Iowa Department of Transportation

MINUTES
OF
IOWA DOT SPECIFICATION COMMITTEE MEETING

April 11, 2013

Members Present:	Darwin Bishop	District 3 - Construction
	Mark Brandl	District 6 - Davenport RCE
	Eric Johnsen, Secretary	Specifications Section
	Sandra Larson	Systems Operations Bureau
	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:	Donna Buchwald	Office of Local Systems
Advisory Members Present:	Lisa McDaniel	FHWA
Others Present:	John Dostart	Office of Local Systems
	Daniel Harness	Office of Design
	Kevin Merryman	Office of Construction
	Melissa Serio	Office of Construction

Tom Reis, Specifications Engineer, opened the meeting. The following items were discussed in accordance with the agenda dated April 4, 2013:

1. **Section 1105, Control of Work.**
Article 2526.03, A, Construction Survey.
The Office of Construction requested to add Automated Machine Guidance (AMG) specifications.

2. **Section 2303, Flexible Pavement.**
The Office of Materials requested several revisions to the flexible pavement specification.

3. **Article 2503.03, E, Tolerances (Storm Sewers).**
Article 2503.03, H, Cleaning, Inspection, and Testing (Storm Sewers).
Article 2504.03, J, 1, Tolerances (Sanitary Sewers).
Article 2504.03, L, 3, Video Inspection (Storm Sewers).
The Specifications Section requested to make the sewer tolerances consistent.

4. **Section 2542, Crack and Joint Cleaning and Sealing (Portland Cement Concrete Pavement).**
The Office of Construction requested to update specification language regarding filling of PCC joints and cracks to align with current Department philosophy.

5. **Section 4109, Aggregate Gradation Table (Gradation 36, floodable backfill).**
The Office of Materials requested to revise the gradation for natural sand floodable backfill.

6. Article 4110.03, Quality (Fine Aggregate for Portland Cement Concrete).
The District 4 Materials Office requested to remove mortar strength requirements for fine aggregate for PCC.

7. Article 4149.04, J, 1, b, 2, Expansion Bands.
The Specifications Section requested to revise the specifications for expansion bands for chimney seals.

8. Article 4150.02, E, 2, Tracer System.
The Specifications Section requested approval of the use of bi-metal tracer wire.

9. Section 4186, Signing Materials.
The Office of Traffic and Safety requested to make changes to the types of retro reflective sheeting used on traffic signs to match current practice.

10. Article 4186.10, D, 2, c, 2, c, PSST Post Anchors.
The Office of Traffic and Safety requested to require that slip base assembly hardware meet the requirements of the manufacturer.

11. DS-12XXX, Precast Noise Wall.
The Specifications Section requested approval of Developmental Specifications for Precast Noise Wall.

12. Discuss communication with Industry concerning proposed specification revisions.
The Specifications Section explained that the Committee needs to do a better job of communicating revisions to the industry prior to bringing to the Specification Committee so that the Committee does not have to revisit the revisions after industry input.

13. Discuss future Specification Book formats.
The Specifications Section asked the Committee to consider what format they would like to see in the next Specification Book, scheduled to be released for the October 2014 letting. Potential formats include the current 6” by 9” bound hard cover, 8.5” by 11” bound hard cover, soft cover in either of the sizes, loose leaf binder, or spiral bound. The Specifications Section also discussed future ERL changes, such as conversion from pdf files to html files and creation of mobile apps for smart phones and tablets.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Tom Jacobson / Kevin Merryman / Melissa Serio	**Office:** Construction	**Item 1**
Submittal Date: 3/27/13	**Proposed Effective Date:** Oct. 15, 2013	
Section No.: 1105 **Title:** Control of Work **Article No.:** 2526.03, A **Title:** Construction Survey	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text: 1105, Control of Work.

1101.02, Definitions of Abbreviations.

Add the definition:

AMG - Automated Machine Guidance

1105, Control of Work.

Renumber Article 1105.06, Construction Stakes, to 1105.16.

Add the Article:

1105.17 AUTOMATED MACHINE GUIDANCE.

A. Contractor may use equipment with AMG that results in meeting the same accuracy requirements as conventional construction as detailed in the Standard Specifications.

B. Use this section in conjunction with Section 2526 unless construction survey is being provided by the Contracting Authority.

C. Electronic files.

1. Available electronic files will be provided by the Contracting Authority with the Proposal Form. This information is available at the Office of Contracts' website.

2. Convert electronic data provided by the Contracting Authority into the format required by AMG system. Files made available will be in a generic format. For naming conventions and file formats refer to Office of Design's online design manual. Note that additional files, such as storm sewer design files, may be included in the original design software format. Files provided may include:

a. CAD Files: Primary CADD (Computer Aided Design and Drafting) design file that may include:

- CADD cross section files.
- CADD Right of Way file.
- CADD Topography files.
- 3D Design break line files in an industry standard format.

b. Machine Control Surface Model Files (including topsoil placement where required on the plans): Documentation file describing all of surface models, typically in LandXML format. Areas where a surface model is not provided, Contractor may, at no additional cost to Contracting Authority, develop required surface models to facilitate AMG.

c. Alignment Data Files: Documentation file describing alignment information both horizontal and vertical, typically in LandXML format.

3. For PCC overlays, compute an estimated quantity of overlay concrete based on existing pavement profile and the electronic model. This quantity will serve as the estimated

concrete quantity for the project and must be approved by the Engineer prior to start of construction.

4. For full-depth paving projects, provide a digital terrain model (DTM) of subgrade surface.

5. For paving projects, provide an electronic file such as a D45 file, or equivalent, identifying x, y, and z coordinates for shoulder and pavement edges as well as the pavement centerline based on project alignments and elevations.

6. No guarantee is made that the data systems used by the Engineer will be directly compatible with the systems the Contractor uses.

7. Electronic information shall not be considered a representation of actual conditions to be encountered during construction. Providing the Contractor this information does not relieve the Contractor from the responsibility of making an investigation of conditions to be encountered, including but not limited to site visits, and basing the bid on information obtained from these investigations and professional interpretations and judgment. Contractor assumes the risk of error if the information is used for any purposes for which the information was not intended. Assumptions the Contractor makes from this electronic information or manipulation of the electronic information is at their risk.

8. Engineer may perform spot checks of the machine control results, surveying calculations, records, field procedures, and actual staking. If the Engineer determines the work is not being performed in a manner assures accurate results, the Engineer may order such work to be redone, to the requirements of the contract documents, at no additional cost to the Contracting Authority.

D. Additional Contracting Authority Responsibilities.

1. For new construction, the Engineer will set initial horizontal and vertical control points in the field for the project as indicated in the contract documents. For reconstruction or PCC overlays, Engineer will furnish information on existing horizontal and vertical control points.

2. Engineer will provide project specific localized coordinate system if required. The control information utilized in establishing the localized coordinate system, specifically rotation, scaling, and translation may be requested from the Engineer.

3. For paving, Engineer will review and approve proposed surface model within two weeks following receipt of the model.

E. Additional Contractor Responsibilities.

1. Provide a rover,readily available for Engineer to use, during duration of contract.

2. Provide Engineer up to 8 hours of formal training on Contractor's AMG systems.

3. Contractor bears all costs, including but not limited to cost of actual reconstruction of work that may be incurred due to errors in application of AMG techniques. Grade elevation errors, rework resulting from errors or failures of AMG system, and associated quantity adjustments resulting from Contractor's activities are at no cost to Contracting Authority. Delays due to late submittals or satellite reception of signals to operate AMG system will not result in adjustment to contract unit prices or justification for granting contract extensions.

4. Check and recalibrate, if necessary, AMG system at beginning of each work day.

5. At least one week prior to preconstruction conference, submit to Engineer for review a written AMG work plan which includes the following:

- Equipment type,
- Control software manufacturer and version,
- Proposed location of local GPS base station for broadcasting differential correction data to rover units, and
- Proposed locations where AMG will be used. Provide minimum of 30 calendar days

notice when there are changes to proposed AMG locations that will require additional construction staking by Contracting Authority. Contractor may perform this additional staking at no additional cost to Contracting Authority.

2526.03, A.

Replace the second sentence:

Do not apply the provisions of Article ~~1105.06~~ 1105.16 to this work, except to preserve the original stakes set by the Engineer. Refer to Article 1105.17 for requirements when AMG is utilized.

2526.03, A, 2, Grading.

Replace the Article:

a. General.

1) Survey right-of-way line between permanent right-of-way corners at 100 foot (20 m) intervals, or less if needed, including borrows, temporary easements, and right of entry. Mark these points by placement of a metal pin or wood hub, flat, and lath at the same location as the slope stakes. Clearly mark the flat with the station number, distance from centerline, and elevation (cut or fill) to subgrade.

~~**b.** Set slope stakes at 100 foot (20 m) intervals, or less if needed, for all embankment and excavation work including roadway, channel changes, and borrow areas. Interpolations may be necessary to match the cross-sections. Set the stakes at the toe of the foreslope or the top of the backslope, or both. Mark slope stakes with a flat and lath. Clearly mark the flat with the station location, distance, slope, and cut/fill information.~~

~~**c.** Set grade check stakes at 100 foot (20 m) intervals for bottoms of subgrade treatments. Set the stakes on centerline for two-lane roads and in the median for four-lane roads. Mark grade check stakes with a lath. Clearly mark the lath with the station location and cut or fill information.~~

~~**d.** Set finish grade stakes (blue tops) at 100 foot (20 m) intervals, or less if needed. Set the blue tops at each shoulder line and at each point where there is a change in cross slope. Mark blue tops with a wood hub and a stake chaser or similar type tassel.~~

~~**e.**~~**2)** Take original and final elevations of all borrows. Provide original and final graphical cross sections at 100 foot (20 m) intervals, or less if needed, suitable for use by the Engineer to calculate excavation quantities.

~~**f.**~~**3)** Set bridge berm slope stakes to establish all transitions, including the face of the berm. Set finish grade stakes (blue tops) on all roadway shoulder lines and roadway centerlines to project down the face of the bridge berm at the top, face of berm bench, and toe.

~~**g.**~~**4)** When Class 12 excavation is a bid item, take cross section elevations at 100 foot (20 m) intervals, or less if needed, and plot cross sections for use by the Engineer to calculate the excavation quantities.

~~**h.**~~**5)** Use a lath to locate, on each side of roadway at the right-of-way line, agricultural drain tile shown in the contract documents. Clearly mark lath to show station location, distance from centerline, tile size and type, and flowline elevation.

b. Areas Constructed Without AMG.

1) Set slope stakes at 100 foot (20 m) intervals, or less if needed, for embankment and excavation work including roadway, channel changes, and borrow areas. Interpolations may be necessary to match cross-sections. Set stakes at toe of foreslope or top of backslope, or both. Mark slope stakes with a flat and lath. Clearly mark flat with station location, distance, slope, and cut or fill information.

2) Set grade check stakes at 100 foot (20 m) intervals for bottoms of subgrade treatments. Set stakes on centerline for two-lane roads and in median for four-lane roads. Mark grade check stakes with a lath. Clearly mark lath with station location and cut or fill information.

3) Set finish grade stakes (blue tops) at 100 foot (20 m) intervals, or less if needed. Set blue tops at each shoulder line and each point where there is a change in cross slope. Mark blue tops with a wood hub and stake chaser or similar type tassel.

c. Areas Constructed With AMG.

1) Establish elevation of secondary control points using differential leveling from project benchmarks, forming closed loops. Provide a copy of new control point information to Engineer prior to construction work. Contractor is responsible for errors resulting from their efforts. Correct deficiencies to the satisfaction of the Engineer at no additional cost to Contracting Authority.

2) Set hubs at top of finished subgrade at hinge points on cross section at 1000 foot (300 m) intervals on mainline and at least two cross sections on side roads and ramps. Establish these hubs, using plan typicals and cross sections, for use by Engineer to check accuracy of construction.

3) Provide grade stakes at critical transition points such as, but not limited to, PC's, PT's, super elevation points, and other critical points required for construction of drainage and roadway

structures.

2526.03, A, 9, Pavements (PCC & HMA).

Replace the Article:

a. ~~Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of the pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark the flat with the station location, cut/fill information, and offset distance to the edge of pavement. Include pavement cross slope information in superelevated curves.~~ **General.**

~~**b.1)**~~ Take elevations of pavement centerline and both edges at bridges and existing pavement at 10 foot (3 m) intervals for 100 feet (30 m). Adjust profile grade to provide smooth transition, and ~~S~~submit final elevations to the Engineer for approval.

~~**c.2)**~~ When a new profile grade is not included in the contract documents:

~~**1)a)**~~ Obtain elevations of existing shoulders and/or pavement ~~as stated in Article 2526.03, A, 9.~~ at 100 foot (30 m) intervals on straight and level sections and 50 foot (10 m) intervals on horizontal and vertical curves.

~~**2)b)**~~ Design a smooth profile grade line based on these elevations to provide the required pavement or shoulder thickness as detailed in the contract documents. This grade line shall tie into existing bridges, adjacent pavement and ramps, and provide the required pavement crown. Submit this proposed grade line to the Engineer for approval.

b. Areas Constructed Without AMG.

Mark locations and elevations with metal pin or tack in wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections and 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with station location, cut or fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.

c. Areas Constructed With AMG.

1) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot (150 m) intervals on each side of pavement. Furnish x,y,z coordinates and station offset information for each point.

2) Set paving hubs with cut or fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.

2526.03, A, 11, PCC Overlays

Replace the Article:

a. ~~Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with the station location, cut/fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.~~ **General.**

~~**b.1)**~~Take elevations of pavement centerline and both edges at bridges and existing pavement at 10 foot (3 m) intervals for 100 feet (30 m). Adjust profile grade to provide a smooth transition, and ~~S~~submit final elevations to the Engineer for approval.

~~**c.2)**~~ When a new profile grade is not included in the contract documents:

~~**1a)**~~ Obtain elevations of existing pavement at centerline and both pavement edges for bonded overlays and projects including mainline stress relief course and/or pavement scarification.

