Iowa Department of Transportation

MINUTES
OF
IOWA D.O.T. SPECIFICATION COMMITTEE MEETING

June 11, 2009

Members Present:	John Adam	Statewide Operations Bureau
	Jim Berger	Office of Materials
	Roger Bierbaum	Office of Contracts
	Donna Buchwald	Office of Local Systems
	Eric Johnsen, Secretary	Specifications Section
	Bruce Kuehl	District 6 - Construction
	Gary Novey	Office of Bridges & Structures
	Dan Redmond	District 4 - Materials
	Tom Reis, Chair	Specifications Section
	John Smythe	Office of Construction
Members Not Present:	Troy Jerman	Office of Traffic & Safety
	Mike Kennerly	Office of Design
Advisory Members Present:	Catherine Nicholas	Black Hawk County
	Lisa Rold	FHWA
Others Present:	Paul Wiegand	SUDAS
	Dan Harness	Office of Design
	Deanna Maifield	Office of Design
	Kevin Merryman	Office of Construction
	Curt Smejkal	FHWA

Tom Reis, Specifications Engineer, opened the meeting. The following items were discussed in accordance with the revised agenda dated June 8, 2009:

1. Article 1102.17, F, Post Construction Requirements.

The Office of Contracts requested a change to require Form 102116 on all Federal-aid contracts regardless of DBE goal.

2. Article 2301.14, Placing Concrete.

The Office of Construction requested a change to clarify that material collected in the paver grout box shall not to be used in the pavement.

3. Article 2310.03, A, Equipment.
Article 2310.03, B, Preparation of Surface.
Article 2310.03, C, 1, c, Joints.
Article 2310.03, C, 2, a, Hot Mix Asphalt Stress Relief Course.
Article 2310.04, D, Pavement Scarification.
Article 2310.05, D, Pavement Scarification.

The Office of Construction requested changes to revise the preparation of surface language, sawing requirements for bonded overlays, and compaction requirements for HMA stress relief course.

4. Article 2407.02, H, Cement.

The Office of Materials requested a change to allow the use of moderate alkali cements in precast and prestressed concrete bridge units.

5. Article 2435.03, A, 4, Installation of Manhole or Intake Structure.

The Office of Contracts requested a change to ensure all structure footings and bases will be below the frostline.

6. Article 2511.04, D, Detectable Warnings for Curb Ramps.
Article 2511.05, D, Detectable Warnings for Curb Ramps.

The Office of Contracts requested changes to method of measurement and basis of payment for Detectable Warnings for Curb Ramps.

7. Article 2513.03, B, Cast-in-Place and Slip Form.

The Office of Materials requested a change to require PCC Level III Certified Technician to oversee development of mix design.

8. Article 2526.01, J, Pavement Overlays (PCC and HMA).
Article 2526.01, K, PCC Overlays.

The Office of Construction requested changes to more thoroughly describe staking requirements and requirements for developing a profile grade when not provided.

9. Article 2528.03, C, 1, b, Cones, Vertical Panels, 42 Inch (1050 mm) Channelizers, Drums, and Tubular Markers.

The Office of Contracts requested a change to allow 42 inch (1050 mm) channelizers in place of drums.

10. DS-01115, Quality Management Concrete (QM-C)

The Office of Construction requested changes to the specifications for QM-C.

11. DS-01130, Mechanically Stabilized Earth (MSE) Retaining Wall

The Office of Materials requested changes in the materials for MSE Retaining Walls to allow moderate alkali cements.

The following items were not included on the revised agenda dated June 8, 2009:

12. 2009 Specification Book Index

The Specifications Section requested to use article numbers in the new specification book index, instead of page numbers. This will save time and effort in future versions when the specification book is published. In many cases, the article number reference will be more effective in guiding users to the applicable information. The Office of Contracts indicated that contractors may not like this, at least initially. Specification Committee approved using article numbers for the 2009 specification book index.

13. Builders Risk Insurance

Black Hawk County inquired if Builders Risk Insurance should be required by the Standard Specifications. The Specification Committee felt it would be more cost effective to develop project specific special

provisions rather than require Builders Risk Insurance on all projects. Local units of government would be allowed to specify Builders Risk Insurance by Special Provision, with a bid item for it.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Roger Bierbaum	**Office:** Contracts	**Item 1**
Submittal Date: May 20, 2009	**Proposed Effective Date:** April 2010	
Article No.: 1102.17, F **Title:** Post Construction Requirements (DBE)	**Other:**	

Specification Committee Action: Approved as is.

Deferred:	**Not Approved:**	**Approved Date:** 6/11/2009	**Effective Date:** 04/20/2010

Specification Committee Approved Text: See Specification Section Recommended Text.

Comments: None.

Specification Section Recommended Text:
1102.17, F, Post Construction Requirements.

Replace the first paragraph:

Prior to receiving final payment, the Contractor shall provide to the Engineer certification of the dollars paid to each DBE firm, using Form 102116, Certification Of DBE Accomplishment. This certificate shall be submitted on all Federal-aid contracts ~~where a DBE performed work~~ and shall list the dollar amounts paid to all DBE firms on the contract. The certification shall be dated and signed by a responsible official legally representing the Contractor. Falsification of this certification will result in suspension of bidder qualifications according to Article 1102.03.

Comments:

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

Strike the following 5 words from the first paragraph of 1102.17, Article F

F. Post Construction Requirements.
Prior to receiving final payment, the Contractor shall provide to the Engineer certification of the dollars paid to each DBE firm, using Form 102116, Certification Of DBE Accomplishment. This certificate shall be submitted on all Federal-aid contracts ~~where a DBE performed work~~ and shall list the dollar amounts paid to all DBE firms on the contract. The certification shall be dated and signed by a responsible official legally representing the Contractor. Falsification of this certification will result in suspension of bidder qualifications according to Article 1102.03.

Reason for Revision: With the current specifications the Office of Contracts doesn't know when they fail to receive a 102116 Certification of DBE Accomplishment form if no DBE firms performed work on the contract or if the project engineer neglected to submit the form. Thus we have to make a contact on each contract we do not receive a 102116 form on. It would make less work for both Contracts and the project engineer if a 102116 form was submitted on all federal aid contracts.

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: John Smythe / Kevin Merryman	**Office:** Construction	**Item 2**
Submittal Date: March 26, 2009	**Proposed Effective Date:** April 2010	
Article No.: 2301.14 **Title:** Placing Concrete	**Other:**	

Specification Committee Action: Approved As is.

Deferred:	**Not Approved:**	**Approved Date:** 06/11/2009	**Effective Date:** 04/20/2010

Specification Committee Approved Text:

2301.14, Placing Concrete.

Add as the fifth paragraph:

Concrete shall be placed and consolidated in a manner that prevents material retained in the grout box of the finishing machine from being incorporated into the pavement. At headers, concrete screeded over the header during finishing shall be removed.

Comments: The Office of Construction indicated that this change should reduce pop-outs, especially in PCC overlays.

Specification Section Recommended Text:

Comments:

Member's Requested Change (Redline/Strikeout):

2301.14 PLACING CONCRETE.

The contract documents will show the width in which it is contemplated that the pavement will be constructed, and unless otherwise shown, the pavement shall be constructed in a single pass.

Pavement constructed using ready mixed concrete shall be placed in single lane widths only and in compliance with the following provisions, unless otherwise permitted by the Engineer. Permission will be based on evaluation of type, quality, and quantity of equipment to be used and its anticipated rate of production.

At the Contractor's option, pavements may be placed in single traffic lane widths under the following conditions:

The Contractor shall submit a proposed plan of operation for the approval of the Engineer. Any additional dowels, tie bars, or extra concrete, required to conform to the approved, modified method of operation, shall be furnished by the Contractor without extra compensation.

The concrete shall be deposited upon the supporting surface in a manner which will minimize segregation and disturbance of reinforcement. Except when welded wire fabric reinforcement is used, concrete shall be deposited to the full depth of the pavement in a single operation. When welded wire fabric is used, Article 2301.12 shall also apply.

The operation of vibrating units shall be substantially as recommended by the manufacturer and in a

manner which complies with the requirements of Article 2301.07, A.

Concrete shall be placed and consolidated in a manner that will prevent material retained in the grout box of the finishing machine from being incorporated into the pavement. At headers, concrete screeded over the header during finishing shall be promptly removed.

Vertical edges of pavements and backs of curbs shall be cured in accordance with Article 2301.19.

All honeycombed areas on pavement edges shall be satisfactorily repaired immediately after removal of forms.

The Contractor shall backfill behind curbs, as directed by the Engineer, to prevent a flow of water in this area and subsequent undermining of pavement.

Reason for Revision: The change clarifies that the material collected in the paver grout box is not to be used in the pavement.

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

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: John Smythe / Kevin Merryman	**Office:** Construction	**Item 3**
Submittal Date: March 26, 2009	**Proposed Effective Date:** April 2010	
Article No.: 2310 **Title:** Portland Cement Concrete Overlay	**Other:**	

Specification Committee Action: Deferred to July meeting.

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

Specification Committee Approved Text:

Comments: Office of Construction suggested adding specification language for Hot Mix Asphalt Stress Relief Course referencing Articles 2303.03, B, 1 and 2303.03, B, 2 for cleaning and tack coat. District 6 Construction would like more clarification on construction of the Hot Mix Asphalt Stress Relief Course. Currently, only the compaction is specified. Specification Section will revise section 2310.03, C, 2, a, Hot Mix Asphalt Stress Relief Course to incorporate any applicable specifications from Section 2303 and bring back to the Specifications Committee for review.

Specification Section Recommended Text:

2310.03, A, Equipment.

Replace the first paragraph:

~~Surface preparation equipment used~~ Equipment used to prepare the existing pavement surface shall be subject to the Engineer's approval and shall comply with the following:

2310.03, B, Preparation of Surface.

