Poll the sign (retrieve sign status) both manual and automated with software,
- Activate a message,
- Blank or remove a message,
- Upload fonts, and
- Reset the controller/onboard computer.

12XXX.03 CONSTRUCTION.

A. Testing and Configuration.

1. A least one week before the PDMS is deployed to a project for use, a testing and configuration meeting with the Engineer shall be held. Coordination of this meeting will be with the Department's ITS Engineer.

2. Physical and electronic access to PDMS shall be granted to the Engineer.

3. The Engineer, in conjunction with the Contractor, will perform necessary configuration adjustments in the PDMS and cellular modem to allow remote control by the Contracting Authority's NTCIP software.

B. Operation of Signs by the Engineer.

1. The Contracting Authority will use their own NTCIP compliant software to activate messages, check the sign's status and perform diagnostic tests.

2. At anytime during the project, the Engineer may remotely activate a message on the PDMS. Any message placed on the PDMS will not be removed or replaced by the Contractor unless requested by the Engineer.

C. Maintenance of Signs.

1. Provide preventive maintenance efforts necessary to achieve uninterrupted service.

2. The Engineer will perform remote diagnostic tests of the sign's operational status each morning and notify the Contractor when a problem is detected.

3. Provide unscheduled maintenance or total replacement of sign when sign is unable to display a message adequately within 24 hours of notification. Action shall be taken to resolve the following problems if they have been visually observed or confirmed by self diagnostics by the PDMS for 3 continuous days or 7 intermittent days over a 2 week period.
- **a.** An entire pixel board is showing a failure.
- **b.** Five or more pixel failures over the entire message panel anytime while the sign is deployed for use (blank or displaying a message).
- **c.** Two or more pixel failures in any character when displaying a message.

4. If service is not restored within 24 hours, the Engineer will cause such work to be performed as may be necessary to provide this service. The cost for this restoration shall be borne by the Contractor.

12XXX.04 METHOD OF MEASUREMENT.

The Engineer will count the number of days each Portable Dynamic Message Sign is required to be in place along a road and capable of displaying messages to the traveling public by remotely using the Department's NTCIP software. Days when the PDMS is blank and is in good working condition, will be measured. Days when the PDMS is unable to display a message due to cellular or mechanical problems will not be measured. Days when the PDMS is on the roadway and not approved by the Engineer will not be measured.

12XXX.05 BASIS OF PAYMENT.

A. Payment for Portable Dynamic Message Sign will be at the contract unit price per calendar day, measured as provided above.

B. Payment is full compensation for furnishing, placing, and maintenance of PDMS. Payment includes the cost of preventative and unscheduled maintenance, cellular communication, hardware, and power supply.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Scott Schram	**Office:** Construction and Materials	**Item 12**
Submittal Date: 2/28/2014	**Proposed Effective Date:** June 2014	
Article No.: **Title:**	**Other:** Developmental Specifications for HMA Interlayer	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 6/17/2014

Specification Committee Approved Text: See attached DS for HMA Interlayer.

Comments: The Office of Construction and Materials requested to make the specification a Developmental Specification so that Scott Schram can be the controller and review proposed uses of the HMA interlayer for appropriateness.

The existing bid item is HMA Interlayer Base, 3/8".

FHWA asked why we are using AAD for acceptance. The Office of Construction and Materials indicated that there is typically not enough material to meet other testing criteria (i.e. less than 1000 tons).

Specification Section Recommended Text: See attached new SS for HMA Interlayer.

Comments:

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

- **See attachment**

Reason for Revisions: This mix has been used on 4 recent projects including I-35 in Cerro Gordo County. A bid item has been established. Increased interest has warranted the need for an SS. The intended use is with a minimum 3" of HMA on top of the interlayer.

County or City Input Needed (X one)	**Yes**	**No** X
Comments:		

Industry Input Needed (X one)			**Yes**	**No** X	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**
Comments: The industry is in support .					

DS-12XXX
(New)

Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATIONS
FOR
HOT MIX ASPHALT INTERLAYER

Effective Date
June 17, 2014

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

12XXX.01 DESCRIPTION.
These specifications describe the requirements for a highly polymer modified asphalt interlayer. Apply Section 2303 of the Standard Specifications unless otherwise directed in these specifications.

12XXX.02 MATERIALS.

A. Asphalt Binder.
Use a PG+ 64-34.

B. Mix Design.

1. See Materials I.M. 510 Appendix A.

2. Mix approval is based on Performance Testing Requirements per Table 4 in Materials I.M. 510 Appendix A.

12XXX.03 CONSTRUCTION.