~~**2b)**~~ Obtain elevations of existing pavement at centerline, quarter points, and both pavement edges for unbonded overlays and whitetopping projects when a stress relief course and/or pavement scarification are not included.

~~**3c)**~~ Obtain elevations at ~~100~~ 50 foot (~~30~~ 10 m) intervals on straight and level sections and at ~~50~~ 25 foot (10 m) intervals on horizontal and vertical curves.

~~**4d)**~~ Design a smooth profile grade line based on these elevations to provide the required pavement or shoulder thickness as detailed in the contract documents. This grade line shall tie into existing bridges, adjacent pavement and ramps, and provide the required pavement crown. This proposed grade line shall be submitted to the Engineer for approval.

~~**d.3)**~~ Reference and preserve existing control points located at each Point of Intersection (P.I.).

~~**e.4)**~~ Obtain Engineer's approval for method used to reference points.

~~**f.5)**~~ Reset Control Points after work is complete.

b. Areas Constructed Without AMG:

Mark locations and elevations with metal pin or tack in wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections

and 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with station location, cut or fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.

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1) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot (150 m) intervals on each side of pavement. Furnish x,y,z coordinates and station offset information for each point.

2) Set paving hubs with cut or fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.

Comments: The Specifications Section asked if the AMG Article should go in Section 2001, General Equipment Requirements. The Office of Construction pointed out that there aren't really any equipment requirements in the AMG Article. The Office of Construction asked if the AMG Article could go with Article 1105.06, Construction Stakes, as these articles are related. The Committee decided to move Article 1105.06 to the end of Section 1105, instead of renumbering Articles 1105.07 through 1105.15. The AMG Article will go after the Construction Stakes Article.

The Office of Construction corrected a couple of grammatical errors in Articles 1105.17, C, 7 and 1105.17, D, 2.

The Committee decided to add a reference to the AMG Article in Article 2526.03, A, so the Articles are tied together in both directions.

The Office of Construction requested to change the intervals listed in Article 2526.03, A, 11, a, 2, c.

Specification Section Recommended Text:

1105, Control of Work.

Add the Article:

1105.16 AUTOMATED MACHINE GUIDANCE.

A. Contractor may use equipment with Automated Machine Guidance (AMG) that results in meeting the same accuracy requirements as conventional construction as detailed in the Standard Specifications.

B. Use this section in conjunction with Section 2526 unless construction survey is being provided by the Contracting Authority.

C. Electronic files.

3. Available electronic files will be provided by the Contracting Authority with the proposal form. This information is available at the Office of Contracts' website.

4. Convert electronic data provided by the Contracting Authority into the format required by AMG system. Files made available will be in a generic format. For naming conventions and file formats refer to Office of Design's online design manual. Note that additional files, such as storm sewer design files, may be included in the original design software format. Files provided may include:

d. CAD Files: Primary CADD (Computer Aided Design and Drafting) design file that may include:

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- CADD Topography files.
- 3D Design break line files in an industry standard format.

e. Machine Control Surface Model Files (including topsoil placement where required in the plans): Documentation file describing all of surface models, typically in LandXML format. For areas where a surface model is not provided, Contractor may, at no additional cost to Contracting Authority, develop required surface models to facilitate AMG.

f. Alignment Data Files: Documentation file describing the alignment information both horizontal and vertical, typically in LandXML format.

4. For PCC overlays, compute an estimated quantity of overlay concrete based on existing pavement profile and the electronic model. This quantity will serve as the estimated concrete quantity for the project and must be approved by the Engineer prior to start of construction.

9. For full-depth paving projects, provide a digital terrain model (DTM) of subgrade surface.

10. For paving projects, provide an electronic file such as a D45 file, or equivalent, identifying x, y, and z coordinates for shoulder and pavement edges as well as the pavement centerline based on project alignments and elevations.

11. No guarantee is made that the data systems used by the Engineer will be directly compatible with the systems the Contractor uses.

12. The electronic information shall not be considered a representation of actual conditions to be encountered during construction. Providing the Contractor this information does not relieve the Contractor from the responsibility of making an investigation of conditions to be encountered, including but not limited to site visits, and basing the bid on information obtained from these investigations and the their professional interpretations and judgment. Contractor assumes the risk of error if the information is used for any purposes for which the information was not intended. Assumptions the Contractor makes from this electronic information or manipulation of the electronic information is at their risk.

13. Engineer may perform spot checks of the machine control results, surveying calculations, records, field procedures, and actual staking. If the Engineer determines the work is not being performed in a manner that will assure accurate results, the Engineer may order such work to be redone, to the requirements of the contract documents, at no additional cost to the Contracting Authority.

D. Additional Contracting Authority Responsibilities.

1. For new construction, the Engineer will set the initial horizontal and vertical control points in the field for the project as indicated in the contract documents. For reconstruction or PCC overlays, the Engineer will furnish information on existing horizontal and vertical control points.

4. Engineer will provide project specific localized coordinate system if required. The control information utilized in establishing the localized coordinate system, specifically the rotation, scaling, and translation may requested from the Engineer.

5. For paving, the Engineer will review and approve the proposed surface model within 2 weeks following receipt of the model.

E. Additional Contractor Responsibilities.

6. Provide a rover that is readily available for Engineer to use during the duration of the contract.

7. Provide Engineer up to 8 hours of formal training on the Contractor's AMG systems.

8. Contractor bears all costs, including but not limited to cost of actual reconstruction of work, that may be incurred due to errors in application of AMG techniques. Grade elevation errors, rework resulting from errors or failures of the AMG system, and associated quantity adjustments resulting from the Contractor's activities are at no cost to the Contracting Authority. Delays due to late submittals or satellite reception of signals to operate AMG system will not result in adjustment to contract unit prices or justification for granting contract extensions.

9. Check and recalibrate, if necessary, AMG system at beginning of each work day.

10. At least 1 week prior to preconstruction conference, submit to Engineer for review a written AMG work plan which includes the following:

- Equipment type,
- Control software manufacturer and version,
- Proposed location of local GPS base station for broadcasting differential correction data to rover units, and
- Proposed locations where AMG will be used. Provide minimum of 30 calendar days notice when there are changes to proposed AMG locations that will require additional construction staking by Contracting Authority. Contractor may perform this additional staking at no additional cost to Contracting Authority.

2526.03, A, 2, Grading.

Replace the Article:

a. General.

1) Survey right-of-way line between permanent right-of-way corners at 100 foot (20 m) intervals, or less if needed, including borrows, temporary easements, and right of entry. Mark these points by placement of a metal pin or wood hub, flat, and lath at the same location as the slope stakes. Clearly mark the flat with the station number, distance from centerline, and elevation (cut or fill) to subgrade.

~~**b.** Set slope stakes at 100 foot (20 m) intervals, or less if needed, for all embankment and excavation work including roadway, channel changes, and borrow areas. Interpolations may be necessary to match the cross-sections. Set the stakes at the toe of the foreslope or the top of the backslope, or both. Mark slope stakes with a flat and lath. Clearly mark the flat with the station location, distance, slope, and cut/fill information.~~

~~**c.** Set grade check stakes at 100 foot (20 m) intervals for bottoms of subgrade treatments. Set the stakes on centerline for two-lane roads and in the median for four-lane roads. Mark grade check stakes with a lath. Clearly mark the lath with the station location and cut or fill information.~~

~~**d.** Set finish grade stakes (blue tops) at 100 foot (20 m) intervals, or less if needed. Set the blue tops at each shoulder line and at each point where there is a change in cross slope. Mark blue tops with a wood hub and a stake chaser or similar type tassel.~~

~~**e.**~~**2)** Take original and final elevations of all borrows. Provide original and final graphical cross sections at 100 foot (20 m) intervals, or less if needed, suitable for use by the Engineer to calculate excavation quantities.

~~**f.**~~**3)** Set bridge berm slope stakes to establish all transitions, including the face of the berm. Set finish grade stakes (blue tops) on all roadway shoulder lines and roadway centerlines to project down the face of the bridge berm at the top, face of berm bench, and toe.

~~**g.**~~**4)** When Class 12 excavation is an item, take cross section elevations at 100 foot (20 m) intervals, or less if needed, and plot cross sections for use by the Engineer to calculate the excavation quantities.

~~**h.**~~**5)** Use a lath to locate, on each side of roadway at the right-of-way line, agricultural drain tile shown in the contract documents. Clearly mark lath to show station location, distance from centerline, tile size and type, and flowline elevation.

b. Areas Constructed Without Automated Machine Guidance (AMG).

4) Set slope stakes at 100 foot (20 m) intervals, or less if needed, for embankment and excavation work including roadway, channel changes, and borrow areas. Interpolations may be necessary to match cross-sections. Set stakes at toe of foreslope or top of backslope, or both. Mark slope stakes with a flat and lath. Clearly mark flat with station location, distance, slope, and cut or fill information.

5) Set grade check stakes at 100 foot (20 m) intervals for bottoms of subgrade treatments. Set stakes on centerline for two-lane roads and in median for four-lane roads. Mark grade check stakes with a lath. Clearly mark lath with station location and cut or fill information.

6) Set finish grade stakes (blue tops) at 100 foot (20 m) intervals, or less if needed. Set blue tops at each shoulder line and each point where there is a change in cross slope. Mark blue tops with a wood hub and stake chaser or similar type tassel.

c. Areas Constructed With AMG.

1) Establish elevation of secondary control points using differential leveling from project benchmarks, forming closed loops. Provide a copy of new control point information to Engineer prior to construction work. Contractor is responsible for errors resulting from their efforts. Correct deficiencies to the satisfaction of the Engineer at no additional cost to Contracting Authority.

4) Set hubs at top of finished subgrade at hinge points on cross section at 1000 foot (300 m) intervals on mainline and at least two cross sections on side roads and ramps. Establish these hubs, using plan typicals and cross sections, for use by Engineer to check accuracy of construction.

5) Provide grade stakes at critical transition points such as, but not limited to, PC's, PT's, super elevation points, and other critical points required for construction of drainage and roadway

structures.

2526.03, A, 9, Pavements (PCC & HMA).

Replace the Article:

a. ~~Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of the pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark the flat with the station location, cut/fill information, and offset distance to the edge of pavement. Include pavement cross slope information in superelevated curves.~~ **General.**

~~**b.1)**~~ Take elevations of pavement centerline and both edges at bridges and existing pavement at 10 foot (3 m) intervals for 100 feet (30 m). Adjust profile grade to provide smooth transition, and ~~S~~submit final elevations to the Engineer for approval.

~~**c.2)**~~ When a new profile grade is not included in the contract documents:

~~**1)a)**~~ Obtain elevations of the existing shoulders and/or pavement ~~as stated in Article 2526.03, A, 9.~~ at 100 foot (30 m) intervals on straight and level sections and 50 foot (10 m) intervals on horizontal and vertical curves.

~~**2)b)**~~ Design a smooth profile grade line based on these elevations to provide the required pavement or shoulder thickness as detailed in the contract documents. This grade line shall tie into existing bridges, adjacent pavement and ramps, and provide the required pavement crown. Submit this proposed grade line to the Engineer for approval.

d. Areas Constructed Without AMG.

Mark locations and elevations with metal pin or tack in wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections and 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with station location, cut or fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.

e. Areas Constructed With AMG.

3) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot (150 m) intervals on each side of pavement. Furnish x,y,z coordinates and station offset information for each point.

4) Set paving hubs with cut or fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.

2526.03, A, 11, PCC Overlays

Replace the Article:

a. ~~Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with the station location, cut/fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.~~ **General.**

~~**b.1)**~~Take elevations of pavement centerline and both edges at bridges and existing pavement at 10 foot (3 m) intervals for 100 feet (30 m). Adjust profile grade to provide a smooth transition, and ~~S~~submit final elevations to the Engineer for approval.

~~**c.2)**~~ When a new profile grade is not included in the contract documents:

~~**1a)**~~ Obtain elevations of existing pavement at centerline and both pavement edges for bonded overlays and projects including mainline stress relief course and/or pavement scarification.

~~**2b)**~~ Obtain elevations of existing pavement at centerline, quarter points, and both pavement edges for unbonded overlays and whitetopping projects when a stress relief course and/or pavement scarification are not included.

~~**3c)**~~ Obtain elevations at 100 foot (30 m) intervals on straight and level sections and at 50 foot (10 m) intervals on horizontal and vertical curves.

~~**4d)**~~ Design a smooth profile grade line based on these elevations to provide the required pavement or shoulder thickness as detailed in the contract documents. This grade line shall tie into existing bridges, adjacent pavement and ramps, and provide the required pavement crown. This proposed grade line shall be submitted to the Engineer for approval.

~~**d.3)**~~ Reference and preserve existing control points located at each Point of Intersection (P.I.).

~~**e.4)**~~ Obtain Engineer's approval for method used to reference points.

~~**f.5)**~~ Reset Control Points after work is complete.

b. Areas Constructed Without AMG:

Mark locations and elevations with metal pin or tack in wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections

and 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with station location, cut or fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.

c. Areas Constructed With AMG:

3) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot (150 m) intervals on each side of pavement. Furnish x,y,z coordinates and station offset information for each point.

4) Set paving hubs with cut or fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.

Comments:

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

Add the following article:

1105.16 AUTOMATED MACHINE GUIDANCE (AMG).

A. The Contractor has the option of using equipment with Automated Machine Guidance (AMG) that results in meeting the same accuracy requirements as conventional construction as detailed in the Standard Specifications.

B. Use this section in conjunction with Section 2526 of the Standard Specifications unless construction survey is being provided by the Contracting Authority.

C. Electronic files

5. Available electronic files will be provided by the Contracting Authority with the proposal form. This information is available at the Office of Contracts' website.