Replace the article:

If full depth base repair is included in the project, it shall be completed prior to ~~surface preparation~~ preparation of the existing pavement surface.

~~Surface preparation~~ When required, preparation of the existing pavement shall include the entire ~~surface~~ area to be resurfaced. Materials removed in the preparation operation may be placed in the shoulder area unless otherwise specified in the contract documents.

1. ~~Bonded Overlays~~ Surface Preparation.

For Bonded Overlays, ~~T~~the surface shall be prepared by shot blasting~~,~~ or ~~shall be scarified and followed by either shot blasting or sand blasting~~ scarification. Scarification shall be to a nominal depth of 1/4 inch (5 mm). In either case, the preparation shall ~~be of an extent to~~ remove all dirt, oil, and ~~other~~ foreign materials, as well as ~~any~~ laitance or loose material from the surface and edges against which new concrete ~~is to~~ will be placed.

2. ~~Unbonded Overlays~~ Pavement Scarification.

For unbonded overlays and whitetopping, pavement scarification shall meet the requirements of Section 2214.

When placement of an HMA stress relief layer is included as part of the contract for unbonded overlays, pavement scarification will not be required.

~~When jointing is specified in which panels are smaller than a normal lane width, the entire surface shall be scarified to create a roughened surface. This will not apply when a new HMA~~

~~stress relief layer is constructed as a part of this contract.~~

~~Any h~~High spots ~~found~~ in the existing HMA pavement shall be trimmed at the direction of the Engineer. This work ~~would~~ shall be accomplished during the scarification operation, ~~only~~ at isolated locations, and ~~would~~ shall be considered incidental to ~~the surface preparation~~ pavement scarification.

~~**3. Whitetopping.**~~
~~When jointing is specified in which panels are smaller than a normal lane width, the entire surface shall be scarified using a cold-milling operation to create a roughened surface. Any high spots found in the existing HMA pavement shall be trimmed at the direction of the Engineer. This work would be accomplished during the scarification operation, only at isolated locations, and would be considered incidental to the surface preparation.~~

2310.03, C, 1, c, Joints.

Replace the second paragraph:

Joints shall be sawed in the resurfacing directly over existing ~~transverse~~ joints. ~~Transverse~~ ~~j~~Joints shall be sawed to the full depth of new resurfacing concrete, including depressions created in the existing surface, and as specified in the widening areas. ~~Transverse j~~Joints shall be sawed as soon as possible without causing excessive raveling. ~~Joints shall be sawed directly over existing longitudinal joints to a depth of one-half the overlay thickness, with a maximum depth of 3 inches (75 mm).~~

2310.03, C, 2, a, Hot Mix Asphalt Stress Relief Course.

Replace the paragraph:

Compaction shall be in accordance with Article 2303.03, E, 2, Class ~~1C~~ II Compaction except only static steel wheeled rollers shall be used.

2310.04, D, Pavement Scarification.

Add new article:

1. Measurement by Weight (Mass).
The quantity of Pavement Scarification will be determined in accordance with Article 2214.06, A, 1.

2. Measurement by Area.
The quantity of Pavement Scarification will be determined in accordance with Article 2214.06, A, 2.

2310.04, D, Hot Mix Asphalt Stress Relief Course.

Renumber article:

~~**D**~~ **E, Hot Mix Asphalt Stress Relief Course.**

2310.05, D, Pavement Scarification.

Add a new article:

1. Measurement by Weight (Mass).
The Contractor will be paid the contract unit price for Pavement Scarification in accordance with Article 2214.07, A, 1.

2. Measurement by Area.

The Contractor will be paid the contract unit price for Pavement Scarification in accordance with Article 2214.07, A, 2.

2310.05, D, Hot Mix Asphalt Stress Relief Course.

Renumber article:

~~**D** **E, Hot Mix Asphalt Stress Relief Course.**~~

Comments:

Member's Requested Change (Redline/Strikeout):

2310.03 CONSTRUCTION.

A. Equipment.
~~Surface preparation equipment used~~ Equipment used to prepare the existing pavement surface shall be subject to approval of the Engineer and shall comply with the following:

1. Scarifying or Shotblasting Equipment.
Equipment shall be a power operated, capable of uniformly scarifying or removing the existing surface to depths required in a satisfactory manner. Other types of removal devices may be used if their operation is suitable and if they can be demonstrated to the satisfaction of the Engineer. The contract documents will include a pay item for such work.

2. Sand Blasting Equipment.
Sand blasting equipment shall be capable of removing rust, oil, and concrete laitance from the existing surface of the pavement.

B. Preparation of Surface.
If full depth base repair is included in the project, it shall be completed prior to ~~surface preparation~~ preparation of the existing pavement surface.

~~Surface preparation~~ When required, preparation of the existing pavement shall include the entire ~~surface~~ area to be resurfaced. Materials removed in the preparation operation may be placed in the shoulder area unless otherwise specified in the contract documents.

1. ~~Bonded Overlays~~ Surface Preparation.
For Bonded Overlays, ~~T~~the surface shall be prepared by shot blasting~~,~~ or ~~shall be scarified and followed by either shot blasting or sand blasting~~ scarification. Scarification shall be to a nominal depth of 1/4 inch (5 mm). In either case, the preparation shall be of an extent to remove all dirt, oil, and other foreign materials, as well as any laitance or loose material from the surface and edges against which new concrete is to be placed.

2. ~~Unbonded Overlays~~ Pavement Scarification.
For unbonded overlays and whitetopping, pavement scarification shall meet the requirements of Section 2214.

When placement of a new HMA stress relief layer is included as part of the contract for unbonded overlays, pavement scarification will not be required.

~~When jointing is specified in which panels are smaller than a normal lane width, the entire surface shall be scarified to create a roughened surface. This will not apply when a new HMA stress relief layer is~~

~~constructed as a part of this contract.~~

Any high spots found in the existing HMA pavement shall be trimmed at the direction of the Engineer. This work would be accomplished during the scarification operation, only at isolated locations, and would be considered incidental to the ~~surface preparation~~ pavement scarification.

~~**3. Whitetopping.**~~
~~When jointing is specified in which panels are smaller than a normal lane width, the entire surface shall be scarified using a cold-milling operation to create a roughened surface.~~

~~Any high spots found in the existing HMA pavement shall be trimmed at the direction of the Engineer. This work would be accomplished during the scarification operation, only at isolated locations, and would be considered incidental to the surface preparation.~~

C. Placing and Finishing Overlay.
Section 2317 shall apply to all PCC Pavement bid items of a Primary project if any individual PCC Pavement bid item for that project is 5000 square yards (4200 m^2) or greater. Section 2316 shall apply to all other Primary projects and when specifically required for other projects.

The placing equipment shall be controlled to the proper elevation by string line. Cross sections shall be taken and a grade line established. The Engineer will review and approve the new grade lines. Information detailing the pavement design thicknesses at the various survey points and material quantities will also be provided. During construction, these grades shall not be altered solely to account for concrete overruns. Some overrun is normal and only with approval of the Engineer will they be adjusted.

1. Bonded Overlays.

a. Surface Cleaning.
Prior to placing concrete onto the surface, the entire surface shall be cleaned with an air blast. After cleaning, no traffic will be permitted on the cleaned surface except that necessary for overlay construction.

b. Surface Condition.
The prepared surface shall be dry to allow some absorption of the concrete mortar.

c. Joints.
The exact location of each contraction and expansion joint in the existing pavement and the joint to be sawed at each full depth patch shall be identified on both sides by a reliable method.

Joints shall be sawed in the resurfacing directly over existing ~~transverse~~ joints. ~~Transverse~~ ~~j~~Joints shall be sawed to the full depth of new resurfacing concrete, including depressions created in the existing surface, and as specified in the widening areas. ~~Transverse j~~Joints shall be sawed as soon as possible without causing excessive raveling. ~~Joints shall be sawed directly over existing longitudinal joints to a depth of one-half the overlay thickness, with a maximum depth of 3 inches (75 mm).~~

2. Unbonded Overlays.

a. Hot Mix Asphalt Stress Relief Course.
Compaction shall be in accordance with Article 2303.03, E, 2, Class ~~1C~~ II Compaction except only static steel wheeled rollers shall be used.

b. Surface Cleaning.
The Contractor shall clean the existing surface of all loose or adhering foreign material prior to placement of the PCC over HMA pavement. Normally this will be accomplished with a power broom and shall be

available during paving operations to clean loose material that may be tracked onto the surface by the construction equipment.

c. Surface Condition.
The prepared surface shall be dry when concrete is placed on the surface of the HMA pavement to allow some absorption of the concrete mortar. If the surface of the HMA is above 110ºF (40ºC), the Contractor may apply water to the surface of the HMA ahead of the paving operation in order to cool the surface. The water shall be applied far enough in advance of the paving operation that the surface will dry from evaporation before concrete is placed. No water shall be applied to the surface of the pavement when the HMA surface temperature is below 100ºF (38ºC).

d. Joints.
When jointing is specified in which panels are smaller than a normal lane width, the joints shall be 1/8 inch (3 mm) wide with no cleaning or sealing required.

3. Whitetopping.

a. Surface Cleaning.
The Contractor shall clean the existing surface of all loose or adhering foreign material prior to placement of the PCC over HMA pavement. Normally this will be accomplished with a power broom and shall be available during paving operations to clean loose material that may be tracked onto the surface by the construction equipment.

b. Surface Condition.
The prepared surface shall be dry when concrete is placed on the surface of the HMA pavement to allow some absorption of the concrete mortar. If the surface of the HMA is above 110ºF (40ºC), the Contractor may apply water to the surface of the HMA ahead of the paving operation in order to cool the surface. The water shall be applied far enough in advance of the paving operation that the surface will dry from evaporation before concrete is place. No water shall be applied to the surface of the pavement when the HMA surface temperature is below 100ºF (38ºC).

c. Joints.
When jointing is specified in which panels are smaller than a normal lane width, the joints shall be 1/8 inch (3 mm) wide with no cleaning or sealing required.