A. Tack the cleaned surface prior to placement of the interlayer. Apply a second tack coat prior to placement of the intermediate/surface layer.

B. Compact with steel wheeled roller.

C. Do not open to traffic until the entire mat has cooled below 150°F (65°C).

D. Quality Assurance/Quality Control.

1. Field Voids Acceptance.
Acceptance for field voids shall be Class II compaction defined in Section 2303 of the Standard Specifications.

2. Lab Voids Acceptance.
Sample and test one hot box per day of production unless otherwise approved by the Engineer. Apply Article 2303.05, A, 3, a, 2, of the Standard Specifications for AAD

acceptance. Air void target is based on approved JMF.

3. Take at least one cold feed for gradation control.

12XXX.04 METHOD OF MEASUREMENT.
Hot Mix Asphalt Interlayer, of the size specified, will be measured according to Article 2303.04 of the Standard Specifications.

12XXX.05 BASIS OF PAYMENT.
Hot Mix Asphalt Interlayer, of the size specified, will be paid for according to Article 2303.05 of the Standard Specifications.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder	**Office:** Construction and Materials	**Item 13**
Submittal Date: 2/28/2014	**Proposed Effective Date:** June 2014	
Article No.: **Title:**	**Other:** Developmental Specifications for HMA Thin Lift Overlay	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 6/17/2014

Specification Committee Approved Text: See attached DS for Hot Mix Asphalt Thin Lift Overlay.

Comments: The Office of Construction and Materials requested to make the specification a Developmental Specification so that Scott Schram can be the controller and review proposed uses of the HMA thin lift overlay for appropriateness.

The Office of Construction and Materials will work with the Office of Contracts on new bid items that will be required with this DS.

Specification Section Recommended Text: See attached SS for Hot Mix Asphalt Thin Lift Overlay.

Comments:

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

- **See attachment**

Reason for Revisions: This mix was used on Hwy 93 as a 3/4" highly modified surface lift. There has been growing confusion between the interlayer and thin lift. Designers are wanting an additional treatment to extend pavement life that is an alternative to a surface treatment, yet not a traditional overlay. To avoid confusion between the interlayer and the thin lift, a specification is needed.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes**	**No** X	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**
Comments: The industry is in support.					

DS-12XXX
(New)

Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATIONS
FOR
HOT MIX ASPHALT THIN LIFT OVERLAY

Effective Date
June 17, 2014

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMANTAL SPECIFICATIONS AND THEY PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

12XXX.01 DESCRIPTION.
These specifications describe the requirements for a highly polymer modified asphalt thin lift surface course. Apply Section 2303 of the Standard Specifications unless otherwise directed in these specifications. Not for use on interstate roadways.

12XXX.02 MATERIALS.

A. Asphalt Binder.
Use a PG+ 76-34 with a minimum 90% elastic recovery when RTFO-aged per AASHTO T 240 and tested per AASHTO T 301 at 77°F (25°C).

B. Mix Design.

3. See Materials I.M. 510 Appendix A.

4. 50% of the total aggregate shall be Friction Type 4.

5. Mix approval is based on Performance Testing Requirements per Table 5 in Materials I.M. 510 Appendix A.

12XXX.03 CONSTRUCTION.

A. Apply a tack coat prior to placement of the thin lift overlay.

B. Compact with steel wheeled roller.

C. Do not open to traffic until the entire mat has cooled below 150°F (65°C).

D. Quality Assurance/Quality Control.

1. Field Voids Acceptance.
Acceptance for field voids shall be Class II compaction defined in Section 2303 of the Standard Specifications.

2. **Lab Voids Acceptance.**
   Sample and test one hot box per day of production unless otherwise approved by the Engineer. Apply Article 2303.05, A, 3, a, 2, of the Standard Specifications for AAD acceptance. Air void target is based on approved JMF.

3. Take at least one cold feed for gradation control.

12XXX.04 METHOD OF MEASUREMENT.
Hot Mix Asphalt Thin Lift Overlay, of the size specified, will be measured according to Article 2303.04 of the Standard Specifications.