6. Convert the electronic data provided by the Contracting Authority into the format required by the AMG system. The files that are made available are in a generic format. For naming conventions and file formats please see the Office of Design's online design manual. Note that additional files, such as storm sewer design files, may be included in the original design software format. Files provided may include:

g. CAD Files: Primary CADD (Computer Aided Design and Drafting) design file that may include:

- CADD cross section files.
- CADD Right of Way file.
- CADD Topography files.
- 3D Design break line files in an industry standard format.

h. Machine Control Surface Model Files (including topsoil placement where required in the plans): Documentation file describing all of surface models typically in LandXML format. For areas where a surface model is not provided, the Contractor may, at no additional cost to the Contracting Authority, develop the required surface models to facilitate AMG.

i. Alignment Data Files: Documentation file describing all of the alignment information both horizontal and vertical typically in LandXML format.

5. For PCC overlays, compute an estimated quantity of overlay concrete based on pavement profiles prior to start of paving and the electronic model. This quantity will serve as the estimated concrete quantity for the project and must be approved by the Engineer prior to start of construction.

14. For full-depth paving projects, provide a digital terrain model (DTM) of the subgrade surface.

15. For paving projects, provide an electronic file such as a D45 file, or equivalent, identifying x, y, and z coordinates for shoulder and pavement edges as well as the pavement centerline based on project alignments and elevations.

16. No guarantee is made that the data systems used by the Engineer will be directly compatible with the

systems the Contractor uses.

17. The electronic information is not to be considered a representation of actual conditions to be encountered during construction. Providing the Contractor this information does not relieve the Contractor from the responsibility of making an investigation of conditions to be encountered, including but not limited to site visits, and basing the bid on information obtained from these investigations and the their professional interpretations and judgment. The Contractor assumes the risk of error if the information is used for any purposes for which the information was not intended. Any assumptions the Contractor makes from this electronic information or manipulation of the electronic information is at their risk.

18. The Engineer may perform spot checks of the machine control results, surveying calculations, records, field procedures, and actual staking. If the Engineer determines the work is not being performed in a manner that will assure accurate results, the Engineer may order such work to be redone, to the requirements of the contract documents, at no additional cost to the Contracting Authority.

D. Additional Contracting Authority Responsibilities.

1. For new construction, the Engineer will set the initial horizontal and vertical control points in the field for the project as indicated in the contract documents. For reconstruction or PCC overlays, the Engineer will furnish information on existing horizontal and vertical control points.

6. The Engineer will provide the project specific localized coordinate system if required. The control information utilized in establishing the localized coordinate system, specifically the rotation, scaling, and translation can be obtained from the Engineer upon request.

7. For paving, the Engineer will review and approve the proposed surface model within two weeks following receipt of the model.

E. Additional Contractor Responsibilities.

11. Provide a rover that is readily available for the Engineer to use during the duration of the contract.

12. Provide the Engineer up to 8 hours of formal training on the Contractor's AMG systems.

13. The Contractor bears all costs, including but not limited to the cost of actual reconstruction of work, that may be incurred due to errors in application of AMG techniques. Grade elevation errors, rework resulting from errors or failures of the AMG system, and associated quantity adjustments resulting from the Contractor's activities are at no cost to the Contracting Authority. Delays due to late submittals or satellite reception of signals to operate the AMG system will not result in adjustment to any contract unit prices or be justification for granting contract extensions.

14. Check and recalibrate, if necessary, the AMG system at the beginning of each work day.

15. At least one week prior to the preconstruction conference, submit to the Engineer for review a written AMG work plan which includes the following:

- Equipment type,
- Control software manufacturer and version,
- Proposed location of the local GPS base station used for broadcasting differential correction data to rover units, and
- Proposed locations where AMG will be used. Provide minimum of 30 days notice when there are changes to the proposed AMG locations that will require additional construction staking by the Contracting Authority. Contractor may elect to perform this additional staking at no additional cost to the Contracting Authority.

Replace article 2526.03, A, 2. Grading with the following:

2. Grading.

a. General

1) ~~**a.**~~ Survey right-of-way line between permanent right-of-way corners at 100 foot (20 m)

intervals, or less if needed, including borrows, temporary easements, and right of entry. Mark these points by placement of a metal pin or wood hub, flat, and lath at the same location as the slope stakes. Clearly mark the flat with the station number, distance from centerline, and elevation (cut or fill) to subgrade.

~~**b.** Set slope stakes at 100 foot (20 m) intervals, or less if needed, for all embankment and excavation work including roadway, channel changes, and borrow areas. Interpolations may be necessary to match the cross-sections. Set the stakes at the toe of the foreslope or the top of the backslope, or both. Mark slope stakes with a flat and lath. Clearly mark the flat with the station location, distance, slope, and cut/fill information.~~

~~**c.** Set grade check stakes at 100 foot (20 m) intervals for bottoms of subgrade treatments. Set the stakes on centerline for two-lane roads and in the median for four-lane roads. Mark grade check stakes with a lath. Clearly mark the lath with the station location and cut or fill information.~~

~~**d.** Set finish grade stakes (blue tops) at 100 foot (20 m) intervals, or less if needed. Set the blue tops at each shoulder line and at each point where there is a change in cross slope. Mark blue tops with a wood hub and a stake chaser or similar type tassel.~~

2) ~~**e.**~~ Take original and final elevations of all borrows. Provide original and final graphical cross sections at 100 foot (20 m) intervals, or less if needed, suitable for use by the Engineer to calculate excavation quantities.

3) ~~**f.**~~ Set bridge berm slope stakes to establish all transitions, including the face of the berm. Set finish grade stakes (blue tops) on all roadway shoulder lines and roadway centerlines to project down the face of the bridge berm at the top, face of berm bench, and toe.

4) ~~**g.**~~ When Class 12 excavation is an item, take cross section elevations at 100 foot (20 m) intervals, or less if needed, and plot cross sections for use by the Engineer to calculate the excavation quantities.

5) ~~**h.**~~ Use a lath to locate, on each side of roadway at the right-of-way line, agricultural drain tile shown in the contract documents. Clearly mark lath to show station location, distance from centerline, tile size and type, and flowline elevation.

b. For areas constructed without Automated Machine Guidance (AMG):

7) Set slope stakes at 100 foot (20 m) intervals, or less if needed, for all embankment and excavation work including roadway, channel changes, and borrow areas. Interpolations may be necessary to match the cross-sections. Set the stakes at the toe of the foreslope or the top of the backslope, or both. Mark slope stakes with a flat and lath. Clearly mark the flat with the station location, distance, slope, and cut/fill information.

8) Set grade check stakes at 100 foot (20 m) intervals for bottoms of subgrade treatments. Set the stakes on centerline for two-lane roads and in the median for four-lane roads. Mark grade check stakes with a lath. Clearly mark the lath with the station location and cut or fill information.

9) Set finish grade stakes (blue tops) at 100 foot (20 m) intervals, or less if needed. Set the blue tops at each shoulder line and at each point where there is a change in cross slope. Mark blue tops with a wood hub and a stake chaser or similar type tassel.

c. For areas constructed with AMG:

1) Establish the elevation of secondary control points using differential leveling from the project benchmarks, forming closed loops. Provide a copy of all new control point information to the Engineer prior to construction activities. The Contractor is responsible for all errors resulting from their efforts. Correct all deficiencies to the satisfaction of the Engineer at no additional cost to the Contracting Authority.

6) Set hubs at the top of the finished subgrade at all hinge points on the cross section at 1000 foot (300 m) intervals on mainline and at least two cross sections on the side roads and ramps. Establish these hubs, using plan typicals and cross sections, for use by the Engineer to check the accuracy of the construction.

7) Provide grade stakes at critical transition points such as, but not limited to, PC's, PT's, super elevation points, and other critical points required for the construction of drainage and roadway structures.

Replace article 2526.03, A, 9. Pavements (PCC & HMA) with the following:

9. Pavements (PCC & HMA).

a. General ~~Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of the pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark the flat with the station location, cut/fill information, and offset distance to the edge~~

~~of pavement. Include pavement cross slope information in superelevated curves.~~

1) **~~b.~~** Take elevations of pavement centerline and both edges at bridges and existing pavement at 10 foot (3 m) intervals for 100 feet (30 m). Adjust the profile grade to provide a smooth transition, and ~~S~~submit final elevations to the Engineer for approval.

2) **~~c.~~** When a new profile grade is not included in the contract documents:

a) **~~1)~~** Obtain elevations of the existing shoulders and/or pavement at 100 foot (30 m) intervals on straight and level sections and at 50 foot (10 m) intervals on horizontal and vertical curves.~~as stated in Article 2526.03, A, 9.~~

b) **~~2)~~** Design a smooth profile grade line based on these elevations to provide the required pavement or shoulder thickness as detailed in the contract documents. This grade line shall tie into existing bridges, adjacent pavement and ramps, and provide the required pavement crown. Submit this proposed grade line to the Engineer for approval.

f. For areas constructed without Automated Machine Guidance (AMG):

1) Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of the pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark the flat with the station location, cut/fill information, and offset distance to the edge of pavement. Include pavement cross slope information in superelevated curves.

g. **For areas constructed with AMG:**

1) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot (150 m) intervals on each side of the pavement. Furnish x,y,z coordinates and station offset information for each point.

2) Set paving hubs with cut/fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.

Replace article 2526.03, A, 11. PCC Overlays with the following:

11. PCC Overlays

a. General ~~Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with the station location, cut/fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.~~

1) **~~b.~~** Take elevations of pavement centerline and both edges at bridges and existing pavement at 10 foot (3 m) intervals for 100 feet (30 m). Adjust the profile grade to provide a smooth transition, and ~~S~~submit final elevations to the Engineer for approval.

2) **~~c.~~** When a new profile grade is not included in the contract documents:

a) **~~1)~~** Obtain elevations of existing pavement at centerline and both pavement edges for bonded overlays and projects including mainline stress relief course and/or pavement scarification.

b) **~~2)~~** Obtain elevations of existing pavement at centerline, quarter points, and both pavement edges for unbonded overlays and whitetopping projects when a stress relief course and/or pavement scarification are not included.

c) **~~3)~~** Obtain elevations at 100 foot (30 m) intervals on straight and level sections and at 50 foot (10 m) intervals on horizontal and vertical curves.

d) **~~4)~~** Design a smooth profile grade line based on these elevations to provide the required pavement or shoulder thickness as detailed in the contract documents. This grade line shall tie into existing bridges, adjacent pavement and ramps, and provide the required pavement crown. This proposed grade line shall be submitted to the Engineer for approval.

3) **~~d.~~** Reference and preserve existing control points located at each Point of Intersection (P.I.).

4) **~~e.~~** Obtain Engineer's approval for method used to reference points.

5) **~~f.~~** Reset Control Points after work is complete.

b. For areas constructed without AMG:

1) Mark locations and elevations with metal pin or tack in a wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. Clearly mark flat with the station location, cut/fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.

c. **For areas constructed with AMG:**

1) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot (150 m) intervals on each side of the pavement. Furnish x,y,z coordinates and station offset information for each point. **2)** Set paving hubs with cut/fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.					
Reason for Revision: To incorporate both the GPS Grading DS-12037 and PCC Paving 3-D Machine Control DS-12025 into the Standard Specifications. The intent with these changes is to allow AMG to be used any time the contractor chooses. It will also be permitted regardless of who is responsible for survey on the project.					
County or City Input Needed (X one)			**Yes**	**No** x	
Comments: None					
Industry Input Needed (X one)			**Yes** X	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes** X	**No**
Comments: Sent to Ia.AGC and ICPA. Received comments were addressed in this spec revision.					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder	**Office:** Materials	**Item 2**
Submittal Date: March 29, 2013	**Proposed Effective Date:** Oct 2013	
Section No.: 2303 **Title:** Flexible Pavement	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text:

2303.02, C, 6.

Replace Note 2 of Table 2303.02-1:

Certified RAP meeting Type A quality for alumina per Section 4127 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.

2303.03, C, 2, b, 2.

Replace the last sentence:

Tack coat may be diluted with water up to 1:1 to improve application.

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

Replace the Article:

1) When PWL is used for Class I field voids acceptance ~~and placement of the lot results in the formation of a longitudinal joint(s) matching one or more lanes~~, obtain and test samples ~~taken directly on each joint created.~~ 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 the random core locations determined for the field voids lot, the Engineer will randomly select four of these locations to be sampled for joint density. ~~At each of the four locations (longitudinal station/milepost), obtain one sample for each longitudinal joint being formed as directed and witnessed by the Engineer. Take samples using a 6-inch (150 mm) diameter bit centered on top of the visible line between the two lanes.~~

3) ~~Do not sample when matching new paving to pre-existing lanes.~~ Informational joint cores may be waived by Engineer when conditions are not ideal or conditions are not suitable for continuous paving.

~~**4)** Use the average of all validated Gmm test results from all days corresponding with the cores, when calculating field voids of the joint(s).~~

5) Include results on the daily plant report.

2303.05, G, Hot Mix Asphalt Pavement Samples.

Replace the Article:

1. Payment will be the lump sum contract price for cutting and delivery of HMA Pavement Samples to determine field voids or thickness according to the specifications, when either of these is the responsibility of the Contractor, and elsewhere when required by the contract documents.

2. Payment is full compensation for furnishing all such samples for all courses or items of work, and for delivery of samples as specified in Article 2303.03, D, 5, c.

Comments: The Specifications Section requested to revise Article 2303.03, D, 4, b, 1, b, as it read "concurrently in same operation" which is redundant. The phrase "in same operation" was deleted.

The Specifications Section asked if we should be using "centerline joint" if this applies to all joints between two driving lanes. In this case centerline joint differentiates between edge line joints (between a driving lane and ramp or other auxiliary lane).

Specification Section Recommended Text:

2303.02, C, 6.

Replace Note 2 of Table 2303.02-1:

Certified RAP meeting Type A quality for alumina per Section 4127 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.

2303.03, C, 2, b, 2.

Replace the last sentence:

Tack coat may be diluted with water, up to 1:1, to improve application.

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

Replace the Article:

1) When PWL is used for Class I field voids acceptance ~~and placement of the lot results in the formation of a longitudinal joint(s) matching one or more lanes~~, obtain and test samples ~~taken directly on each joint created.~~ 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 in same operation (cold joint eliminated), take samples centered directly on the visible line between the two lanes.