D. Limitation of Operations.
At forecasted air temperatures below 55°F (13°C) the opening time shall be determined using the maturity method. Resurfacing concrete shall not be placed when the air or pavement temperature is below 40°F (4°C).

The Contractor will be permitted to use the shoulders for construction activities. It will be the Contractor's responsibility to repair the shoulders at no additional cost as deemed necessary by the Engineer, to restore the shoulders to a condition acceptable for shoulder work. The Contractor may elect to limit the use and vehicle loadings to minimize this work and its cost.

Bonded concrete overlays shall be placed between June 1 and September 30.

Unbonded overlay and whitetopping materials shall not be placed on any HMA when the pavement surface temperature exceeds 120° F (50°C).

2310.04 METHOD OF MEASUREMENT.
The quantity of the various items of work involved in the construction of PCC overlay will be measured by

the Engineer in accordance with the following provisions:

A. Portland Cement Concrete Overlay, Furnish Only.
The quantity of resurfacing concrete furnished will be measured in cubic yards (cubic meters), using a count of batches incorporated. This quantity will include concrete placed in widening sections and partial depth patches.

B. Portland Cement Concrete Overlay, Placement Only.
The quantity of Portland Cement Concrete Overlay, Placement Only, in square yards (square meters), will be the quantity shown in the contract documents. The area of PCC overlay placement will be determined from the longitudinal surface and the nominal pavement width, including widening sections.

C. Surface Preparation.
The quantity of Surface Preparation, in square yards (square meters), will be the quantity shown in the contract documents. The area of surface preparation will be determined from the longitudinal surface and the nominal width of existing pavement.

D. Pavement Scarification

1. Measurement by Weight (Mass).
The quantity of Pavement Scarification will be determined in accordance with Section 2214.06, A, 1.

2. Measurement by Area.
The quantity of Pavement Scarification will be determined in accordance with Section 2214.06, A, 2.

~~D~~E. Hot Mix Asphalt Stress Relief Course.

1. Measurement by Weight (Mass).
When measurement is by weight (mass), the quantity of Hot Mix Asphalt Stress Relief Course will be expressed in tons (megagrams) and determined from the weight (mass) of individual loads, including fillets, measured to the nearest 0.01 tons (0.01 Mg). Loads may be weighed in trucks, weigh hoppers, or from the weight (mass) from batch plants computed by count of batches in each truck and batch weight (mass). Article 2001.07 shall apply.

The asphalt binder will be measured in accordance with Article 2303.05, B.

2. Measurement by Area.
When payment is based on square yards (square meters), the quantity of Hot Mix Asphalt Stress Relief Course, in square yards (square meters), will be the quantity shown in the contract documents.

The quantity of asphalt binder used will not be measured separately for payment.

2310.05 BASIS OF PAYMENT.
For the performance of acceptable work, measured as provided above, the Contractor will be paid the contract unit price in accordance with the following provisions:

A. Portland Cement Concrete Overlay, Furnish Only.
The Contractor will be paid the contract unit price per cubic yards (cubic meters) for Portland Cement Concrete, Furnish Only, as measured above. This payment shall be full compensation for furnishing all

raw materials, and for proportioning, mixing, and delivery of concrete to the paving machine.

B. Portland Cement Concrete Overlay, Placement Only.
The Contractor will be paid the contract unit price per square yard (square meter) for Portland Cement Concrete Overlay, Placement Only. This payment shall be full compensation for furnishing all materials, labor, and equipment necessary to place, finish, texture, and cure the concrete, including the placement of tie bars for widening, if required; sawing, cleaning, and sealing the joints, if required; and surface cleaning.

C. Surface Preparation.
The Contractor will be paid the contract unit price per square yard (square meter) for Surface Preparation. This payment shall be full compensation for preparation of the existing pavement, sandblasting or shot blasting, and for removal of the existing pavement surface material in accordance with Article 1104.08.

D. Pavement Scarification

1. Measurement by Weight (Mass).
The contractor will be paid the contract unit price for Pavement Scarification in accordance with Section 2214.07, A, 1.

2. Measurement by Area.
The contractor will be paid the contract unit price for Pavement Scarification in accordance with Section 2214.07, A, 2.

~~D~~E. Hot Mix Asphalt Stress Relief Course.
The Contractor will be paid for the asphalt binder in accordance with Article 2303.06, B.

1. Measurement by Weight (Mass).
The Contractor will be paid the contract unit price per ton (megagram) for Hot Mix Asphalt Stress Relief Course as measured above. This payment shall be full compensation for furnishing and placing the HMA stress relief course. The Contractor will be paid separately for the asphalt binder in accordance with Article 2303.06, B.

2. Measurement by Area.
The Contractor will be paid the contract unit price per square yard (square meter) for Hot Mix Asphalt Stress Relief Course constructed. This payment shall be full compensation for furnishing and placing the HMA stress relief course, including the cost of the asphalt binder.

Reason for Revision: Revises preparation of surface language to require the Surface Preparation item only for Bonded Overlays and Pavement Scarification for Unbonded Overlays and Whitetopping. Also, revises joint sawing requirements for bonded overlays and compaction requirements for HMA stress relief course.

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

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Jim Berger		**Office:** Materials	**Item 4**
Submittal Date: May 19, 2009		**Proposed Effective Date:** April 2010	
Article No.: 2407.02, H **Title:** Cement		**Other:**	
Specification Committee Action: Approved as is.			
Deferred:	**Not Approved:**	**Approved Date:** 06/11/2009	**Effective Date:** 04/20/2010
Specification Committee Approved Text: See Specification Section Recommended Text.			
Comments: None.			

Specification Section Recommended Text:
2407.02, H, Cement.

Replace entire article:

Unless otherwise specified, Section 4101 shall apply. Type III Portland cement, when authorized, ~~will~~ shall be used in the same proportions ~~as~~ specified for Type I Portland cement. Cement with total equivalent sodium oxide between 0.61% and 0.75% may be used, provided it is non-reactive with the proposed aggregate when tested according to ASTM C 1260, C 1567, or C 1293.

Comments:

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

2407.02, H. Cement.

Unless otherwise specified, Section 4101 shall apply. Type III Portland cement, when authorized, will be used in the same proportions as specified for Type I Portland cement. Cement with total equivalent sodium oxide between 0.61% and 0.75% may be used, provided that it is non-reactive with a proposed aggregate when tested by ASTM C 1260, C 1567, or C 1293.

Reason for Revision: The requirement on using low alkali cement was introduced about a decade ago due to a concern of durability of concrete pavement. Recently, cement producers like to review this requirement due to its cost. Allowing the use of moderate alkali cement based on ASTM test will be more acceptable.

County or City Input Needed (X one)			**Yes**	**No** x	
Comments:					
Industry Input Needed (X one)			**Yes**	**No** x	
Industry Notified:	**Yes** x	**No**	**Industry Concurrence:**	**Yes** x	**No**
Comments: The proposed change will benefit cement industry.					

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Roger Bierbaum	**Office:** Contracts	**Item 5**
Submittal Date: 5-8-09	**Proposed Effective Date:** April 2010	
Article no.: 2435.03, A, 4 **Title:** Installation of Manhole or Intake Structure (Sanitary and Storm Sewer Structures)	**Other:**	

Specification Committee Action: Approved as revised in Specification Committee Approved Text.

Deferred:	**Not Approved:**	**Approved Date:** 6/11/2009	**Effective Date:** 10/20/2009

Specification Committee Approved Text:

2435.03, A, 4, Installation of Manhole or Intake Structure.

Add as the first paragraph:

When necessary, adjust wall height and depth of base to provide a minimum of 48 inches (1.2 meters) between form grade elevation and top of base.

Comments: Office of Design noted this change will match SUDAS. "When necessary" and metric units were added.

Specification Section Recommended Text:

2435.03, A, 4, Installation of Manhole or Intake Structure.

Add the following first paragraph:

Adjust wall height and depth of base to provide a minimum of 48 inches between form grade elevation and top of base.

Comments:

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

Section 2435. Sanitary and Storm Sewer Structures

2435.01 DESCRIPTION.

This section was developed in conjunction with Sections 6010 and 6030 of the SUDAS Standard Specifications, with modifications to suit the needs of the Department.

A. Construct sanitary and storm sewer manholes to provide access to sewer systems for maintenance and cleaning purposes.

B. Construct storm sewer intakes for collection of surface water and conveyance to the storm sewer system.

C. Modify existing manholes and intakes as necessitated by other improvements adjacent to the manholes or intakes.

D. Clean and inspect sanitary and storm sewer manholes, intakes, and other utility structures. Test sanitary sewer manholes.

2435.02 MATERIALS.

Apply Article 4149.04.

2435.03 CONSTRUCTION.

A. General Requirements for Installation of Manholes and Intakes.

1. **Excavation.**
   Excavate according to Section 2553.

2. **Subgrade Preparation.**

   a. **Cut Sections (Undisturbed Soil):** Prepare subgrade to accurate elevation required to place structure base or subbase.

   b. **Fill Sections:** Compact to 95% of maximum Standard Proctor Density and hand grade to accurate elevation required to place structure base or subbase, or install stabilization material as directed by the Engineer.

   c. **Unstable Soil:** Install stabilization material as directed by the Engineer.

3. **Subbase.**

   a. **Cast-in-place Structures:** No subbase material is required.

   b. **Precast Structures:** If precast structure is provided, install 8 inch (200 mm) thick pad of Class I bedding material a minimum of 12 inches (300 mm) outside the footprint of the structure.