12XXX.05 BASIS OF PAYMENT.
Hot Mix Asphalt Thin Lift Overlay, of the size specified, will be paid for according to Article 2303.05 of the Standard Specifications.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Scott Schram	**Office:** Construction and Materials	**Item 14**
Submittal Date: 2/28/2014	**Proposed Effective Date:** June 2014	
Article No.: **Title:**	**Other:** Supplemental Specifications for Evaluation of Longitudinal Joint Quality for Flexible Paving Mixtures	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 6/17/2014

Specification Committee Approved Text: See attached SS for Evaluation of Longitudinal Joint Quality for Flexible Paving Mixtures.

Comments: This SS will apply to all projects with HMA bid items. It will apply to local projects also. This year is for evaluation purposes. Next season there will be a schedule with incentive/disincentive payments based on results. When the I/D is added, the locals will be able to opt out as they do now for some other HMA I/D via a DS.

Specification Section Recommended Text:

Comments:

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

- **See attachment**

Reason for Revisions: Currently the specifications do not consider the material placed within 1 foot of the pavement edge in the acceptance decision. Longitudinal joint performance has been historically less than that of the mat. These specifications will consider the joint quality in the acceptance decision. 2014 will serve as a trial year. The Basis of Payment will be revised in 2015 to include a payment schedule with incentives and disincentives. Until then, the plant report will show the future incentive/disincentive for information only.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**

Comments: The industry is in support of a 2014 trial year and would like to review the information collected prior to implementing the payment schedule.

SS-12XXX
(New)

Iowa Department of Transportation

SUPPLEMENTAL SPECIFICATIONS
FOR
EVALUATION OF LONGITUDINAL JOINT QUALITY FOR FLEXIBLE PAVING MIXTURES

Effective Date
June 17, 2014

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

12XXX.01 DESCRIPTION.
This work is evaluating in-place quality of centerline longitudinal joints on the surface wearing course for flexible paving and replaces Article 2303.03, D, 4, c, of the Standard Specifications.

12XXX.02 EVALUATION.

A. General Requirements.
For Class I compaction areas on the surface, longitudinal joint density lots independent from the mat will be established for mainline paving as specified in Article 12XXX.02, B for acceptance. Class I compaction is defined in Article 2303.03, C, 5 of the Standard Specifications. Mainline shall be considered through lanes within the traveled way including middle turn lanes. These specifications only apply when the total length of eligible longitudinal joints is 12,500 feet (3750 m) or greater. Sampling and testing will be for information only.

B. Sampling.

1. Divide the total length of surface longitudinal joints into 2500 foot (750 m) sublots. If the last sublot is less than 1000 feet (300 m), combine its length with the previous sublot. If the last sublot is 1000 feet (300 m) or more establish an additional sublot. The Engineer will randomly determine a sample location within each sublot. The joint length need not be contiguous and may include multiple joints throughout the project limits.

2. When surface paving abuts a previously placed surface course, forming a completed longitudinal joint eligible for evaluation, the Engineer will obtain and test samples according to Materials I.M. 320 and 321.

3. When sampling for mat field voids is modified to include multiple days due to low production, sampling from the joint may also be modified by the Engineer.

4. Joints constructed with tandem pavers will be included, unless otherwise indicated in the contract documents.

5. For vertical joints, center joint cores on the visible seam between to the two adjacent lanes as shown in Appendix A of these specifications.

6. For notched wedge joints, center joint cores 4 inches (100 mm) away from the visible seam in the direction of the wedge as shown in Appendix A of these specifications.

7. Under the direction and witnessing of the Engineer, drill one 6 inch (150 mm) diameter core at each sample location as soon as possible, but no later than the day following the completion of the longitudinal joint.

8. Do not compress, bend, or distort samples during cutting, handling, transporting, and storing. If samples are damaged, immediately obtain replacement samples, as directed by the Engineer, longitudinally from within 12 inches (300 mm) of the original sample location.

9. Apply Article 2303.03, D, 5, c, of the Standard Specifications for post drilling operations.

10. Report sample locations and test results on the daily plant report corresponding with the JMF used in production of the sublot(s).

C. Lot Size.

1. Except when the entire production of the bid item is placed in a single day, consider all sublots obtained on the first day as a separate test strip lot. If the test strip lot size is less than five, the Engineer will obtain additional samples such that the total test strip lot size is at least five.