2) Using the random core locations determined for the field voids lot, the Engineer will randomly select four of these locations to be sampled for joint density. ~~At each of the four locations (longitudinal station/milepost), obtain one sample for each longitudinal joint being formed as directed and witnessed by the Engineer. Take samples using a 6-inch (150 mm) diameter bit centered on top of the visible line between the two lanes.~~

3) ~~Do not sample when matching new paving to pre-existing lanes.~~ Informational joint cores may be waived by Engineer when conditions are not ideal or conditions are not suitable for continuous paving.

~~**4)** Use the average of all validated Gmm test results from all days corresponding with the cores, when calculating field voids of the joint(s).~~

5) Include results on the daily plant report.

2303.05, G, Hot Mix Asphalt Pavement Samples.

Replace the Article:

3. Payment will be the lump sum contract price for cutting and delivery of HMA Pavement Samples to determine field voids or thickness according to the specifications, when either of these is the responsibility of the Contractor, and elsewhere when required by the contract documents.

4. Payment is full compensation for furnishing all such samples for all courses or items of work, and for delivery of samples as specified in Article 2303.03, D, 5, c.

Comments:

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

- **Table 2303.02-1: Allowable RAP Usage**
  Replace Note 2
  Certified RAP meeting Type A quality for alumina per Section 4127 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 sieve from the Engineer's extraction test.

- **2303.03, C, 2, b, 2**
  Replace the last sentence
  Tack coat may be diluted with water to improve application up to 1:1.

- **2303.03, D, 4, b**
  b. Longitudinal Joint Compaction.
  1) When PWL is used for Class I field voids acceptance, obtain and test samples

using a nominal 6-inch (150 mm) diameter bit from the centerline joint as follows:

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

i) Unconfined Edge

Sample such that the entire core is within 6 inches of the unconfined edge.

ii) Confined Edge

Sample such that the entire core is within 6 inches of the visible line between the two lanes.

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

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

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

4) Include results on the daily plant report.

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

~~**1)** When PWL is used for Class I field voids acceptance and placement of the lot results in the formation of a longitudinal joint(s) matching one or more lanes, obtain and test samples taken directly on each joint created.~~

~~2) Using the random core locations determined for the field voids lot, the Engineer will randomly select four of these locations to be sampled for joint density. At each of the four locations (longitudinal station/milepost), obtain one sample for each longitudinal joint being formed as directed and witnessed by the Engineer. Take samples using a 6-inch (150 mm) diameter bit centered on top of the visible line between the two lanes.~~

~~3) Do not sample when matching new paving to pre-existing lanes.~~

~~4) Use the average of all validated Gmm test results from all days corresponding with the cores, when calculating field voids of the joint(s).~~

~~5) Include results on the daily plant report.~~

- **2303.05, G, Hot Mix Asphalt Pavement Samples**

5. Payment will be the lump sum contract price for cutting and delivery of HMA Pavement Samples to determine field voids or thickness according to the specifications, when either of these is the responsibility of the Contractor, and elsewhere when required by the contract documents.

6. Payment is full compensation for furnishing all such samples for all courses or items of work, and for delivery of samples as specified in Article 2303.03, D, 5, C.

Reason for Revisions:

When XRF testing is performed, the +8 is used. Geology is confident all the +8 material used in the test is crushed. It would be conservative to credit the pile with the % of +8 material.

Field dilution of tack coats can be excessive toward the end of the season or as supply of the tack coat depletes.

The longitudinal joint subcommittee between the APAI and DOT has recommended the above changes to alleviate the challenges with determining the Gmm of a core drilled directly on the centerline. In order to collect all the information for 2013 uniformly, the changes are requested to take effective immediately until the October GS goes into effect.

There has been confusion on payment of HMA samples. The intent is to only pay this item when cores are taken and delivered for testing. All other testing is incidental as stated in the first paragraph of 2303.05.

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: Tom Reis / Eric Johnsen	**Office:** Specifications	**Item 3**
Submittal Date: 3/26/2013	**Proposed Effective Date:** October 2013	
Article No.: 2503.03, E **Title:** Tolerances (Storm Sewers) **Article No.:** 2503.03, H **Title:** Cleaning, Inspection, and Testing (Storm Sewers) **Article No.:** 2504.03, J, 1 **Title:** Tolerances (Sanitary Sewers) **Article No.:** 2504.03, L, 3 **Title:** Video Inspection (Storm Sewers)	**Other:**	

Specification Committee Action: Approved with changes.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text:

2503.03, E, Tolerances.

Replace the Article:

~~The following tolerances apply to utilities installed by open trench construction. For trenchless construction, apply Section 2553.~~

1. Ensure horizontal and vertical alignment ~~of gravity sewer lines~~ does not vary from design line and grade at any ~~point along the pipe~~ structure by more than 1% of the inside diameter of the pipe or 1/4 inch (6 mm), whichever is larger.

2. ~~Tolerance is allowed only if design line and grade is sufficient to prevent backslope when tolerance limits are reached.~~ Do not allow horizontal alignment of pipe to vary from design line at any point along pipe by more than 1% of the inside diameter of the pipe.

3. ~~Reverse slope on pipe is prohibited. Remove and reinstall to proper grade.~~ Low spots holding water exceeding the following depths for each pipe size will be considered unacceptable and shall be removed and reinstalled to proper grade.

Table 2504.03-1: Gravity Main Tolerance

Pipe Diameter	Maximum Low Spot Depth
8” (200 mm)	1/2” (13 mm)
10” (250 mm)	1/2” (13 mm)
12” (300 mm)	3/4” (19 mm)
15” (375 mm)	3/4” (19 mm)
18” (450 mm) and larger	5% of Pipe Diameter*

* Measured to the nearest 1/2” (13 mm)

2503.03, H, Cleaning, Inspection, and Testing.

Replace the Article:

Apply Articles 2504.03, L, 1; 2; 3; and 5. Video inspection of storm sewers is not required on Interstate, Primary, State Park, and Institutional Road Projects.

2504.03, J, 1, Gravity Main.

Replace the Article:

~~**a.** Do not allow horizontal and vertical alignment of trenched gravity sewer lines to vary from design line and grade at any point along the pipe by more than 1% of the inside diameter of the pipe or 1/4 inch (6 mm), whichever is larger.~~

~~**b.** This tolerance is allowed for trenched gravity sewer lines only if design line and grade is sufficient to prevent backslope when tolerance limits are reached.~~

~~**c.** Reverse slope on gravity pipe is prohibited. Remove and reinstall pipe to proper grade.~~

Apply Article 2503.03, E.

2504.03, L, 3, a, General.

Replace the Article:

1) Unless otherwise specified in the contract documents, ~~C~~conduct video inspection of all new and rehabilitated sanitary and storm sewers after all backfill and compaction operations are completed, but prior to paving.

2) Notify the Engineer the day prior to inspection so the Engineer may be present during the inspection.

3) ~~Low spots holding water in excess of 1 inch (25 mm) or 5% of the pipe diameter, whichever is less, will be considered unacceptable.~~ Notify Engineer of extent of noncompliance with the low spot depth tolerances.

4) ~~If unacceptable low spots exist, as indicated by standing water during video inspection, remove and replace sewer as necessary and re-inspect.~~ Re-inspect sewers after corrective action has been completed.

Comments: The Office of Construction asked if the sewer tolerances can be kept in Article 2503, E and have a reference to this section in Article 2504.03, J, 1. This is consistent with the Department's use of Section 2503 much more often than Section 2504.

The Office of Construction asked if the Department wanted to require video inspection of storm sewers on our projects. Typically, the Department inspects storm sewer installations during construction and prior to backfill placement. The Committee felt this is adequate and video inspection should not be required. Video inspection of storm sewers has been written out for Interstate, Primary, State Park, and Institutional Road Projects.

Specification Section Recommended Text:

2503.03, E, Tolerances.

Replace the Article:

~~The following tolerances apply to utilities installed by open trench construction. For trenchless construction, apply Section 2553.~~ Apply Article 2504.03, J, 1.

~~**1.** Ensure horizontal and vertical alignment of gravity sewer lines does not vary from design line and grade at any point along the pipe by more than 1% of the inside diameter of the pipe or 1/4 inch (6 mm), whichever is larger.~~

~~**2.** Tolerance is allowed only if design line and grade is sufficient to prevent backslope when tolerance limits are reached.~~

~~**3.** Reverse slope on pipe is prohibited. Remove and reinstall to proper grade.~~

2503.03, H, Cleaning, Inspection, and Testing.

Replace the Article:

Apply Articles 2504.03, L, 1; 2; 3; and 5.

2504.03, J, 1, Gravity Main.

Replace the Article:

a. Do not allow horizontal and vertical alignment ~~of trenched gravity sewer lines~~ to vary from design line and grade at any ~~point along the pipe~~ structure by more than 1% of the inside diameter of the pipe or 1/4 inch (6 mm), whichever is larger.

b. ~~This tolerance is allowed for trenched gravity sewer lines only if design line and grade is sufficient to prevent backslope when tolerance limits are reached.~~ Do not allow horizontal alignment of pipe to vary from design line at any point along pipe by more than 1% of the inside diameter of the pipe.

c. ~~Reverse slope on gravity pipe is prohibited. Remove and reinstall pipe to proper grade.~~ Low spots holding water exceeding the following depths for each pipe size will be considered unacceptable and shall be removed and reinstalled to proper grade.

Table 2504.03-1: Gravity Main Tolerance

Pipe Diameter	Maximum Low Spot Depth
8” (200 mm)	1/2” (13 mm)
10” (250 mm)	1/2” (13 mm)
12” (300 mm)	3/4” (19 mm)
15” (375 mm)	3/4” (19 mm)
18” (450 mm) and larger	5% of Pipe Diameter*

* Measured to the nearest 1/2” (13 mm)

2504.03, L, 3, a, General.

Replace the Article:

1) Unless otherwise specified in the contract documents, ~~C~~conduct video inspection of all new and rehabilitated sanitary and storm sewers after all backfill and compaction operations are completed, but prior to paving.

2) Notify the Engineer the day prior to inspection so the Engineer may be present during the inspection.

3) ~~Low spots holding water in excess of 1 inch (25 mm) or 5% of the pipe diameter, whichever is less, will be considered unacceptable.~~ Notify Engineer of extent of noncompliance with the low spot depth tolerances.

4) ~~If unacceptable low spots exist, as indicated by standing water during video inspection, remove and replace sewer as necessary and re-inspect.~~ Re-inspect sewers after corrective action has been completed.

Comments:

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

Reason for Revision: Requested by SUDAS to make the sewer tolerances consistent.

County or City Input Needed (X one)	**Yes** X	**No**
Comments: Has been approved by all SUDAS Districts.		

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

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Kevin Merryman	**Office:** Construction	**Item 4**
Submittal Date: March 28, 2013	**Proposed Effective Date:** October 2013	
Section No.: 2542 **Title:** Crack and Joint Cleaning and Sealing (Portland Cement Concrete Pavement)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: The Office of Local Systems asked about the use of "sealer" in some parts of the specification. The Office of Construction explained that the product used is joint sealer.

The Specifications Section asked if changes needed to be made to Section 2541, Crack and Joint Cleaning and Sealing (HMA Surfaces). The Office of Construction indicated that with HMA surfaces, the joint sealer is intended to bond and seal the cracks and joints, so no changes are necessary to Section 2541.

Specification Section Recommended Text:

2542, Crack and Joint Cleaning and Sealing (Portland Cement Concrete Pavement)

Replace **the Section:**

Section 2542. Crack and Joint Cleaning and ~~Sealing~~ Filling (Portland Cement Concrete Pavement)

2542.01 DESCRIPTION.

A. Rout or saw and clean random cracks and existing transverse and longitudinal joints in PCC pavement. ~~Seal~~ Fill prepared cracks and joints with an approved sealing material.

B. Crack and joint cleaning and ~~sealing~~ filling is intended to address longitudinal cracking, transverse cracking, and corner breaks. Crack and joint cleaning and ~~sealing~~ filling is not intended ~~to clean or seal~~ for durability ("D") cracking or map cracking. Definitions for these pavement distress types can be found in the 'Distress Identification Manual for the Long-Term Pavement Performance Program' (Publication No. FHWA-RD-03-031, dated June 2003, web address: ~~(~~http://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/reports/03031/03031.pdf).

2542.02 MATERIALS.

A. Use hot poured joint sealer and backer rod that meet the requirements of Article 4136.02.

B. Installation of preformed elastomeric joint seals meeting the requirements of Article 4136.02 may be required in the contract documents. Substitution of elastomeric joint seal material for poured joint sealer material will not be allowed unless specified otherwise in the contract documents.

2542.03 CONSTRUCTION.

A. Equipment.

1. Routing or Sawing Equipment.

a. Use power driven routing or sawing equipment, where required, capable of cutting the cracks to the required dimensions without excessive spalling of the adjacent surface.

b. Use power driven sawing equipment (wet or dry), where required, capable of sawing the sealant

reservoir to the dimensions shown in the contract documents.

2. Water ~~and Abrasive Blasting~~ Cleaning Equipment.

~~a.~~ To remove existing joint sealer, debris, and loose material from the crack or joint, use water cleaning equipment capable of delivering water with a pressure of 2,000 psi (13.8 MPa) from a nozzle.

~~b.~~ ~~Use abrasive blast equipment capable of removing the existing sealant, saw slurry, silt, or other foreign material from the vertical face of the crack or joint to the specified depth. Ensure the equipment leaves a clean, dry, newly exposed concrete surface.~~

3. Air Compressors.

Use air compressors that provide moisture free and oil free air and are of sufficient size to blow sand and other foreign material from the crack or joint prior to placing the sealant material.

4. Equipment for Heating and Placing Sealant Material.

Use an oil jacketed, double boiler type, heating kettle or other thermostatically controlled equipment of a type approved by the Engineer, capable of heating the material to 400°F (205°C) and pumping the material into the prepared crack or joint.

5. Auxiliary Equipment.

Provide auxiliary equipment, such as brooms, scrapers, etc., as necessary to perform the work.