4. **Installation of Manhole or Intake Structure.**
   Adjust wall height and depth of base to provide a minimum of 48 inches between form grade elevation and top of base.

   a. **Cast-in-place:** Apply Article 2435.03, B.

   b. **Precast:** Apply Article 2435.03, C.

Reason for Revision: Ensures all structures will be below frost line

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: Roger Bierbaum	**Office:** Contracts	**Item 6**
Submittal Date: May 21, 2009	**Proposed Effective Date:** April 2010	
Article No.: 2511.04 **Title:** Method of Measurement (Removal and Construction of PCC Sidewalks) **Article No.:** 2511.05 **Title:** Basis of Payment (Removal and Construction of PCC Sidewalks)	**Other:**	

Specification Committee Action: Deferred to July meeting.

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

Specification Committee Approved Text:

Comments: Office of Construction proposed paying for detectable warnings for curb ramps on an each basis, with each detectable warning for curb ramps having a nominal size of 2 feet by 2 feet (0.6 m by 0.6 m). SUDAS measures the square feet, requiring the contractor to account for any waste or inefficiencies in the bid price.

SUDAS requires no gaps in detectable warning panels, but the IDOT does not give explicit requirements, but drawings do not show gaps. FHWA has indicated they would allow a maximum 4" gap between panels.

The Specifications Section will revise the method of measurement and basis of payment to each panel and bring this specification change back to the Specification Committee for review.

Specification Section Recommended Text:

2511.04, D, Detectable Warnings for Curb Ramps.

Replace the entire article:

The quantity of detectable warnings for curb ramps will computed based on nominal size of the quantity of standard panels used for a curb ramp. No deductions will be made for the portions of the panels trimmed and not used. A minimum of 8.0 square feet (0.8 m²) of Detectable Warning for Curb Ramps will be paid for each curb ramp installation.

2511.05, D, Detectable Warnings for Curb Ramps.

Replace the entire article:

The Contractor will be paid the contract unit price for the square feet of Detectable Warning for Curb Ramps panels or partial panels used. This payment shall be full compensation for furnishing all equipment, labor, and materials to construct the detectable warnings for curb ramps in accordance with the contract documents.

Comments:

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

1. Replace 2511.04 D. Detectable Warnings for Curb Ramps with the following:

The quantity of detectable warnings for curb ramps will computed based on nominal size of the quantity of standard panels used for a curb ramp. No deductions will be made for the portions of the panels trimmed and not used. A minimum of 8.0 square feet of Detectable Warning for Curb Ramps will be paid for each curb ramp installation.

2. Replace 2511.05 D. Detectable Warnings for Curb Ramps with the following:

The Contractor will be paid the contract unit price for the square feet of Detectable Warning for Curb

Ramps panels or partial panels used. This payment shall be full compensation for furnishing all materials, equipment and labor to construct the detectable warnings for curb ramps in accordance with the contract documents.

Reason for Revision: Detectable Warnings for Curb Ramps are normally installed in 2 foot by 2 foot or 2 foot by 4 foot standard panels. The cost of cutting and installing a partial panel is more costly than installing a full panel. The current specification bases payment on the quantity shown in the contract documents, which is a computed quantity, often based on partial panels. This revision will pay for the number of full or partial panels consumed, not the based on the size of the panels installed.

Secondly the actual site conditions often require a different quantity of Detectable Warnings for Curb Ramps panels than what is computed by the designer. Therefore the quantity paid should be based on actual field information to ensure the acceptable number of panels is installed.

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

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Jim Berger	**Office:** Materials	**Item 7**
Submittal Date: 2009.04.03	**Proposed Effective Date:** April 2010	
Article No.: 2513.03, B **Title:** Cast-in-Place and Slip Form (Concrete Barrier, Concrete)	**Other:**	

Specification Committee Action: None.

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

Specification Committee Approved Text:

Comments: Office of Materials withdrew this item. This change will be handled by a Materials I.M. revision.

Specification Section Recommended Text:

2513.03, B, Cast-in-Place and Slip Form.

Replace the second paragraph:

Class BR mix design shall be submitted to the District Materials Engineer for approval at least 7 calendar days prior to placement. Personnel overseeing the development of the mix design shall be Iowa DOT PCC Level III Certified Technician. Section 2403 shall apply, except the concrete shall meet the following mix design requirements:

Comments:

Member's Requested Change (Redline/Strikeout):

B. Cast-in-Place and Slip Form.
Class C concrete in accordance with Materials I.M. 529 shall be used for cast-in-place. Class BR in accordance with Materials I.M. 529 shall be used for slip form.

Class BR mix design shall be submitted to the District Materials Engineer for approval at least 7 calendar days prior to placement. Personnel overseeing the development of the mix design shall be an Iowa DOT PCC Level III Certified Technician. Section 2403 shall apply, except the concrete shall meet the following mix design requirements:

Reason for Revision:

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

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

Comments: Typically has been a Level III person developing the mix designs. Sometimes we get personnel with little knowledge trying to develop the mix and they want the DOT to determine proportions. Since it is their mix it would be better to have the producer develop a mix with their own personnel who has been certified. Most ready mix producers have certified PCC III personnel.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: John Smythe / Kevin Merryman	**Office:** Construction	**Item 8**
Submittal Date: April 21, 2009	**Proposed Effective Date:** April 2010	
Article No.: 2526.01 **Title:** Description (Construction Survey)	**Other:**	

Specification Committee Action: Deferred to a future meeting.

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

Specification Committee Approved Text:

Comments: More survey is needed for PCC overlays. New article combines language from PCC paving and HMA overlay survey specifications. District 6 Construction Office inquired if "smooth profile grade" could be more accurately defined. There have been problems related to the Contractor's profile grade being too smooth thus causing concrete overruns or the Contractor proposing too many vertical changes. The Contracting Authority could survey and provide profile grade solving these problems. SUDAS pointed out that research is being done on higher speed profiling (10 mph) using gators and GPS. Office of Design will try to quantify the specifications for a "smooth profile grade", such as minimum rate of change, chord length, etc.

Specification Section Recommended Text:

2526.01, J, Pavement Overlays (PCC and HMA).

Rename article:

J. ~~Pavement~~ HMA Overlays ~~(PCC and HMA)~~.

2526.01, K, PCC Overlays.

Add article:

Locations and elevations shall be marked with metal pin or tack in a wood hub (only tack one side), flat, and lath. 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. The flat shall be clearly marked with the station location, cut/fill information, and offset distance to the edge of pavement. Pavement cross slope information shall be included in superelevated curves.

Elevations of pavement centerline, and both edges at bridges and existing pavement, shall be taken at 10 foot (3 m) intervals for 100 feet (30 m). Final elevations shall be submitted to the Engineer for approval.

When a new profile grade is not included in the contract documents the Contractor shall:

1. Obtain elevations of the existing pavement at centerline and both pavement edges for bonded overlays and projects including mainline pavement scarification.

Obtain elevations of the existing pavement at centerline, quarter points, and both pavement edges for unbonded overlays and whitetopping projects when a stress relief course and pavement scarification are not included.

Elevations shall be taken at 100 foot (30 m) intervals on straight and level sections and at 50 foot (10 m) intervals on horizontal and vertical curves.

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. This proposed grade line shall be submitted to the Engineer for approval.

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

Method used to reference points shall be approved by the Engineer.

Control Points shall be reset after the work is complete.

2526.01, K, Structural Walls.

Renumber article:

~~**K**~~ **L, Structural Walls.**

Comments:

Member's Requested Change (Redline/Strikeout):

2526.01 DESCRIPTION.

J. ~~Pavement~~ HMA Overlays ~~(PCC and HMA)~~

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

Method used to reference points shall be approved by the Engineer.

Control Points shall be reset after the work is complete.

K. PCC Overlays

Locations and elevations shall be marked with metal pin or tack in a wood hub (only tack one side), flat, and lath. 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. The flat shall be clearly marked with the station location, cut/fill information, and offset distance to the edge of pavement. Pavement cross slope information shall be included in superelevated curves.

Elevations of pavement centerline, and both edges at bridges and existing pavement, shall be taken at 10 foot (3 m) intervals for 100 feet (30 m). Final elevations shall be submitted to the Engineer for approval.

When a new profile grade is not included in the contract documents the Contractor shall:

1. Obtain elevations of the existing pavement at centerline and both pavement edges for bonded overlays and projects including mainline pavement scarification.

Obtain elevations of the existing pavement at centerline, quarter points, and both pavement edges for unbonded overlays and whitetopping projects when a stress relief course and pavement scarification are not included.

Elevations shall be taken at 100 foot (30 m) intervals on straight and level sections and at 50 foot (10 m) intervals on horizontal and vertical curves.

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. This proposed grade line shall be submitted to the Engineer for approval.

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

Method used to reference points shall be approved by the Engineer.

Control Points shall be reset after the work is complete.

~~KL~~. Structural Walls.
Survey requirements for structural walls shall include the following work types:

Mechanically Stabilized Earth (MSE) Walls
Cast in Place (CIP) Retaining Walls
Soil Nail Walls
Tie Back Walls
Noise Walls
Modular Block Retaining Walls
Segmental Retaining Walls

Locations and elevations shall be marked with a metal pin or a wood hub, flat, and lath. The flat shall be clearly marked with the station location, cut/fill elevation, and offset distance to face of wall.

Reason for Revision: Current specification language does not adequately describe survey requirements for PCC overlays. The changes more thoroughly describe staking requirements and requirements for developing a profile grade when one is not provided.

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

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Roger Bierbaum	**Office:** Contracts	**Item 9**
Submittal Date: 5-8-09	**Proposed Effective Date:** April 2010	
Article No.: 2528.03 **Title:** Signs and devices	**Other:**	

Specification Committee Action: Approved as shown in Specification Committee Approved Text.