2. Combine all subsequent sublots into lots of eight.

3. If the last lot has fewer than eight samples, combine them with the previous lot.

D. Excluded Areas.

1. The Engineer will not obtain samples from the following excluded areas to determine lot acceptance:

- Joints where one side of the joint is formed by existing pavement not constructed under this contract
- Joints where one side of the joint is not on the mainline surface.
- Areas within 1 foot (300 mm) longitudinally of an obstruction during construction of the surface course (manholes, inlet grates, utilities, bridge structures, runout, etc.). Should a random sample location fall within 1 foot (300 mm) of such an area, the Engineer shall select an alternate nearby location away from the obstruction.
- Small areas, such as intersections, gore areas or transitions, or anywhere the Engineer determines paving and phasing methods do not allow for consistent longitudinal joint construction.

2. Prior to paving, submit requests in writing to the Engineer for consideration of any areas to be excluded on this basis. The Engineer will make the final determination.

E. Percent Within Limits.

Determine PWL for each lot using a lower specification limit (LSL) of 0% voids (100.0% of G_{mm}) and an upper specification limit of 10.0% voids (90% G_{mm}). PWL calculations can be found in Appendix A.

12XXX.03 METHOD OF MEASUREMENT AND BASIS OF PAYMENT.

Costs associated with providing joint pavement samples shall be included with the payment for Hot Mix Asphalt Pavement Samples.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Jim Rost	**Office:** Construction and Materials & Location and Environment	**Item 15**
Submittal Date: 2013.03.03	**Proposed Effective Date:** October 2014	
Article No.: 1105.14, C, 12 **Title:** Indiana Bats **Article No.:** 2101.01, A **Title:** Clearing	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 3/13/2014	**Effective Date:** 10/21/2014

Specification Committee Approved Text:

1105.14, C, 12, Indiana Bats.

Replace the title and Article:

~~**Indiana**~~ **Threatened/Endangered Bats.**

Suitable habitat for ~~the Indiana bat (Myotis sodalis)~~ threatened/endangered bats, as identified by the Contracting Authority, shall be removed ~~between September 15th and April 15th when Indiana bats are not expected to be using potentially suitable trees~~ in accordance with Article 2101.01. The Contractor shall limit removal of forest cover to those areas which are absolutely necessary for the construction of the work. Questions regarding this condition shall be directed to the Engineer.

2101.01, A.

Replace the Article:

Clearing: Cut and remove trees 3 inches (75 mm) or more in diameter. Cutting shall be performed between October 1st and March 31st.

Comments: The Office of Traffic and Safety commented that "completing" cutting between October 1st and March 31st did not mean the Contractor needed to start cutting between those dates. "Completed" was changed to "performed" to be more accurate.

The standard plan note regarding the Indiana bat (232-9) will be obsoleted with the implementation of this specification revision.

The Office of Location and Environment is addressing projects let prior to October by getting an exemption from the Fish and Wildlife Bureau.

Specification Section Recommended Text:

1105.14, C, 12, Indiana Bats.

Replace the title and Article:

~~**Indiana**~~ **Threatened/Endangered Bats.**

Suitable habitat for ~~the Indiana bat (Myotis sodalis)~~ threatened/endangered bats, as identified by the Contracting Authority, shall be removed ~~between September 15th and April 15th when Indiana bats are not expected to be using potentially suitable trees~~ in accordance with Article 2101.01. The Contractor shall limit removal of forest cover to those areas which are absolutely necessary for the construction of the work. Questions regarding this condition shall be directed to the Engineer.

2101.01, A.

Replace the Article:

Clearing: Cut and remove trees 3 inches (75 mm) or more in diameter. Cutting shall be completed between October 1st and March 31st.

Comments: Do we need to make this a proposal note for projects let prior to the October letting?

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

Add the following sentence to 2101.01, A:

Clearing: Cut and remove trees 3 inches (75 mm) or more in diameter. Cut all trees after September 30 and before April 1.

Change the following paragraph in 1105.14, C.12:

~~Indiana bats~~ Threatened/Endangered Bats.

Suitable habitat for ~~the Indiana bat (Myotis sodalis)~~ threatened/endangered bats, as identified by the Contracting Authority, shall be removed ~~between September 15th and April 15th when Indiana bats are not expected to be using potentially suitable trees~~ in accordance with Section 2101.01. The Contractor shall limit removal of forest cover to those areas which are absolutely necessary for the construction of the work. Questions regarding this condition shall be directed to the Engineer.

Reason for Revision: The USFWS has updated tree cut dates for Indiana bats. In addition, the USFWS will list the northern long-eared bat as endangered in October 2014. The northern long-eared bat occurs statewide throughout Iowa, and it is expected that tree clearing throughout the state will be subject to the same cut date restrictions as Indiana bats.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes**	**No**
Comments:					