B. Construction.

1. A partial depth finish patch may be required when joints or cracks have edge spalls or other distress greater than 3 inches (75 mm) in width. If not otherwise included as part of the contract work, these areas will be designated by the Engineer as extra work. Construct partial depth finish patches according to Section 2530. ~~Seal~~ Fill joints or cracks less than or equal to 3 inches (75 mm) in width without patching.

2. Clean cracks and joints of existing joint sealer, vegetation, dirt, and all other foreign material to the required depth ~~of the bottom of the backer rod~~. ~~Sand blast the edges throughout the proposed depth of the joint sealer, leaving a clean, dry, newly exposed concrete surface on the vertical edges. This will require two passes of the sand blasting operation for each joint and crack: one pass for each joint or crack edge. Set the angle of approach of the sand blast nozzle to each vertical face of the reservoir to be approximately 30 degrees. The sand blast nozzle shall have a guide which inserts in the joint and assures positive location and directional control of the nozzle.~~

~~3.~~ ~~Perform sand blasting just prior to the application of the joint sealer. When cleaned joints or cracks are contaminated before being sealed, reclean them by sand blast before sealing. Rain will be considered contamination.~~

4. When required, ~~P~~place a backer rod at the bottom of the joint or crack as a bond breaker. Install it dry. If the width of opening exceeds the maximum size available, approved alternates of bond breakers at the bottom of the crack or joint may be used.

5. Widen cracks and joints in partial depth HMA finish patches ~~to 1/2 inch (13 mm), if widening is necessary~~ as needed to allow room for filling of the joint or crack. Extend the cleaning and ~~sealing~~ filling operation across the joint or crack.

6. Prior to placing backer rod (when used) and joint sealer:

- Ensure cracks and joints are dry.
- Use compressed air to blow cracks and joints clean.
-

7. Fill joints and cracks to the level shown in the contract documents.

8. Heat, handle, and apply the sealer material according to the manufacturer's recommendations.

9. ~~Rout or s~~Saw ~~cracks and~~ joints with an average opening of ~~3/8~~ 1/2 inch (~~10~~ 13 mm) or less to ~~provide a minimum sealant reservoir of 3/8 inch (10 mm) in width by a nominal 1/2 inch (13 mm) in depth~~ the full width and depth of the existing joint. Sawed joint should not exceed 1/2 inch (13 mm) in width.

10. Rout or saw cracks ~~and joints~~ with an average opening of ~~3/8~~ 1/2 inch (~~10~~ 13 mm) or less, and place

backer rod to provide a minimum sealant reservoir of ~~3/8~~ 1/2 inch (~~10~~ 13 mm) in width by a nominal 1/2 inch (13 mm) in depth.

11. For cracks and joints with an existing width greater than ~~3/8~~ 1/2 inch (~~10~~ 13 mm), place backer rod to a depth that will provide at least ~~5/8~~ 1/2 inch (~~16~~ 13 mm) clearance above the backer rod for the sealer.

12. Clean cracks and joints of all foreign material to a depth necessary to accommodate the sealer material and the backer rod, ~~to be~~ when used. Ensure backer rod is dry when placed.

C. Traffic Control.

1. When there is a separate item for traffic control, furnish all signs and traffic control devices, such as flaggers, barricades, traffic cones, warning lights, and pilot car signs (when required) according to Section 2528. Erect, maintain, and remove all traffic control devices.

2. Conduct the work on only one lane of the pavement width at a time.

3. Apply Articles 1107.08, 1107.09, and 1108.03.

D. Limitations.

1. When other work is included in the contract, sequence operations in the following order:
- **a.** Undersealing,
- **b.** Longitudinal subdrains,
- **c.** Patching,
- **d.** Installation of retrofit load transfer,
- **e.** Grinding or milling, and then
- **f.** Crack and joint ~~sealing~~ filling.

2. Perform joint and crack ~~sealing~~ filling only when the ambient air and pavement surface temperatures are above 40°F (4°C). When near this minimum temperature, additional air blasting or drying time, or both, may be necessary to assure a satisfactory bond to the joint surfaces.

3. Lanes may be opened to traffic only after the sealer has set sufficiently so it will not pick up under traffic. Blotting material may be applied to the sealer, but only after the sealer surface has set so as to avoid penetration of the blotting material into the sealer.

4. Remove old sealant, other debris, and saw slurry from the pavement surface before the pavement is opened to traffic.

5. Before the pavement is opened to traffic, clean the dry sawed or routed joints or cracks with a stream of air sufficient to remove all dirt, dust, and deleterious material that can adhere to the joint face. Complete this work within 3 hours after the joint or crack has been dry sawed or routed.

6. Clean wet sawed joints using high pressure water immediately after sawing to remove residue produced by the sawing operation.

7. ~~Seal~~ Fill joints and cracks within 5 working days after completion of any sawing or routing or removing old joint sealant material or debris from the crack or joint.

8. Do not perform crack and joint ~~sealing~~ filling after September 30. When joint sealer cannot be placed in an otherwise completed joint or crack prior to this date due to temperature or other conditions, temporarily ~~seal~~ fill these joints or cracks with a joint sealer over the winter shutdown period. Remove this seal and ~~re~~clean and ~~reseal~~ fill the joint or crack according to this specification during the next construction season (at no additional cost to the Contracting Authority).

9. Do not overfill with sealant. Immediately remove sealant placed on the pavement surface.

2542.04 METHOD OF MEASUREMENT.

Measurement will be as follows:

A. Crack and Joint Cleaning and ~~Sealing~~ Filling (PCC Pavement).

1. Miles (kilometers), calculated to the nearest 0.1 mile (0.1 km), of main line pavement and shoulders on which cracks and joints were cleaned and ~~sealed~~ filled. Calculations will be based on the center line distance of main line, two-lane pavement, corrected for main line pavement of more than two lanes, including climbing lanes.

2. Shoulders 4 feet (1.2 meters) or less in width will not be measured separately for payment.

3. At intersections, rest areas, and interchanges designated for cleaning and ~~sealing~~ filling, 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.

4. Between limits for which cleaning and ~~sealing~~ filling is intended for either pavement or shoulders, no deductions will be made for bridges, intersections, or other interruptions where cracks or joints are not to be cleaned and ~~sealed~~ filled.

B. Sealer Material (PCC Pavement).
Pounds (kilograms) of sealer material used in cracks and joints.

2542.05 BASIS OF PAYMENT.
Payment will be the contract unit price as follows:

A. Crack and Joint Cleaning and ~~Sealing~~ Filling (PCC Pavement).

1. Per mile (kilometer) for pavement or shoulders on which the cracks and joints were cleaned and ~~sealed~~ filled.

2. Shoulders 4 feet (1.2 meters) or less in width are incidental to the price bid for Crack and Joint Cleaning and ~~Sealing~~ Filling (PCC Pavement).

3. Payment is full compensation for all labor, equipment, and materials (except for sealer, but including backer rod) for cleaning and ~~sealing~~ filling cracks and joints.

B. Sealer Material (PCC Pavement).

1. Per pound (kilogram). Price is predetermined.

2. Payment is full compensation for furnishing the sealer material only.

C. Partial Depth Finish Patches.
If not included otherwise as part of the contract work, payment for partial depth finish patches designated by the Engineer will be as extra work according to Article 1109.03, B.

Comments:

Member's Requested Change (Redline/Strikeout):

Section 2542. Crack and Joint Cleaning and ~~Sealing~~ Filling (Portland Cement Concrete Pavement)

2542.01 DESCRIPTION.

A. Rout or saw and clean random cracks and existing transverse and longitudinal joints in PCC pavement. ~~Seal~~ Fill the prepared cracks and joints with an approved sealing material.

B. Crack and joint cleaning and ~~sealing~~ filling is intended to address longitudinal cracking, transverse cracking, and corner breaks. Crack and joint cleaning and ~~sealing~~ filling is not intended to clean or seal durability ("D") cracking or map cracking. Definitions for these pavement distress types can be found in the 'Distress Identification Manual for the Long-Term Pavement Performance Program' (Publication No. FHWA-RD-03-031, dated June 2003, web address: (http://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/reports/03031/03031.pdf).

2542.02 MATERIALS.

A. Use hot poured joint sealer and backer rod that meet the requirements of Article 4136.02.

B. Installation of preformed elastomeric joint seals meeting the requirements of Article 4136.02 may be required in the contract documents. Substitution of elastomeric joint seal material for poured joint sealer material will not be allowed unless specified otherwise in the contract documents.

2542.03 CONSTRUCTION.

A. Equipment.

1. Routing or Sawing Equipment.
- **a.** Use power driven routing or sawing equipment, where required, capable of cutting the cracks to the required dimensions without excessive spalling of the adjacent surface.
- **b.** Use power driven sawing equipment (wet or dry), where required, capable of sawing the sealant reservoir to the dimensions shown in the contract documents.

2. Water ~~and Abrasive Blasting~~ Cleaning Equipment.
- ~~**a.**~~ To remove existing joint sealer, debris, and loose material from the crack or joint, use water cleaning equipment capable of delivering water with a pressure of 2,000 psi (13.8 MPa) from a nozzle.
- ~~**b.** Use abrasive blast equipment capable of removing the existing sealant, saw slurry, silt, or other foreign material from the vertical face of the crack or joint to the specified depth. Ensure the equipment leaves a clean, dry, newly exposed concrete surface.~~

3. Air Compressors.
Use air compressors that provide moisture free and oil free air and are of sufficient size to blow sand and other foreign material from the crack or joint prior to placing the sealant material.

4. Equipment for Heating and Placing Sealant Material.
Use an oil jacketed, double boiler type, heating kettle or other thermostatically controlled equipment of a type approved by the Engineer, capable of heating the material to 400°F (205°C) and pumping the material into the prepared crack or joint.

5. Auxiliary Equipment.
Provide auxiliary equipment, such as brooms, scrapers, etc., as necessary to perform the work.

B. Construction.

1. A partial depth finish patch may be required when joints or cracks have edge spalls or other distress greater than 3 inches (75 mm) in width. If not otherwise included as part of the contract work, these areas will be designated by the Engineer as extra work. Construct partial depth finish patches according to Section 2530. ~~Seal~~ Fill joints or cracks less than or equal to 3 inches (75 mm) in width without patching.

2. Clean cracks and joints of existing joint sealer, vegetation, dirt, and all other foreign material to the ~~depth of the bottom of the backer rod~~ required depth. ~~Sand blast the edges throughout the proposed depth of the joint sealer, leaving a clean, dry, newly exposed concrete surface on the vertical edges. This will require two passes of the sand blasting operation for each joint and crack: one pass for each joint or crack edge. Set the angle of approach of the sand blast nozzle to each vertical face of the reservoir to be approximately 30 degrees. The sand blast nozzle shall have a guide which inserts in the joint and assures positive location and directional control of the nozzle.~~

3. ~~Perform sand blasting just prior to the application of the joint sealer. When cleaned joints or cracks are contaminated before being sealed, reclean them by sand blast before sealing. Rain will be considered contamination.~~

4. When required, ~~P~~place a backer rod at the bottom of the joint or crack as a bond breaker. Install it dry. If the width of opening exceeds the maximum size available, approved alternates of bond breakers at the bottom of the crack or joint may be used.

5. Widen cracks and joints in partial depth HMA finish patches ~~to 1/2 inch (13 mm), if widening is necessary~~ as needed to allow room for filling of the joint or crack. Extend the cleaning and ~~sealing~~ filling operation

across the joint or crack.

6. Prior to placing backer rod and joint sealer:
- Ensure cracks and joints are dry.
- Use compressed air to blow cracks and joints clean.

7. Fill joints and cracks to the level shown in the contract documents.

8. Heat, handle, and apply the sealer material according to the manufacturer's recommendations.

9. ~~Rout or s~~Saw ~~cracks and~~ joints with an average opening of ~~3/8~~ ½ inch (1~~0~~3 mm) or less to the full width and depth of the existing joint. ~~provide a minimum sealant reservoir of 3/8 inch (10 mm) in width by a nominal 1/2 inch (13 mm) in depth.~~ Sawed joint should not exceed ½ inch (13 mm) in width. Do not place backer rod in joints ½ inch (13 mm) or less in width, and fill joint completely with sealer material.

10. Rout or saw cracks ~~and joints~~ with an average opening of ~~3/8~~ ½ inch (1~~0~~3 mm) or less, and place backer rod to provide a minimum sealant reservoir of ~~3/8~~ ½ inch (1~~0~~3 mm) in width by a nominal 1/2 inch (13 mm) in depth.

11. For cracks and joints with an existing width greater than ~~3/8~~ ½ inch (1~~0~~3 mm), place backer rod to a depth that will provide at least ~~5/8~~ ½ inch (1~~6~~3 mm) clearance above the backer rod for the sealer.

12. Clean cracks and joints of all foreign material to a depth necessary to accommodate the sealer material and the backer rod~~, to be~~ when used. Ensure backer rod is dry when placed.

C. Traffic Control.

1. When there is a separate item for traffic control, furnish all signs and traffic control devices, such as flaggers, barricades, traffic cones, warning lights, and pilot car signs (when required) according to Section 2528. Erect, maintain, and remove all traffic control devices.

2. Conduct the work on only one lane of the pavement width at a time.

3. Apply Articles 1107.08, 1107.09, and 1108.03.

D. Limitations.

1. When other work is included in the contract, sequence operations in the following order:
- **a.** Undersealing,
- **b.** Longitudinal subdrains,
- **c.** Patching,
- **d.** Installation of retrofit load transfer,
- **e.** Grinding or milling, and then
- **f.** Crack and joint ~~sealing~~ filling.

2. Perform joint and crack ~~sealing~~ filling only when the ambient air and pavement surface temperatures are above 40°F (4°C). When near this minimum temperature, additional air blasting or drying time, or both, may be necessary to assure a satisfactory bond to the joint surfaces.

3. Lanes may be opened to traffic only after the sealer has set sufficiently so it will not pick up under traffic. Blotting material may be applied to the sealer, but only after the sealer surface has set so as to avoid penetration of the blotting material into the sealer.