Deferred:	**Not Approved:**	**Approved Date:** 6/11/2009	**Effective Date:** 04/20/2010

Specification Committee Approved Text:

2528.03, C, 1, b, Cones, Vertical Panels, 42 Inch (1050 mm) Channelizers, Drums, and Tubular Markers.

Add the following paragraph:

5) 42-inch (1050 mm) channelizers may be used in place of drums in work areas remaining in place for up to three days. Spacing of channelizers shall be half the spacing required for drums or double the number of drums required.

Comments: Office of Design stated this change is consistent with the MUTCD. Also, if an intended short term closure extends past three days, no MUTCD rules would be violated.

General discussion regarding whether this note conflicted with the road standards that only show drums. It was decided that there is little chance of conflicts developing from this change because it benefits the contractor to allow channelizer use.

Specification Section Recommended Text:

2528.03, C, 1, b, Cones, Vertical Panels, 42 Inch (1050 mm) Channelizers, Drums, and Tubular Markers.

Add the following paragraph:

5) 42-inch channelizers may be used in place of drums in work areas that remain in place for up to three days. Spacing of the channelizers will be half the spacing required for drums or double the number of drums required.

Comments:

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

2528.03 SIGNS AND DEVICES.

C. Channelizing Devices.

1. Use Channelizing Devices that are of the type shown in the contract documents. Use reflective sheeting meeting the requirements of Article 4186.03.

a. Barricades.

1) A 2 foot (0.6 m) minimum length barricade may be used when Type I or Type II Barricades are furnished as one of the options for channelizing devices in lieu of vertical panels, 42 inch (1050 mm) channelizers, cones, or drums.

2) Ensure Type III barricades have a minimum length of rail of 6 feet (1.8 m). When

traffic is permitted in each direction around a Type III Barricade, ensure the Type III Barricade used has fully reflectorized faces on both sides of the rails.

3) Erect barricades in essentially a horizontal position perpendicular to the direction of approaching traffic. Ballast them so as not to cover any striped rail.

b. Cones, Vertical Panels, 42 Inch (1050 mm) Channelizers, Drums, and Tubular Markers.

1) Ensure cones, vertical panels, 42 inch (1050 mm) channelizers, drums, and tubular markers meet the current requirements of the MUTCD, and Section 4188.

2) When used to separate two way traffic, separate temporary no passing lines by approximately 16 inches (400 mm), with the marker to be installed between these lines.

3) Ensure tubular markers meet the following:

a) Between 28 inches (710 mm) and 34 inches (865 mm) in height.

b) Diameter facing traffic at least 2 inches (50 mm) in width.

c) Completely faced with reflectorized white and orange sheeting that is in two bands 4 inches (100 m) wide with 6 inches (150 mm) between bands, with the top band no more than 2 inches (50 mm) from the top of the tubular marker.

4) Cones may be used as channelizing devices in tapers and along lane lines during daylight hours only.

5) 42-inch channelizers may be used in place of drums in work areas that remain in place for up to three days. Spacing of the channelizers will half the spacing required for drums or double the number of drums required.

2. Channelizing devices may be placed up to 2 feet (0.6 m) beyond centerline or lane line at specific locations where actual work activity is taking place. Return channelizing devices to the original position when the work activity has passed.

3. Individual channelizing devices may be omitted during working hours in areas where placement interferes with the work. Channelizing devices on tapers are required at all times.

4. Do not intermix channelizing devices of different types.

Reason for Revision: Request by Workzone Traffic Committee. Allows more options for contractor.					
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: John Smythe / Kevin Merryman	**Office:** Construction	**Item 10**
Submittal Date: May 13, 2009	**Proposed Effective Date:** October 2009	
Article No.: DS-01115 **Title:** Quality Management Concrete	**Other:**	

Specification Committee Action: Approved as is.

Deferred:	**Not Approved:**	**Approved Date:** 6/11/2009	**Effective Date:** 10/20/2009

Specification Committee Approved Text: See attached draft DS-090XX, Quality Management Concrete (QM-C)

Comments: SUDAS wondered if CMD personnel certification statement was necessary in the DS. The Office of Materials verified this information was necessary in the DS.

Specification Section Recommended Text: See attached draft DS-090XX, Quality Management Concrete (QM-C)

Comments:

Member's Requested Change (Redline/Strikeout):

Reason for Revision: Deletes Intermediate Aggregate requirements in the DS since the new Section 4112 will address this. Removes the allowance of ACI certification to perform grade QC testing since the ACI certification does not meet Iowa DOT PCC Level I requirements. Revises language to clarify payment for hand finished pavement.

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: Industry had no comments on the changes.					

Draft DS-090XX
(Replaces DS-01115)

Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATIONS
FOR
QUALITY MANAGEMENT CONCRETE (QM-C)

Effective Date
October 20, 2009

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

090XX.01 DESCRIPTION.
This specification identifies a concrete mixture design with an optimum combined aggregate gradation and the Contractor's testing and quality control responsibilities. Optimization of the aggregates should produce concrete with low water requirement as well as with improved workability and finishing characteristics. While concrete strength is important and shall be measured, it is not the basis for optimization of the concrete mixture design.

Testing and quality control shall apply to all Contractor produced concrete, utilizing the Concrete Design Mixture (CDM). The CDM shall apply to mainline slip form pavement. At the Contractor's option, the CDM may apply to any other slip form paving.

090XX.02 MATERIALS.
All materials shall meet the quality requirements for the respective items in Division 41 of the Standard Specifications. Compatibility of all material combinations shall be the responsibility of the Contractor based on acquired field experience with proposed materials.

~~A. Coarse and Fine~~ Aggregate.
The Gradation Table in Article 4109.02 of the Standard Specifications ~~will not apply to~~ may be waived for coarse aggregate if specific gradations are produced to meet requirements of this specification. ~~Fine aggregate sources shall meet the requirements of Section 4110 of the Standard Specifications. A coarse, uncrushed sand may be produced from an approved Class 2, Class 3, or Class 3I gravel source meeting the requirements of Section 4110 of the Standard Specifications and the following gradation limits:~~

~~Table 01115.02, A~~

~~Sieve~~	**~~% Passing~~**
~~1/2 inch (12.5 mm)~~	~~100~~
~~3/8 inch (9.5 mm)~~	~~90-100~~
~~No. 4 (4.75 mm)~~	~~75-95~~
~~No. 8 (2.36 mm)~~	~~60-90~~
~~No. 30 (600 µm)~~	~~10-60~~
~~No. 200 (75 µm)~~	~~0-1.5~~

~~**B. Intermediate Aggregate.**~~

~~Any limestone intermediate aggregate material shall be produced from approved beds and meet the durability class required for the coarse aggregate. Intermediate aggregate shall be considered coarse aggregate for gradations and correlations.~~

~~Uncrushed pea gravel produced from an approved Class 2 or Class 3 gravel source and meeting the quality requirements of Section 4110 of the Standard Specifications shall not exceed 10% of the total aggregate for a Class 2 gravel source, or 15% of the total aggregate for a Class 3 gravel source.~~

090XX.03 LABORATORY DESIGN MIXTURE.

The Contractor shall develop a CDM based on a unit volume of 1.000 according to industry standard practice. The CDM shall contain proportions of materials, including admixtures. Proportions shall be based upon saturated surface dry aggregates and shall produce a workable concrete mixture meeting the following constraints:

Table 090XX.03-1

Nominal Maximum Coarse Aggregate Size	Greater than or equal to 1 inch (25 mm)
Gradation	Materials I.M. 532
Cementitious Content	Minimum, 560 lbs./cy* (333 kg/m^3*)
Fly Ash Substitution Rate	See Article 2301.04, E
Water/Cementitious Ratio	Maximum, 0.45
Air Content	6% ± 1%, Design Absolute Volume = 0.060
28 Day Flexural Strength, Third Point	Minimum, 640 psi (4.40 MPa)

*The minimum cement content assumes the use of Type I/II cement with a specific gravity of 3.14 for an absolute volume of 0.106. The absolute volume shall be 0.106 and the weight (mass) of cement shall be determined from the specific gravity of the cement, if other than Type I/II cement. The absolute volume of cement for Type IP cement shall be 0.111. Cement content may need to be increased to maintain water to cementitious ratio during hot weather conditions.

Normal production gradations shall be used to determine the relative percentage of each individual aggregate used in the CDM. The relative percentage of each individual aggregate shall be selected to produce the desired combined aggregate gradation using the following sieves: 2 inch, 1 1/2 inch, 1 inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, No. 50, No. 100, and No. 200 (50 mm, 37.5 mm, 25 mm, 19 mm, 12.5 mm, 9.5 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm, 150 µm, and 75 µm). A target combined gradation shall be developed for each CDM based on normal production gradations and the relative percentages of each individual aggregate. Percent passing the No. 200 (75 µm) sieve shall not exceed 1.5% for the combined aggregate gradation. When the coarse aggregate used meets the increase in percent passing the No. 200 (75 µm) sieve, in accordance with Article 4115.05 of the Standard Specifications, the percent passing the No. 200 (75 µm) sieve shall not exceed 2.0% for the combined aggregate gradation. Water reducing admixture, Type A, or water reducing and retarding admixture, Type D, may be used in the CDM.

Laboratory development of the CDM shall be in accordance with AASHTO T 126. Mix designs may be conducted in a ready mix or central mix batch plant provided the following conditions are met:

1. All non-mix design materials are emptied.
2. Mix design materials are used.
3. Batch size at least 3 cubic yards (2 m^3).

Personnel overseeing the development of the CDM shall be an Iowa DOT PCC Level III Certified Technician. The Engineer shall be allowed to witness the development of the CDM. Notice shall be given 7 calendar days prior to this event. The following tests shall be performed in the development of the CDM:

Table 090XX.03-2

Specific Gravity of Each Individual Aggregate	Materials I.M. 307
Gradation of Each Individual Aggregate	Materials I.M. 302
Unit Weight of Plastic Concrete	AASHTO T 121
Air Content of Plastic Concrete	Materials I.M. 318
28 Day Flexural Strength	AASHTO T 97
Temperature of Plastic Concrete	ASTM C 1064

090XX.04 MIX DESIGN DOCUMENTATION.