4. Remove old sealant, other debris, and saw slurry from the pavement surface before the pavement is opened to traffic.

5. Before the pavement is opened to traffic, clean the dry sawed or routed joints or cracks with a stream of air sufficient to remove all dirt, dust, and deleterious material that can adhere to the joint face. Complete this work within 3 hours after the joint or crack has been dry sawed or routed.

6. Clean wet sawed joints using high pressure water immediately after sawing to remove residue produced by the sawing operation.

7. ~~Seal~~ Fill joints and cracks within 5 working days after completion of any sawing or routing or removing old joint sealant material or debris from the crack or joint.

8. Do not perform crack and joint ~~sealing~~ filling after September 30. When joint sealer cannot be placed in an otherwise completed joint or crack prior to this date due to temperature or other conditions, temporarily ~~seal~~ fill these joints or cracks with a joint sealer over the winter shutdown period. Remove this seal and reclean and ~~reseal~~ refill the joint or crack according to this specification during the next construction season (at no additional cost to the Contracting Authority).

9. Do not overfill with sealant. Immediately remove sealant placed on the pavement surface.

2542.04 METHOD OF MEASUREMENT.
Measurement will be as follows:

A. Crack and Joint Cleaning and ~~Sealing~~ Filling (PCC Pavement).

1. Miles (kilometers), calculated to the nearest 0.1 mile (0.1 km), of main line pavement and shoulders on which cracks and joints were cleaned and ~~sealed~~ filled. Calculations will be based on the center line distance of main line, two-lane pavement, corrected for main line pavement of more than two lanes, including climbing lanes.

2. Shoulders 4 feet (1.2 meters) or less in width will not be measured separately for payment.

3. At intersections, rest areas, and interchanges designated for cleaning and ~~sealing~~ filling, 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.

4. Between limits for which cleaning and ~~sealing~~ filling is intended for either pavement or shoulders, no deductions will be made for bridges, intersections, or other interruptions where cracks or joints are not to be cleaned and ~~sealed~~ filled.

B. Sealer Material (PCC Pavement).
Pounds (kilograms) of sealer material used in cracks and joints.

2542.05 BASIS OF PAYMENT.
Payment will be the contract unit price as follows:

A. Crack and Joint Cleaning and ~~Sealing~~ Filling (PCC Pavement).

1. Per mile (kilometer) for pavement or shoulders on which the cracks and joints were cleaned and ~~sealed~~ filled.

2. Shoulders 4 feet (1.2 meters) or less in width are incidental to the price bid for Crack and Joint Cleaning and ~~Sealing~~ Filling (PCC Pavement).

3. Payment is full compensation for all labor, equipment, and materials (except for sealer, but including backer rod) for cleaning and ~~sealing~~ filling cracks and joints.

B. Sealer Material (PCC Pavement).

1. Per pound (kilogram). Price is predetermined.

2. Payment is full compensation for furnishing the sealer material only.

C. **Partial Depth Finish Patches.**
If not included otherwise as part of the contract work, payment for partial depth finish patches designated by the Engineer will be as extra work according to Article 1109.03, B.

Reason for Revision: To update specification language regarding filling of PCC joints and cracks to align with current Department philosophy. The change updates terminology to “filling” of joints and cracks vs. “sealing” of joints and cracks. Past practice for this work required widening and abrasive cleaning of the

existing joint to create a clean face for joint filler to adhere to. This is no longer necessary under the current philosophy. Use of backer rod also has been greatly minimized due to problems with joint/crack deterioration partially caused by the backer rod. Joints will now be completely filled with joint filler where backer rod is not used.

These changes align with current changes to the RR-21 road standard that will go into effect in October 2013.

County or City Input Needed (X one)			**Yes**	**No** X	
Comments:					
Industry Input Needed (X one)			**Yes**	**No**	
Industry Notified:	**Yes** X	**No**	**Industry Concurrence:**	**Yes**	**No**
Comments: ICPA was copied with these changes. No objection is anticipated as they have been in agreement with this philosophy for many years.					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Greg Mulder / Dan Redmond	**Office:** Materials / District 4 Materials	**Item 5**
Submittal Date: 2013.03.29	**Proposed Effective Date:** October 2013 GS	
Section No.: 4109 **Title:** Aggregate Gradation Table (Gradation 36, floodable backfill)	**Other:**	

Specification Committee Action: Approved as recommended.			
Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013
Specification Committee Approved Text: See Specification Section Recommended Text.			
Comments: None.			
Specification Section Recommended Text: **Appendix.** **Replace** Gradation No. 36 of the English and Metric Aggregate Gradation Tables: See attached.			
Comments:			

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

Reason for Revision: For floodable backfill, moving the 100% passing from the No. 8 to the No. 4 sieve will allow the use of additional fine sands without changing compaction characteristics. Some fine sands have minor amounts retained on the No. 8. Gradation 1, which is an even coarser material, works for floodable applications.

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:. See attached gradation table for revision.					

AGGREGATE GRADATION TABLE – ENGLISH

Grad. No.	Section No.	Std. Sieve Size	1½"	1"	3/4"	1/2"	3/8"	#4	#8	#30	#50	#100	#200	
		Intended Use	Percent Passing											*Notes
36	4134 (Natural Sand)	Floodable Backfill						100	~~100~~				0-2	11

AGGREGATE GRADATION TABLE – METRIC

Grad. No.	Section No.	Std. Sieve Size	37.5mm	25mm	19mm	12.5mm	9.5mm	4.75mm	2.36mm	600µm	300µm	150µm	75µm	
		Intended Use	Percent Passing											*Notes
36	4134 (Natural Sand)	Floodable Backfill						100	~~100~~				0-2	11

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Dan Redmond	**Office:** District 4 Materials	**Item 6**
Submittal Date: 2013.03.29	**Proposed Effective Date:** October 2013 GS	
Article No.: 4110.03 **Title:** Quality (Fine Aggregate for PCC)	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

4110.03, Quality.

Replace the Article:

~~**A.**~~ Meet the requirements of Table 4110.03-1:

Table 4110.03-1: Test Limits and Methods

Fine Aggregate Quality	Test Limits	Test Method
Shale and Coal	2.0% (maximum)	Materials I.M. 344
~~Mortar Strength~~	~~6000 psi (41.4 MPa) (minimum)~~	~~Office of Materials Test Method No. Iowa 212~~

~~**B.** The Engineer may require additional mortar strength testing for sources where quality changes.~~

Comments:

Section 4110. Fine Aggregate for Portland Cement Concrete

4110.01 DESCRIPTION.
Natural sands resulting from disintegration of rock through erosional processes. Acquire mineral aggregate from an approved source as described in Materials I.M. 409.

4110.02 GRADATION.
Meet the requirements for Gradation No. 1 of the Aggregate Gradation Table, Article 4109.02.

4110.03 QUALITY.

~~**A.**~~ Meet the requirements of Table 4110.03-1:

Table 4110.03-1: Test Limits and Methods

Fine Aggregate Quality	Test Limits	Test Method
Shale and Coal	2.0% (maximum)	Materials I.M. 344

~~Mortar Strength~~	~~6000 psi (41.4 MPa) (minimum)~~	~~Office of Materials Test Method No. Iowa 212~~

~~**B.** The Engineer may require additional mortar strength testing for sources where quality changes.~~

Reason for Revision: Approval of fine aggregate now rely more on consistency of the fineness modulus (FM) than absolute mortar strength.

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:.					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Tom Reis / Eric Johnsen	**Office:** Specifications	**Item 7**
Submittal Date: 3/26/2013	**Proposed Effective Date:** October 2013	
Article No.: 4149.04, J, 1, b, 2 **Title:** Expansion Bands	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: The metric dimension of the band has been corrected.

Specification Section Recommended Text:

4149.04, J, 1, b, 2, Expansion Bands.

Replace the Article:

a) One-piece band assembly to compress sleeve or extension against manhole and casting surfaces to make a watertight seal.

b) 16 gauge ASTM A 240, Type 304 stainless steel, minimum 1 ~~3/4~~ inch (~~45~~ 25 mm) width, minimum adjustment range of 2 inches (50 mm) more than the manhole inside diameter.

c) ~~Stainless steel locking mechanism of studs and nuts complying with ASTM F 593 and ASTM F 594, Type 304.~~ Positive stainless steel locking mechanism permanently securing band in its expanded position after tightening.

Comments:

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

Reason for Revision: Requested by SUDAS to allow for additional manufacturers chimney seals.

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

Comments: Has been approved by all SUDAS Districts.

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

Comments:

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Tom Reis / Eric Johnsen	**Office:** Specifications	**Item 8**
Submittal Date: 3/26/2013	**Proposed Effective Date:** October 2013	
Article No.: 4150.02, E, 2 **Title:** Tracer System	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:

4150.02, E, 2, a.

Replace the Article:

Tracer Wire: ~~#12 AWG solid single copper conductor~~.

1) ~~**Insulation Material:** Linear low-density polyethylene (LLDPE) installation suitable for direct burial applications.~~
   Solid Single Copper Conductor.
   a) **Size:** #12 AWG.
   b) **Insulation Material:** Linear low-density polyethylene (LLDPE) installation suitable for direct burial applications.
   c) **Insulation Thickness:** 0.045 inches (1 mm), minimum.
2) ~~**Insulation Thickness:** 0.045 inches, minimum.~~
   Bimetallic Copper Clad Steel Conductor.
   a) **Size:** #12 AWG**.**
   b) **Rating:** Direct burial.
   c) **Operating Voltage:** 30 volts.
   d) **Conductivity:** 21%.
   e) **Copper Cladding:** 3% of conductor diameter, minimum**.**
   f) **Insulation Material:** High density polyethylene.
   g) **Insulation Thickness:** 0.030 inches (0.75 mm), minimum.

4150.02, E, 2, d.

Replace the Article:

Splice Kit: Inline resin splice kit with split bolt ~~for~~ (1 kV and 5 kV)~~. Insulates and seals~~ for use with single conductor and unshielded cable splices ~~for~~ in direct bury and submersible applications.

Comments:

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

Reason for Revision: Requested by SUDAS to allow copper clad steel tracer wire.

County or City Input Needed (X one)	**Yes** X	**No**
Comments: Has been approved by all SUDAS Districts.		

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

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Willy Sorenson / Tim Crouch	**Office:** Traffic and Safety	**Item 9**
Submittal Date: 2013.03.29	**Proposed Effective Date:** October 2013 GS	
Section No.: 4186 **Title:** Signing Materials	**Other:**	

Specification Committee Action: Approved as recommended.

Deferred:	**Not Approved:**	**Approved Date:** 4/11/2013	**Effective Date:** 10/15/2013

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: The Office of Local Systems indicated that the counties and cities were in agreement with this revision as the Iowa DOT Sign Shop no longer produces Type I, II, or III signs.

The Office of Contracts asked if there should be a transition period for work zone signs and devices. Work zone signs on Interstate and Primary Highways will have no change, although sheeting used for drums, channelizers, tubular markers, and other traffic control devices will no longer be allowed to use Type III. Work zone signs on other highways can use the same signs as Interstate and Primary or Type IV signs.

Specification Section Recommended Text:

4186.03, A, 3.

Replace Table 4186.03-1:

Table 4186.03-1: Retro Reflective Sheeting Classification

~~Type I~~	~~A medium retroreflective sheeting referred to as "engineering grade". This sheeting is typically enclosed lens glass bead material.~~
~~Type II~~	~~A medium high intensity retroreflective sheeting sometimes referred to as "super engineering grade". This sheeting is typically enclosed lens glass bead material.~~
~~Type III~~	~~A high intensity retroreflective sheeting. This sheeting is typically an encapsulated glass bead retroreflective material.~~
Type IV	A high intensity retroreflective sheeting. This sheeting is typically an unmetalized microprismatic retroreflective element material.
Type VI (Iowa)	A flexible, very high intensity retroreflective sheeting for use on roll-up signs. This sheeti is typically a microprismatic retroreflective material.
Type VII (Iowa)	A prismatic, very high intensity retroreflective sheeting. This sheeting is typically a microprismatic retroreflective material.
Type XI	A prismatic, very high intensity retro reflective sheeting having highest retro reflective characteristics at wide range of distances.

4186.03, B, Utilization of Reflective Sheeting.

Replace the Article:

~~Use Type III or IV sheeting for all signs with white background, unless specified otherwise.~~

1. Permanent Signs and Devices.

a. Meet the following requirements:

1) Type ~~III or~~ IV sheeting is used for all signs with white, green, red, blue, or brown background, unless otherwise specified.

2) Type XI Fluorescent sheeting is used for signs with yellow or yellow-green background.

3) The legend on white, ~~and~~ yellow, and yellow-green signs is fabricated using black nonreflective sheeting that is applied directly, or by silk screening with black opaque ink.

4) The legend on green signs is fabricated using white Type ~~III or~~ IV sheeting that is applied directly.

5) The legend on red signs is fabricated using transparent red ink that is reverse silk screened on white Type ~~III or~~ IV sheeting, or is fabricated using white Type ~~III or~~ IV sheeting that is applied directly on a red Type ~~III or~~ IV sheeting background.

6) The legend on blue and brown signs is fabricated using transparent ink that is reverse silk screened on white Type ~~III or~~ IV sheeting, or white Type ~~III or~~ IV sheeting that is applied directly.

b. Use Type ~~III or~~ IV sheeting for permanent road closure barricades.

2. Work Zone Signs and Devices.

a. Interstate and Primary Highways.

Meet the following requirements:

1) Type VII (Iowa) sheeting is used for all rigid signs with orange backgrounds. The legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink.

2) Type VI (Iowa) sheeting is used for all flexible roll-up signs with orange backgrounds. The legend is fabricated by silk screening with black opaque ink.

3) Type VII (Iowa) sheeting is used for STOP/SLOW paddles. The black legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink on orange Type VII (Iowa) sheeting. The white legend is fabricated using transparent red ink that is reverse silk screened on white Type VII (Iowa) sheeting.

4) Type VII (Iowa) non-fluorescent sheeting is used for barricades, vertical panels, and all other work zone traffic control devices that use premanufactured barricade sheeting.

5) Type VII (Iowa) fluorescent orange and Type ~~III or~~ IV white sheeting is used for drums, 42 inch (1050 mm) channelizers, tubular markers, and all other work zone traffic control devices that use horizontal sheeting.

6) For reboundable traffic control devices, Type ~~III or~~ IV or Type VII (Iowa) sheeting designed for this application is used.

b. Other Highways.

1) Meet the following requirements:

a) Type ~~III or~~ IV sheeting is used for all rigid post mounted signs with orange backgrounds. Unless specified otherwise, Type ~~I or II~~ IV sheeting is used for all skid mounted signs with orange backgrounds. The legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink.

b) Type ~~I or II~~ IV sheeting is used for STOP/SLOW paddles. The black legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink. The white legend is fabricated using transparent red ink that is reverse silk screened on white retroreflective sheeting.

c) Type ~~III or~~ IV sheeting is used for barricades and vertical panels.

d) Type ~~III or~~ IV sheeting designed for reboundable devices is used for reboundable drums, tubular markers, and other reboundable markers.

2) At the Contractor's option, work zone signs and devices using retroreflective sheeting according to Article 4186.03, B, 2, a, above may be used on all other highways.

4186.03, C, Durability of Reflective Sheeting.

Replace Articles 1 and 2:

1. White, yellow, yellow-green, green, red, blue and brown reflective sheeting used for permanent signing and traffic control devices: 3 year outdoor ~~Iowa~~ NTPEP Minnesota test deck exposure at 45 degrees facing south.

2. Orange and White reflective sheeting used for temporary traffic control signing and traffic control devices: 1 year outdoor ~~Iowa~~ NTPEP Minnesota test deck exposure at 45 degrees facing south.

4186.04, Nonreflective Sheeting.

Replace the second bullet:

Color properties are the same as for Type ~~III~~ IV reflective sheeting found in ASTM D 4956.

Comments:

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

4186.03 and 4186.04

Replace the Article:

4186.03 RETRO REFLECTIVE SHEETING.

A. General.

1. Meet the requirements of ASTM D 4956, including supplementary requirements, except when modified in the contract documents or this specification. Comply with Materials I.M. 486.03 for inspection and acceptance of reflective sheeting.

2. Retro Reflective sheeting is to be uniform in color and reflectivity. In a single sign, or traffic control device, variations in color or reflectivity noticeable at a distance of 50 feet (15 m) or more, under daytime or nighttime lighting conditions, is cause for rejection of the sign.

3. Retro Reflective sheeting is classified as shown in Table 4186.03-1.

Table 4186.03-1: Retro Reflective Sheeting Classification

~~Type I~~	~~A medium retroreflective sheeting referred to as "engineering grade". This sheeting is typically enclosed lens glass bead material.~~
~~Type II~~	~~A medium high intensity retroreflective sheeting sometimes referred to as "super engineering grade". This sheeting is typically enclosed lens glass bead material.~~
~~Type III~~	~~A high intensity retroreflective sheeting. This sheeting is typically an encapsulated glass bead retroreflective material.~~
Type IV	A high intensity retroreflective sheeting. This sheeting is typically an unmetalized microprismatic retroreflective element material.
Type VI (Iowa)	A flexible, very high intensity retroreflective sheeting for use on roll-up signs. This sheeting is typically a microprismatic retroreflective material.
Type VII (Iowa)	A prismatic, very high intensity retroreflective sheeting. This sheeting is typically a microprismatic retroreflective material.
Type XI	A prismatic, very high intensity retro reflective sheeting having highest retro reflective characteristics at wide range of distances.

4. For Type VI (Iowa) and Type VII (Iowa) sheeting, meet the requirements of Materials I.M. 486.03. (The I.M. will need to be updated by Materials.)

B. Utilization of Reflective Sheeting.
~~Use Type III or IV sheeting for all signs with white background, unless specified otherwise.~~

1. Permanent Signs and Devices.
a. Meet the following requirements:
1) Type ~~III or~~ IV sheeting is used for all signs with white, green, red, blue, or brown background, unless otherwise specified.
2) Type XI Fluorescent sheeting is used for signs with yellow or yellow-green background.
3) The legend on white~~, and~~ yellow, and yellow-green signs is fabricated using black nonreflective sheeting that is applied directly, or by silk screening with black opaque ink.
4) The legend on green signs is fabricated using white Type ~~III or~~ IV sheeting that is applied directly.
5) The legend on red signs is fabricated using transparent red ink that is reverse silk screened on white Type ~~III or~~ IV sheeting, or is fabricated using white Type ~~III or~~ IV sheeting that is applied directly on a red Type ~~III or~~ IV sheeting background.
6) The legend on blue and brown signs is fabricated using transparent ink that is reverse silk screened on white Type ~~III or~~ IV sheeting, or white Type ~~III or~~ IV sheeting that is applied directly.
b. Use Type ~~III or~~ IV sheeting for permanent road closure barricades.

2. Work Zone Signs and Devices.

a. Interstate and Primary Highways.

Meet the following requirements:

1) Type VII (Iowa) sheeting is used for all rigid signs with orange backgrounds. The legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink.

2) Type VI (Iowa) sheeting is used for all flexible roll-up signs with orange backgrounds. The legend is fabricated by silk screening with black opaque ink.

3) Type VII (Iowa) sheeting is used for STOP/SLOW paddles. The black legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink on orange Type VII (Iowa) sheeting. The white legend is fabricated using transparent red ink that is reverse silk screened on white Type VII (Iowa) sheeting.

4) Type VII (Iowa) non-fluorescent sheeting is used for barricades, vertical panels, and all other work zone traffic control devices that use premanufactured barricade sheeting.

5) Type VII (Iowa) fluorescent orange and Type ~~III or~~ IV white sheeting is used for drums, 42 inch (1050 mm) channelizers, tubular markers, and all other work zone traffic control devices that use horizontal sheeting.

6) For reboundable traffic control devices, Type ~~III or~~ IV or Type VII (Iowa) sheeting designed for this application is used.

b. Other Highways.

3) Meet the following requirements:

e) Type ~~III or~~ IV sheeting is used for all rigid post mounted signs with orange backgrounds. Unless specified otherwise, Type I or II sheeting is used for all skid mounted signs with orange backgrounds. The legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink.

f) Type ~~I or II~~ IV sheeting is used for STOP/SLOW paddles. The black legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink. The white legend is fabricated using transparent red ink that is reverse silk screened on white retroreflective sheeting.

g) Type ~~III or~~ IV sheeting is used for barricades and vertical panels.

h) Type ~~III or~~ IV sheeting designed for reboundable devices is used for reboundable drums, tubular markers, and other reboundable markers.

4) At the Contractor's option, work zone signs and devices using retroreflective sheeting according to Article 4186.03, B, 2, a, above may be used on all other highways.

c. Durability of Reflective Sheeting.

Subject reflective sheeting to the following tests, and at the end of the testing period, ensure it meets the requirements for artificial weathering specified in ASTM D 4956 Section 7.4 and 7.5 and shows no evidence of mildewing or similar disfigurement:

1. **White, yellow, yellow-green, green, red, blue and brown reflective sheeting used for permanent signing and traffic control devices:** 3 year outdoor ~~Iowa~~ NTPEP Minnesota test deck exposure at 45 degrees facing south.
2. **Orange and White reflective sheeting used for temporary traffic control signing and traffic control devices:** 1 year outdoor ~~Iowa~~ NTPEP Minnesota test deck exposure at 45 degrees facing south.

4186.04 NONREFLECTIVE SHEETING.

Meet the following requirements:

- Adhesive and physical properties are the same as for reflective sheeting found in ASTM D 4956.
- Color properties are the same as for Type ~~III~~ IV reflective sheeting found in ASTM D 4956.

Reason for Revision: Make changes to the types of retro reflective sheeting used on traffic signs to match current practice.

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

Comments: Counties and cities may have some comments, if they currently use DOT specifications when purchasing/specifying traffic signs.					
Industry Input Needed (X one)			**Yes**	**No** X	
Industry Notified:	**Yes**	**No**	**Industry Concurrence:**	**Yes**	**No**
Comments:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Willy Sorenson / Zachary Abrams	**Office:** Traffic and Safety	**Item 10**
Submittal Date: 2013.03.08	**Proposed Effective Date:** October 2013	
Article No.: 4186.10, D, 2 **Title:** PSST Post Anchors	**Other:**	

Specification Committee Action: This item was deferred until May.

Deferred: X	**Not Approved:**	**Approved Date:**	**Effective Date:**

Specification Committee Approved Text:

Comments: The Specifications Section asked if the Iowa DOT needed to include specifications on the finish or durability of the PSST post anchor hardware to ensure that we are getting adequate lifespan from the anchors. The Office of Construction and Materials will set up a meeting with the Offices of Traffic and Safety and Design to review this topic.

Specification Section Recommended Text:

4186.10, D, 2, c, 2, c.

Replace the Article:

Hardware shall meet requirements of ~~Article 4186.09~~ the manufacturer.

Comments:

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

2. PSST Post Anchors.

a. Break-away, soil installation.
42 inch (1065 mm) minimum length, 7 gauge (4.76 mm) heavy duty winged anchor.

b. Break-away, concrete installation.
Posts installed in a concrete island, use a 48 inch (1220 mm) minimum length, 7 gauge (4.76 mm) heavy duty anchor. Core an 8 inch (200 mm) diameter hole through pavement at least 8 inches (200 mm) deep. After placing anchor, fill hole with concrete mix approved by the Engineer and level off top of concrete.

c. Triangular Slip Base Assembly.

1) Ensure design is in accordance with the AASHTO Standards and Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, current edition and meets or exceeds NCHRP Report 350 or the AASHTO MASH criteria for any assembly system evaluated after January 1, 2011 and be FHWA accepted.

2) Triangular Slip Base Assembly consists of four parts: one-piece anchor, top half slip base, hardware, and concrete foundation.

a) One-piece anchor shall meet the following requirements:

- Anchor shall have a triangular slip plate (1 inch (25 mm) thick) welded directly to anchor leg.
- Anchoring portion shall be 3 inches (75 mm) square 7 gauge (4.76 mm) material and 42 inches (1065 mm) long.
- Galvanize by hot dip process, complying with ASTM A 123, grade 85.

b) Top-half slip base shall meet the following requirements:

- Cast unit from Ductile Iron meeting ASTM A 536 Class 65-45-12.
- Top half slip base shall have a triangular dimension to match 8 inch (200 mm) standard triangular slip plate, and shall receive 2.5 inch (63 mm) square sign support.

c) Hardware shall meet requirements of ~~Article 4186.09.~~ the manufacturer.

d) Concrete Footings: Apply Section 2403.

Reason for Revision: It is imperative that the hardware used on any slip base system be the equivalent of what has been accepted for the slip base per the manufacturer's FHWA letter.

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:					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Tom Reis / Eric Johnsen	**Office:** Specifications	**Item 11**
Submittal Date: 3/29/2013	**Proposed Effective Date:** July 16, 2013	
Article No.: **Title:**	**Other:** Developmental Specifications for Precast Noise Wall	

Specification Committee Action: Deferred to the May meeting.

Deferred: X	**Not Approved:**	**Approved Date:**	**Effective Date:**

Specification Committee Approved Text:

Comments: The Offices of Bridges & Structures and Construction & Materials are reviewing the DS to eliminate some of the language on concrete drilled shafts that is already included in the Standard Specifications.

Specification Section Recommended Text: See attached Draft Developmental Specifications for Precast Noise Wall

Comments: This is an update of DS-09007, Precast Noise Wall, which also incorporates SP-09060, Concrete Drilled Shaft - Noise Wall, into one specification.

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

Reason for Revision:

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
PRECAST NOISE WALL

Effective Date
July 16, 2013

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.

A. Construct and install precast noise wall units according to this specification and the contract documents.

B. Noise walls are precast concrete panels held in place by columns placed on concrete drilled shafts used to reduce noise pollution.

12XXX.02 MATERIALS.

A. Precast Noise Wall Panels and Columns.
Construct according to Materials I.M. 445.06. Manufacturer shall be approved per Materials I.M. 445.06, Appendix A.

B. Concrete Drilled Shafts.

1. Slurry.

a. Use only mineral or polymer slurries in the drilling process unless the Engineer approves, in writing, other drilling fluids. Ensure percentage and specific gravity of material used to make suspension is sufficient to maintain stability of excavation and to allow proper concrete placement. In the event of a sudden significant loss of slurry to the excavation, stop foundation construction until Engineer has approved either: 1) methods to stop slurry loss; or 2) an alternate construction procedure.

b. Perform all tests at a slurry temperature of 40°F (4°C) or higher.

c. Thoroughly premix mineral slurry or polymer slurry with clean, fresh water. Mix for the adequate time (as prescribed by the manufacturer) allotted for hydration in slurry tanks. Adequate capacity slurry tanks are required for slurry circulation, storage, treatment, and disposal. No excavated slurry pits will be allowed. Prior to introduction into the shaft excavation, draw sample sets from slurry tanks and test samples for conformance with specified material properties. A sample set consists of samples taken at mid-height and within 2 feet (0.6 m) of bottom of slurry tanks.

d. In Engineer's presence, sample and test slurry, unless directed otherwise. Record date, time, persons' names sampling and testing the slurry, and the test results. Submit a copy

of test results to Engineer at completion of each shaft, and during construction of each shaft when Engineer requests.

e. During shaft excavation, take and test sample sets of all slurry, composed of samples taken at mid-height and within 2 feet (0.6 m) of bottom of shaft, as necessary to verify control of slurry properties. As a minimum, take and test sample sets at least once every 2 hours after beginning slurry use. When test results show consistent specified properties, take and test sample sets at least once every 4 hours of slurry use. When tests show sample sets do not have consistent specified properties, either recirculate slurry or agitate it with drilling equipment.

f. When samples are found to be unacceptable, either clean, recirculate, desand, or replace slurry to maintain required slurry properties. Do not begin cleaning bottom of excavation and placing concrete until after tests show the sample sets have consistent specified properties.

g. Demonstrate to Engineer's satisfaction that stable conditions are being maintained. If Engineer determines stable conditions are not being maintained, immediately take action to stabilize shaft. Submit revised installation plan which corrects the problem and prevents future instability. Do not continue with shaft construction until receiving Engineer's approval of revised shaft installation plan.