At least 7 calendar days prior to the start of paving the Contractor shall submit a CDM report to the District Materials Engineer for approval. Contract extensions will not be allowed due to inadequate or additional CDMs. The CDM report shall include the following:

Table 090XX.04

Cover Page	Contractor name Project number Date and location of CDM laboratory development Date Submitted Signature of Contractor representative
Material Source Information	Brand Type Source
Material Proportion Information	Specific gravity Relative percentage of each individual aggregate Target combined gradation % passing (Materials I.M. 531) Target combined gradation charts (Materials I.M. 532) Design batch weight (mass) (SSD) As mixed batch weight (mass) (SSD)
Mix Properties	Unit weight (mass) of plastic concrete Air content of plastic concrete 28 day flexural strength Slump Temperature of plastic concrete

The District Materials Engineer may approve the mix design without laboratory mixture testing if the proposed mix design proportions fall within Zone II-A of Materials I.M. 532. If the mix design is approved without laboratory testing, the Contractor shall cast a set of three beams on the first day of paving from concrete meeting the mix design criteria. The Contractor shall test the beams for 28 day flexural strength, third point loading. When the coarse aggregate for the mix design is quartzite, an additional set of three beams shall be cast and tested by the Contractor at 90 days. The strength results shall be submitted to the Engineer.

090XX.05 QUALITY CONTROL.

Quality control of the concrete shall be the responsibility of the Contractor. Personnel overseeing quality control operations shall be an Iowa DOT PCC Level II Certified Technician. Personnel conducting testing on grade shall be an Iowa DOT PCC Level I Certified Technician ~~or Concrete Field Testing Technician Grade I in accordance with ACI CP-2~~. The Contractor shall calibrate and correlate testing equipment prior to and during paving operations. The Quality Control Plan and Project Information Quality Control Plan, in accordance with Materials I.M. 530, shall be submitted to the Engineer at least 7 calendar days prior to the preconstruction conference. Paving shall not begin until the plan is reviewed for conformance with the contract documents. The Contractor shall maintain equipment and qualified personnel who shall direct and perform all field quality control sampling and testing necessary to determine the various properties of the concrete governed by the contract documents and to maintain the properties described in this specification.

A. Quality Control Testing.

The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to this specification and as set forth in the Quality Control Plan. All

samples for quality control testing shall be taken in a random manner according to the prescribed sampling rate. The Contractor shall perform the following tests described herein:

Table 090XX.05, A-1
QUALITY CONTROL TABLE

	Limits	**Minimum Testing Frequency**	**Test Methods**
Unit Weight (Mass) of Plastic Concrete	±3% of the CDM	Twice/day	AASHTO T 121
Gradation Combined % Passing	See below	1/1500 cy (1/1200 m^3)	Materials I.M. 216, 301, 302, & 531
Aggregate Moisture Contents	See Materials I.M. 527	1/1500 cy (1/1200 m^3)	Materials I.M. 308
Air Content Plastic Concrete In Front of Paver	See Article 2301.04, C	1/350 cy (1/275 m^3) See below	Materials I.M. 318
Water/Cementitious Ratio	0.45 maximum	Twice/day	Materials I.M. 527
Vibrator Frequency	See Article 2301.07,A,6,a	With Electronic Vibration Monitoring: Twice/day Without Electronic Vibration Monitoring: Twice/Vibrator/Day	Materials I.M. 384

Gradation shall be performed at a frequency listed in the table above. The running average of three combined aggregate gradation tests shall fall within the limits established by the CDM target gradation and the following working ranges:

Table 090XX.05, A-2	
Sieve Size	**Working Range**
No. 4 or greater (4.75 mm or greater)	± 5%
No. 8 to No. 30 (2.36 mm to 600 µm)	± 4%
No. 50 (300 µm)	± 3%
No. 100 (150 µm)	± 2%
minus No. 200 (75 µm)	See Article 090XX.03

B. Corrective Action.
For QM-C mixes only, the Contractor shall plot all quality control test results on control charts as described in Materials I.M. 530.

1. Aggregate Tests.
When the running average approaches the working range limits, the Contractor shall take corrective action. When a combined gradation test result for a sieve exceeds the working range limits, the target shall be adjusted and the Engineer shall be notified. If the verification test result for the minus No. 200 (75 µm) exceeds the limits in Article 090XX.03 of this specification for the combined gradation, the material represented by that test for this sieve will be considered non-complying. Pay factors will be assessed based on Coarseness/Workability Factors as described in Article 090XX.07 of this specification.

2. Concrete Tests.
When an individual test result approaches the control limits, the Contractor shall take corrective action. The Contractor shall notify the Engineer whenever an individual test result exceeds the control limits.

C. Acceptable Field Adjustments.
All mix changes shall be documented by the Contractor on the QM-C Mix Adjustment form and mutually agreed upon between the Contractor and Engineer. Batch weights shall be determined using a basic water cement ratio of 0.40. When the water cement ratio varies more than ±0.03 from the basic water cement ratio, the mix design shall be adjusted to a unit volume of 1.000. A change in the source of materials or an addition of admixtures or additives shall necessitate a new CDM. The following are small adjustments that may be made without a new CDM being required:

- Increase cementitious content
- Decrease fly ash substitution rate
- Aggregate proportions may be adjusted from CDM proportions by a maximum of ± ~~2~~ 4% for ~~the coarse~~ each aggregate ~~and ± 2% for the fine aggregate~~. ~~The coarse and intermediate aggregates may be adjusted from CDM proportions by a maximum of ± 5% in the coarse fraction.~~
- Change water reducer to water reducer retarder
- Adjustment in water reducer or water reducer retarder admixture dosage
- Change in source of fly ash
- Change in source of sand, provided target gradation limits are met

When circumstances arise, such as a cement plant breakdown, that create cement supply problems, a change in cement source may be allowed with approval of the Engineer. The District Materials Engineer shall be consulted for approval of other changes to the mix design. A set of three beams for 28 day flexural strength testing may be required to document the changes. The Contractor will be allowed to utilize a Class C mix or a mix based on Class C mix proportions utilizing project materials in the event conditions beyond the Contractor's control prevent completion of the work with the CDM. This shall be by mutual agreement between the Contractor and Engineer and at no additional cost to the Contracting Authority.

Prior to 28 days strength test results, paving with QM-C mix may begin when the mix design strength, based on the average of three beams, meets or exceeds 640 psi (4.4 MPa) with the approval of the Engineer.

D. Hand Finished Pavement.
Contractor produced concrete for hand finished pavement shall utilize project materials, based on Class C or Class M concrete mix proportions. With approval of the Engineer, the contractor's CDM may be used for hand finished pavement. ~~Hand finished pavement may utilize Class C or M ready mix concrete without the requirements of this specification.~~ Quality control, as required in this specification, will not apply to hand finished pavement.

090XX.06 METHOD OF MEASUREMENT.

A. Quality Management Concrete (QM-C).
The Engineer will compute the number of cubic yards (cubic meters) of QM-C based on the number of batches produced upon which quality control and testing were performed. This QM-C quantity will also include the quantity of QM-C produced at the Contractor's option as referenced in Article 090XX.01 of this specification and Class C mixture used in accordance with Article 090XX.05, C, of this specification. The amount of concrete produced for hand finished pavement and ~~All quantity of~~ waste will be excluded from this quantity.

B. Standard or Slip-Form Portland Cement Concrete Pavement, QM-C.
The quantity of Standard or Slip-Form Portland Cement Concrete Pavement, QM-C, in square yards (square meters), will be the quantity shown in the contract documents.

C. Portland Cement Concrete Overlay, QM-C, Furnish Only.
Article 2310.04, A, of the Standard Specifications will apply.

D. Portland Cement Concrete Overlay, QM-C, Placement Only.
Article 2310.04, B, of the Standard Specifications will apply.

E. Class C and Class M Mixtures.
The Engineer will compute the number of square yards (square meters) of Standard or Slip-Form Portland Cement Concrete Pavement, QM-C, constructed utilizing Class C or Class M mixtures. For overlays, the Engineer will compute the number of square yards (square meters) of Portland Cement Concrete Overlay, QM-C, Placement Only, constructed utilizing Class C or Class M mixtures and the number of cubic yards (cubic meters) of Class C and Class M mixtures used.

090XX.07 BASIS OF PAYMENT.
For construction of concrete pavement and other construction in connection therewith, the Contractor will be paid the contract unit prices for the following items of work:

A. Quality Management Concrete (QM-C).
For the number of cubic yards (cubic meters) of QM-C computed as provided above, the Contractor will be paid the predetermined contract unit price for Quality Management-Concrete per cubic yard (cubic meter). This price will be considered full compensation for furnishing all labor, equipment, and materials for the work required by the Contractor to design, test, and provide process control for the production of QM-C.

B. Standard or Slip Form Portland Cement Concrete Pavement, QM-C.
For the number of square yards (square meters) of Standard or Slip-Form Portland Cement Concrete Pavement, QM-C, constructed, the Engineer will determine the average coarseness and workability factors for each lot in accordance with Materials I.M. 530.

The contract unit price per square yard (square meter) for Standard or Slip-Form Portland Cement Concrete Pavement, QM-C, constructed will be adjusted in the following manner:

Table 090XX.07, B
Pay Factor Chart

Gradation Zone (Materials I.M. 532)	Pay Factor
II-A	1.03
II-B	1.02
II-C	1.01
II-D	1.00
IV	0.98
I	0.95

C. Portland Cement Concrete Overlay, QM-C, Furnish Only
Article 2310.04, A, of the Standard Specifications will apply. The Engineer will determine the average coarseness and workability factor for each lot according to Materials I.M. 530. The contract unit price will be adjusted according to Table 090XX.07 B, of this specification.