1) Mineral Slurry.

Ensure mineral slurry complies with Table DS-12XXX.02-1:

Table DS-12XXX.02-1: Mineral Slurry Requirements

Property	Test Method	Requirements
Density (lb/ft^3 (kg/m^3))	Slurry Density Materials I.M. 387	64 to 75 (1030 to 1200)
Viscosity (sec/gal (sec/L))	Marsh Funnel and Cup Materials I.M. 387	104 to 201 (27.5 to 53)
pH	pH Paper	8 to 11
Sand Content (%)	Sand Content Test Materials I.M. 387	*
* Sand content of mineral slurry prior to placing the reinforcing steel cage and immediately prior to placing concrete less than or equal to 4.0%.		

2) Polymer Slurry.

a) For polymer slurry use, comply with manufacturer's recommendations and this specification. Submit to Engineer the name and telephone number of manufacturer's representative. Manufacturer's representative shall provide technical assistance in the use of polymer slurry as needed.

b) Ensure polymer slurry complies with Table DS-12XXX.02-2:

Table DS-12XXX.02-2: Polymer Slurry Requirements

Property	Test Method	Requirements
Density (lb/ft^3 (kg/m^3))	Slurry Density Materials I.M. 387	62 to 63 (995 to 1010)
Viscosity (sec/gal (sec/L))	Marsh Funnel and Cup Materials I.M. 387	136 to 227 (36 to 60) 231 to 252 (61 to 66.5) (dry sand/gravel)
pH	pH Paper	8 to 11
Sand Content (%)	Sand Content Test Materials I.M. 387	*
* The sand content of polymer slurry prior to placing the reinforcing steel cage and immediately prior to placing concrete less than 2.0%.		

c) Wait 30 minutes after last drilling and scouring to allow contaminants to settle out before taking and testing a sample set of slurry. After reinforcing steel cage is placed in excavation, take and test a sample set of slurry immediately prior to concrete placement.

2. Concrete.
Comply with the following:
- **a.** Materials, proportioning, air entraining, mixing, slump, and transporting of PCC shall be according to Section 2403 of the Standard Specifications, except as modified herein.
- **b.** Water/cement ratio: not to exceed 0.45.
- **c.** Drilled shaft construction: use Class D PCC mixture with a slump of 8 inches ±1.5 inches (200 mm ±40mm).
- **d.** Portland cement: meet requirements of ASTM C 150 Type I / II and Section 4101 of the Standard Specifications.
- **e.** Air entrainment: apply Section 2403 of the Standard Specifications.
- **f.** Mid-range water reducer is required according to Materials I.M. 403.
- **g.** Retarder is required according to Materials I.M. 403 to maintain workable concrete.
- **h.** Do not use GGBFS.

3. Grout.
Apply Materials I.M. 388.

12XXX.03 CONSTRUCTION.

A. Concrete Drilled Shaft.

1. Construction Tolerances.
Drilled shaft excavations and completed shafts not constructed within required tolerances will be considered unacceptable. Correct unacceptable shaft excavations and completed shafts to Engineer's satisfaction. Furnish materials and work necessary, including engineering analysis and redesign, to complete corrections for out of tolerance drilled shaft excavations (without either additional cost to the Contracting Authority or an extension of completion dates of the project).
- **a.** Ensure drilled shaft is within 3 inches (75 mm) of plan position at top of shaft.
- **b.** Ensure vertical alignment of shaft excavation does not vary from plan alignment by more than 1/4 inch/foot (20 mm/m of depth).
- **c.** Set full depth reinforcing steel cages at no less than 6 inches (150 mm) above bottom of excavated shaft prior to concrete placement.
- **d.** Ensure that, after all the concrete is placed, the top of reinforcing steel cage is no more than 6 inches (150 mm) above and no more than 2 3/4 inches (70 mm) below plan position.
- **e.** Casing dimensions are subject to American Pipe Institute tolerances applicable to regular steel pipe.
- **f.** Top elevation of shaft may have a tolerance of plus 1 inch (25 mm) or minus 3 inches (75 mm) from plan top of shaft elevation. Ensure sufficient reinforcement bar splice length for splices above the shaft.
- **g.** Use excavation equipment and methods that ensure completed shaft excavation will have a planar bottom. Ensure excavation equipment cutting edges are normal to equipment's vertical axis within a tolerance of 3/8 inch/foot (30 mm/m) of diameter.

2. Control and Disposal of Materials.
Dispose of excavated material, as well as slurry and/or water removed from shaft excavation. Collect and properly dispose off site all slurry and water displaced during final cleaning and concrete placement. Open pits for collection of materials will not be allowed. Control all excavated material, slurry, water, and other matter so that at no time it enters or encroaches upon the adjacent travel lanes, railroad, water ways, and so forth.

3. Shaft Excavation.

a. General.

1) Construct drilled shafts by either the wet, dry, or casing method as necessary to produce sound, durable concrete foundation shafts free of defects. These methods are described below.

2) Remove surface and subsurface obstructions. Special tools and/or procedures may be required. No separate payment will be made for removing obstructions.

3) If Engineer determines that material encountered during excavation and/or present at tip elevation is unsuitable and/or differs from that anticipated in the design of the drilled shaft, extend the drilled shaft tip elevations.

4) Maintain a drilling log during shaft and socket excavation. In the log, place information such as elevation, depth of penetration, drilling time in each strata, material description, and remarks. Furnish two copies of the log (signed by Contractor) to Engineer within 1 week after completion of the excavation.

5) After shaft excavation has been completed, immediately proceed with shaft construction.

b. Wet Method.

1) Consists of:

- Keeping shaft filled with slurry a minimum of 4 feet (1.3 m) above highest expected water table during drilling and excavation,
- Desanding of slurry when required,
- Final cleaning of excavation by means of a bailing bucket, air lift, pump or other approved device, and
- Placing shaft concrete which displaces the slurry.

2) In the event that layers susceptible to cave-ins are encountered which cannot be controlled by slurry, install temporary removable casing according to Article 2433.03, D, 3 of the Standard Specifications.

c. Dry Method.

1) Consists of:

- Drilling the shaft excavation,
- Removing accumulated water and loose material from the excavation,
- Placing reinforcing cage, and
- Concreting shaft in a relatively dry excavation.

2) Use only at sites where:

- Ground water level and soil and rock conditions are suitable to permit construction of shaft in a relatively dry excavation, and
- Engineer can visually inspect sides and bottom of shaft prior to placing concrete.

3) Engineer will approve dry method only if shaft excavation demonstrates:

- Less than 12 inches (0.305 m) of water accumulates above base over a 1 hour period when no pumping is permitted,
- Sides and bottom of the hole remain stable without detrimental caving, sloughing, or swelling between completion of excavation and concrete placement, and
- All loose material and water can be satisfactorily removed prior to inspection and concrete placement (less than 3 inches (75 mm) of water will be permitted in the bottom of the shaft excavation at the time of concrete placement).

4) Use the wet or casing method for shafts that do not meet the dry method requirements.

d. Casing Method.

1) Used to advance the hole through unstable material. Over-reaming to the outside diameter of the casing may be required. Before the casing is to be removed, the level of fresh concrete shall be a minimum of 5 feet (1.5 m) above the bottom of the casing so fluid trapped behind casing is displaced upward. As casing is withdrawn, maintain concrete level so fluid trapped behind casing is displaced upward without contamination or displacing shaft concrete.

2) Determine appropriate depth to terminate temporary casing to ensure stability of shaft. The purpose of the temporary casing is to stabilize shaft walls during drilling to prevent cave-ins as the result of potential vibrations. The purpose of casing is also to prevent shaft installation procedures from having an impact on adjacent structures, railroads, and so forth.

3) Permanent casing, if required, will be specified in the contract documents.

4. Final Cleaning.

a. If a slurry cake builds up on shaft sidewalls, remove it prior to concrete placement (at no additional cost to Contracting Authority). If mineral slurry is used, ream shaft sidewalls above rock socket reamed prior to placement of reinforcement. Adjust operations so the maximum time the slurry is allowed to remain in the shaft is 24 hours.

b. Clean base of each shaft so a minimum of 50% of base will have less than 1/2 inch (15mm) of sediment at time of concrete placement. Ensure maximum sediment or debris depth at base of shaft does not exceed 1 inch (25mm).

c. Engineer will visually inspect dry shafts.

d. For slurry shafts, Engineer will check cleanliness of bottom of shaft with a weighted tape.

5. Excavation Inspection.

Provide equipment for checking dimensions and alignment of each shaft excavation. Under the direction of the Engineer, verify dimensions and alignment of shaft under construction. After final cleaning, use a suitable weighted tape or other approved methods to measure final shaft depths.

6. Reinforcing Steel Cage Construction and Placement.

a. Assemble reinforcing steel cage (consisting of longitudinal bars, ties, cage stiffener bars, spacers, cage centering devices, and other necessary appurtenances). Place steel cage immediately after shaft excavation has been inspected and accepted, and prior to concrete placement. If Engineer approves, reinforcing steel cage may be placed as two approximately equal units joined together in the shaft excavation.

b. Ensure reinforcing steel in the shaft is tied at intersections and supported so the reinforcing steel will remain within allowable tolerances given in this specification. Use concrete spacers or other approved non-corrosive spacing devices at sufficient intervals near the top and bottom, and at intervals not exceeding 10 feet (3 m) along shaft, to ensure concentric spacing for entire cage length. Ensure spacers are:

- Constructed of approved material equal in quality and durability to the concrete specified for the shaft.
- Of adequate dimension to ensure a minimum distance of 3 inches (75 mm) between cage and the excavated hole.

c. When a full depth reinforcing steel cage is used, support it at the bottom using approved cylindrical feet to ensure the bottom of the cage is maintained at the proper distance above the base. When a partial depth reinforcing steel cage is used, design and furnish a support system.

d. Check elevation of top of steel cage before and after concrete is placed. If reinforcing cage is not maintained within specified tolerances, make necessary corrections to the satisfaction of the Engineer. Do not construct additional shafts until after modifying the reinforcing cage support in a manner satisfactory to the Engineer.

7. Concrete Placement.

a. General.

1) Place shaft concrete within 24 hours of the start of excavation of rock socket. Place concrete as soon as possible after placing reinforcing steel.

2) Coordinate concrete batching and delivery with the batch plant the time limits, as stated in the contract documents, between batching and delivery are not exceeded.

3) Place concrete in a continuous manner. Continue concrete placement after shaft excavation is full until good quality concrete is evident at top of shaft.

4) Before continuing with column construction, remove a sufficient volume of concrete to ensure elimination of contaminated concrete at top of shaft.
5) Place concrete through either a tremie or concrete pump.
6) Complete placement of concrete in the shaft within 3 hours. Adjust admixtures, when approved for use, for conditions encountered on the job so concrete remains in a workable plastic state throughout the 3 hour placement limit.
7) For construction of shafts larger than 6 feet (2 m) in diameter, Contractor may propose a placement time in excess of 3 hours provided the Contractor submits trial mix documentation that concrete in the shaft will retain a minimum 4 inch (100 mm) slump for entire placement period.
8) Remove temporary casing.

b. Concrete Placement by Tremie:

1) Comply with the following:
- Constructed so it is watertight and will readily discharge concrete.
- No more than 12 inches (300 mm) in diameter.
- No aluminum parts in contact with concrete.
- Discharge end of tremie constructed to prevent water or slurry intrusion and permit free flow of concrete during placement operations.
- Sufficient mass so it will rest on shaft bottom before start of concrete placement.
- Sufficient length to extend to bottom of shaft.

2) Maintain discharge orifice between 5 feet and 10 feet (1.5 m and 3.0 m) below surface of the fluid concrete.
3) Support tremie so it can be raised to increase discharge of concrete and lowered to reduce discharge of concrete.
4) Maintain continuous flow of concrete. Ensure concrete in tremie maintains a positive pressure differential at all times to prevent introduction of air pockets or contaminants into the concrete.

c. Concrete Placement by Pump.

1) Concrete pumps and lines may be used for concrete placement. Use minimum 4 inch (100 mm) diameter pump lines constructed with watertight joints. Do not begin concrete placement until the pump line discharge orifice is at the shaft base elevation.
2) Use a plug or similar device to separate the concrete from fluid in the hole until pumping begins. Either remove the plug from the excavation, or use a plug of a material approved by the Engineer which will not be a detriment to the shaft if not removed.
3) Maintain discharge orifice between 5 feet and 10 feet (1.5 m and 3.0 m) below surface of fluid concrete. When lifting pump line during concreting, temporarily reduce line pressure until orifice has been repositioned at a higher level in the excavation.
4) Perform pumping operation in a manner that prevents introduction of air pockets into the concrete. If breaking the pump line is required, temporarily position discharge orifice 3 feet to 5 feet (1.0 m to 1.5 m) below surface of fluid concrete in the hole. Contractor may propose additional methods to eliminate introduction of air into the concrete.

B. Precast Noise Wall.

1. Placing Concrete Columns.

a. The concrete columns can be pushed into plastic shaft concrete a maximum of 5 feet (1.5 m).

b. Confirm correct location of reinforcing steel cage after removal of temporary casing and before setting concrete column in plastic shaft concrete.

c. Vibrate around the embedded concrete columns to consolidate plastic concrete without causing segregation.

2. Placing Wall Panels.

Place wall panels between concrete columns per manufacturer's instructions.

12XXX.04 METHOD OF MEASUREMENT.

Quantity of Precast Noise Wall will be the quantity, in square feet (square meters), shown in the contract documents.

12XXX.05 BASIS OF PAYMENT.

For the number of square feet (square meters) of Precast Noise Wall shown in the contract documents, Contractor will be paid the contract unit price per square foot (square meter). This payment is full compensation for furnishing and erecting precast noise wall, including panels, columns, and concrete drilled shafts according to the contract documents.