D. Portland Cement Concrete Overlay, QM-C, Placement Only
Article 2310.04, B, of the Standard Specifications will apply. The Engineer will determine the average coarseness and workability factor for each lot according to Materials I.M. 530. The contract unit price will be adjusted according to Table 090XX.07, B, of this specification.

E. Class C and Class M Mixtures.
For the number of square yards (square meters) of Class C and Class M mixtures constructed, the Contractor will be paid the contract unit price per square yard (square meter) for Standard or Slip-Form Portland Cement Concrete Pavement, QM-C. For overlays, the Contractor will be paid the

contract unit price per square yard (square meter) for Portland Cement Concrete Overlay, QM-C, Placement Only, and the contract unit price per cubic yard (cubic meter) for Portland Cement Concrete Overlay, QM-C, Furnish Only. Pay Factor incentives/disincentives in Article 090XX.07, B, of this specification, will not be applied to Class C and Class M mixtures.

SPECIFICATION REVISION SUBMITTAL FORM

Submitted by: Jim Berger		**Office:** Materials	**Item 11**
Submittal Date: May 19, 2009		**Proposed Effective Date:** September 2009	
Article No.: DS-01130 **Title:** Mechanically Stabilized Earth (MSE) Retaining Wall		**Other:**	
Specification Committee Action: Approved as is.			
Deferred:	**Not Approved:**	**Approved Date:** 06/11/2009	**Effective Date:** 09/15/2009
Specification Committee Approved Text: See attached draft DS-011XX, Mechanically Stabilized Earth (MSE) Retaining Wall.			
Comments: None.			
Specification Section Recommended Text: See attached draft DS-011XX, Mechanically Stabilized Earth (MSE) Retaining Wall.			
Comments:			

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

01068.03 MATERIALS
The wall system shall be manufactured by a company on the approved manufacturer's list in Materials IM 445, Appendix E.

A. Concrete Panels.

1. Concrete.

Unless otherwise specified, cement shall be Type I, meeting requirements of Section 4101 of the Standard Specifications. Cement with total equivalent sodium oxide between 0.61% and 0.75% may be used, provided that it is non-reactive with a proposed aggregate when tested by ASTM C 1260, C 1567, or C 1293.

Cement content per cubic yard (cubic meter) of concrete for face panels and precast coping sections shall be not less than 600 pounds (360 kg) nor more than 700 pounds (420 kg).

Concrete aggregates shall meet requirements of Sections 4110 and 4115 of the Standard Specifications. Coarse aggregate shall be Class 3 durability, as defined in Article 4115.04 of the Standard Specifications. The use of gravel is subject to approval by the Engineer, based on past history of deleterious and stain-producing material found in the aggregate source.

Air entrainment shall be obtained by addition of an approved air-entraining agent. The air content of fresh, unvibrated concrete, as determined by AASHTO T 152, shall be 6.5% as a target value, with a maximum variation of ± 1.0%. When specified or authorized by the Engineer, approved admixtures for the purpose of improving workability or for retardation may be used according to the Engineer's instructions.

The final mix design is subject to the approval of the Engineer.

Reason for Revision: The requirement on using low alkali cement was introduced about a decade ago due to a concern of durability of concrete pavement. Recently, cement producers like to review this requirement due to its cost. Allowing the use of moderate alkali cement based on ASTM test will be

more acceptable.					
County or City Input Needed (X one)			**Yes**	**No** x	
Comments:					
Industry Input Needed (X one)			**Yes**	**No** x	
Industry Notified:	**Yes** x	**No**	**Industry Concurrence:**	**Yes** x	**No**
Comments: The proposed change will benefit cement industry.					

Draft DS-011XX
(Replaces DS-01130)

Iowa Department of Transportation

DEVELOPMENTAL SPECIFICATIONS
FOR
MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALL

Effective Date
September 15, 2009

THE STANDARD SPECIFICATIONS, SERIES 2001, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

011XX.01 DESCRIPTION.
This work consists of construction of mechanically stabilized earth (MSE) retaining walls in accordance with this specification and in reasonably close conformity with the lines, grades, design, and dimensions shown on the plans or established by the Engineer. MSE walls are defined as large panel retaining wall systems which use mesh or strips in the soil backfill behind a concrete wall facing to limit backfill stresses by reinforcing the soil structure.

011XX.02 DESIGN.

A. Wall Design Engineer.
The wall design shall be performed by a Professional Engineer licensed in the State of Iowa that prepares and seals the design submittals as defined in this specification.

B. Design Requirements.
The design by the wall system supplier shall consider the internal stability of the wall mass. Wall design shall be as per Section 5, 'Retaining Walls', of the AASHTO Standard Specifications for Highway Bridges.

Design calculations shall include a summary of all design parameters used, including material types, strength values and assumed allowable soil bearing pressure, assumed load and loading combinations, and factor of safety parameters.

Earth reinforcing, and their connections to concrete panels, shall be designed for corrosion over the design life using the following electrochemical criteria:

Requirement	Test Method
Resistivity > 2,000 ohm-cm	AASHTO T 288
Chlorides < 200 ppm	AASHTO T 291
Sulfates < 300 ppm	AASHTO T 290

All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, or other appurtenances shown on the plans shall be accounted for in the stability design of the wall.

Unless otherwise noted on the plans, a minimum cover of 4 feet (1.2 m) shall be provided from the

top of the leveling pad to finish grade.

Where wall or wall sections intersect with an angle of 130 degrees or less on the backfill side, a special vertical corner element panel shall be used. The corner element panels shall cover the joint of the panels that abut the corner, and allow for independent movement of the abutting panels. Corner elements shall not be formed by connecting standard facing panels that abut the acute corner.

The face panels shall be designed to accommodate differential settlement of 1 foot in 100 feet (0.3 m in 30 m). The spacing between adjacent panels shall be designed to be at least 3/4 inch (19 mm). Where shown on the plans, slip joints to accommodate excessive differential settlement shall be included.

C. Submittals.
For Interstate and Primary projects, the MSE supplier shall provide the Office of Design, Soils Design Section with preliminary (non-structural) design calculations which include estimated maximum applied (required) MSE wall bearing pressures, reinforcing strip or mesh lengths, and random backfill requirements (if other than Class 10 backfill) prior to preparation of their final MSE plans.

The Contractor shall submit design computations and approved final MSE system construction drawings in accordance with Article 1105.03 of the Standard Specifications.

These construction drawings shall include all details, dimensions, and cross-sections necessary to construct the wall and shall include, but shall not be limited to the following:

1. An elevation sheet or sheets for each wall.

2. An elevation view of the wall which shall include the elevation at the top of the wall at all horizontal and vertical break points and at least every 15 feet (5 m) along the face of the wall, all steps in the leveling pads, the designation as to the type of panel, the length of soil reinforcing elements, the distance along the face of the wall to where changes in length of the soil reinforcing elements occur, and an indication of the final ground line and maximum calculated bearing pressures.

3. Details of the architectural treatment. Refer to plans for details and nominal dimensions.

4. All panel details shall show all dimensions necessary to construct the element, all reinforcing steel in the element, and the location of soil reinforcing connection devices embedded in the panels.

5. The details for connections between the concrete panel and the soil reinforcements.

6. A typical cross section or cross sections showing the elevation relationship between ground conditions and proposed grades.

7. General notes pertaining to design criteria and wall construction.

8. The details for diverting soil reinforcements around obstructions such as piles, catch basins, and other utilities.

9. Clearly indicated details for construction of walls around drainage facilities.

10. General location of subdrain and outlets of the internal drainage system.

011XX.03 MATERIALS
The wall system shall be manufactured by a company on the approved manufacturer's list in Materials I.M. 445.03, Appendix A.

A. Concrete Panels.

1. Concrete.

Unless otherwise specified, ~~C~~cement shall be Type I, meeting requirements of Section 4101 of the Standard Specifications. Cement with total equivalent sodium oxide between 0.61% and 0.75% may be used, provided that it is non-reactive with a proposed aggregate when tested by ASTM C 1260, C 1567, or C 1293.

Cement content per cubic yard (cubic meter) of concrete for face panels and precast coping sections shall be not less than 600 pounds (360 kg) nor more than 700 pounds (420 kg).

Concrete aggregates shall meet requirements of Sections 4110 and 4115 of the Standard Specifications. Coarse aggregate shall be Class 3 durability, as defined in Article 4115.04 of the Standard Specifications. The use of gravel is subject to approval by the Engineer, based on past history of deleterious and stain-producing material found in the aggregate source.

Air entrainment shall be obtained by addition of an approved air-entraining agent. The air content of fresh, unvibrated concrete, as determined by AASHTO T 152, shall be 6.5% as a target value, with a maximum variation of ± 1.0%. When specified or authorized by the Engineer, approved admixtures for the purpose of improving workability or for retardation may be used according to the Engineer's instructions.

The final mix design is subject to the approval of the Engineer.

2. Compressive Strength.

The concrete in reinforced earth face panels shall have the following minimum compressive strength.

Strength prior to moving	Strength at 28 days
1800 psi (12.4 MPa)	4000 psi (27.6 MPa)

Acceptance of the concrete face panels with respect to compressive strength will be determined on a lot basis. The lot will consist of all production units (batches of concrete or panels) produced within a consecutive 7 day production period. Production units will be randomly selected in accordance with the production day sample sizes of Table A and tested for compressive strength. Compression tests shall be made on the test specimens in accordance with Materials I.M. 315.

Table A

Production Day Quantities	Sample Size
35 cubic yards (27 m^3) or less (50 panels or less)	1
35-70 cubic yards (27-54 m^3) (50 –100 panels)	2
70-100 cubic yards (54-81 m^3) (100-150 panels)	3
Over 100 cubic yards (81 m^3) (150 panels)	5

A minimum of four test cylinders shall be cast for each production unit sampled. All of the specimens shall be cured in accordance with this Developmental Specification.

Two specimens shall be tested at 7 days and 2 at 28 days. A test will be the average compressive strength of 2 cylinders.

Acceptance of the lot will be made if all acceptance tests in a lot are greater than 4000 psi (27.6 MPa) or provided no individual 28 day compressive-strength test result falls below 3500 psi (24.8 MPa), and the average 28 day compressive strength of all test results of the lot equals or exceeds the acceptance limits set forth in Table B.

The acceptance limits of Table B shall also apply to core compressive strength test results.

Table B. Lot Acceptance Limits

Number of Lot Acceptance Tests	Average of all Lot Acceptance Tests Must Equal or Exceed these Limits
3-7	4000 psi + 0.33R* (27.6 MPa + 0.33R*)
8-15	4000 psi + 0.44R* (27.6 MPa + 0.44R*)
16+	4000 psi+ 0.46R* (27.6 MPa + 0.46R*)

*R is the range – the difference between the highest and lowest acceptance test result.

3. Reinforcement.
Reinforcement steel shall be per Article 4151.03 of the Standard Specifications and shall also be epoxy coated per Article 4151.03, B.

4. Casting.
Earth reinforcement connections or ties, PVC pipe, and lifting devices shall be set in place to the required dimensions and tolerances, prior to casting.

The panels shall be cast on a flat area, the front face of the panel at the bottom, the back face at the upper part. Reinforcement connection guides shall be set on the rear face. The concrete in each unit shall be placed without interruption and shall be consolidated by use of an approved vibrator, supplemented by such hand-tamping as may be necessary to force the concrete into the corners of the forms and to prevent the formation of stone pockets or cleavage planes. Clear form oil of the same manufacturer shall be used throughout the casting operation.

5. Concrete Finish.
The formed front face shall have a uniform surface as designated. The rear face of the panel shall be roughly screeded to eliminate open pockets of aggregate and surface distortions.

6. Marking.
The date of manufacture, production lot number, and piece-mark shall be clearly scribed on the rear face of each panel.

7. Fasteners.
Bolts and nuts for fasteners, where required, shall be of type and length recommended by the Wall Design Engineer; high strength, conforming to ASTM A 325 or equivalent, and galvanized.

8. Tolerances.
All units shall be manufactured within the following tolerances:

a. Lateral position of the strips within 1 inch (25 mm)
b. All dimensions within 1/4 inch (5 mm)
c. Angular distortion with regard to the height of the panel shall not exceed 1/4 inch in 5 feet (5 mm in 1.5 m).
d. Surface defects on smooth-formed surfaces shall not exceed 1/8 inch in 5 feet (2.5 mm in 1.5 m). On textured surfaces, surface defects shall not exceed 5/16 inch in 5 feet (8 mm in 1.5 m).

9. Curing.
As soon as practical after casting, but not later than 30 minutes, the panels shall be covered with wet burlap and kept wet. Within two hours of the initial covering, water shall be applied to the burlap by means of a continuous, pressure-sprinkling system that is effective in keeping the burlap wet during the initial curing period. The initial curing period shall continue until the minimum moving strength is obtained.

After the initial curing period is complete, panels may be moved from the casting beds to a secondary curing area and covered with one layer of wet burlap and one layer of 2 mil (50 µm) plastic, secured to retain curing moisture. The concrete face panels shall not be uncovered more than 30 minutes during the moving process. Curing shall continue until the specified strength is obtained.

Steam curing procedures may be approved by the Engineer.

10. Removal of Forms.
The forms shall remain in place until they can be removed without damage to the unit.

11. Testing and Inspection.
Acceptability of the precast units will be determined on the basis of compression tests and visual inspection.

The precast units will be considered acceptable, regardless of age, when compression test results indicate the concrete will meet the specified 28-day strength. The Contractor or the Contractor's supplier shall furnish facilities and collaborate with the Engineer so that all necessary sampling and testing is done in an expeditious and satisfactory manner, subject to approval of the Engineer. Panels will be considered acceptable for placement in the wall when 7-day strengths exceed 80% of 28-day requirements.

12. Rejection.
Units may be subject to rejection because of failure to meet any of the requirements specified above. In addition, any or all of the following defects may be sufficient cause for rejection:

- **a.** Defects that indicate imperfect molding.
- **b.** Defects indicating honeycombed or open-texture concrete.

13. Handling, Storage, and Shipping.
All units shall be handled, stored, and shipped in such a manner as to eliminate the danger of chipping, cracks, fractures, and excessive bending stresses. Panels in storage shall be supported on firm blocking located immediately adjacent to earth reinforcing connections to avoid damage.

B. Leveling Pad.
This concrete may be any mix the supplier markets as having a nominal strength of 3500 psi (24.1 MPa).

C. Joint Materials.

1. Horizontal and Vertical Joints.
Cover for horizontal and vertical joints between panels shall be a polyester fabric meeting requirements of Article 4196, C, of the Standard Specifications and acceptable to the MSE wall company. Adhesives used to temporarily attach the fabric to the back of the facing panels shall be subject to approval by the Engineer.

2. Bearing or Filter Pads.
Where required, bearing and filter pads shall be of the quality and dimensions recommended by the MSE wall company, subject to approval of the Engineer.

D. Subdrains.
Subdrains shall be perforated, plastic pipe of one of the types described in Article 4143.01, C, of the Standard Specifications. If the size is not designated, the nominal diameter shall be not less than 4 inches (100 mm) nor more than 6 inches (150 mm).

Standard Road Plan RF-19E Type A outlet shall be provided and fitted with a Standard Road Plan

RF-19E rodent guard.

E. Backfill.
Granular Backfill material for the entire reinforced earth zone shall be furnished by the Contractor, unless otherwise specified in the contract documents. When identified as MSE wall design requirement in the contract documents, the granular backfill for any core-outs, other remedial/ ground improvement location, or behind the reinforced zone, shall be furnished by the Contractor unless otherwise specified in the contract documents. Contractor furnished Granular Backfill material shall meet the requirements of Section 4133 of the Standard Specifications, except that the percent passing the No. 200 (75 µm) sieve shall not exceed 5.0%.

The backfill shall meet the following criteria for electrochemical requirements:

Requirement	Test Method
Resistivity > 3000 ohm-cm	AASHTO T 288
pH range 5 to 10	AASHTO T 289
Chlorides < 100 ppm	AASHTO T 291
Sulfates < 200 ppm	AASHTO T 290
Organic content < 1%	AASHTO T 267

The Engineer will take two samples from the source of the granular backfill material to determine the electrochemical levels. The source of backfill shall be approved by the Engineer before placement.

F. Earth Reinforcing.
All reinforcing shall be carefully inspected to insure they are true to size and free from defects that may impair their strength and durability.

1. Reinforcing and Tie Strip.
Tie strips shall be shop-fabricated from hot-rolled steel conforming to the minimum requirements of ASTM A 570, Grade 50, or equivalent. Galvanization shall conform to the minimum requirements of ASTM A 123 or equivalent. Reinforcing strips shall be hot rolled from bars to the required shape and dimensions. Their physical and mechanical properties shall conform to ASTM A 572, Grade 65, or equivalent. Galvanization shall conform to ASTM A 123. Strips shall be cut to lengths and tolerances shown on the plans or recommended. Holes for bolts shall be punched in the locations shown.

2. Reinforced Mesh
Reinforcing mesh shall be prefabricated from smooth bars meeting the requirements of ASTM A 82 and A 185. Reinforcing mesh shall be galvanized in accordance with ASTM A 123. The mesh connector shall be galvanized in accordance with ASTM A 153. The mesh shall be cut to lengths and tolerances shown on the plans or on the shop drawings.

011XX.04 CONSTRUCTION

A. Construction Supervision.
MSE units and reinforcement material suppliers shall provide a qualified and experienced representative on site at beginning of wall construction for up to 3 working days at no additional cost to the Contracting Authority.

The Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site.

B. Excavation.
Excavation shall conform to the limits and construction stages shown on the contract documents. Any core-outs or other remedial/ground improvement procedures identified in the construction drawing shall be completed and approved prior to start of MSE wall construction. Temporary or other excavation lines shown or depicted in the construction drawings are for right of way, quantity

calculation, and/or other design purposes only.

C. Foundation Soil Preparation.
The foundation for the structure shall be graded level for a width equal to or exceeding the length of reinforcing mesh or strips, unless otherwise shown on the construction drawings. Prior to wall construction, the foundation shall be compacted with a smooth-wheel, vibratory roller.

D. Leveling Pad.
At each panel leveling pad, an unreinforced concrete leveling pad shall be provided as shown on the construction drawings. The footing shall be cured a minimum of 24 hours before placement of wall panels.

E. Wall Erection.

1. Panels.
For erection, panels are to be handled by means of a lifting device set into the upper edge of the panels. Panels should be placed in successive horizontal lifts in the proper sequence as backfill placement proceeds. As fill material is placed behind a panel, the panels shall be maintained in position by means of temporary wooden wedges placed in the joint at the junction of the two adjacent panels on the external side of the wall. External bracing may also be required for the initial lift. Vertical tolerances and horizontal alignment tolerance shall not exceed 3/4 inch (19 mm) when measured along a 10 foot (3 m) straight edge. The maximum allowable offset in any panel joint shall be 3/4 inch (19 mm). The overall vertical tolerance of the wall shall not exceed 1/2 inch per 10 feet (12.5 mm per 3 m) of wall height.

2. Coping.
The coping shall be placed as shown on the construction drawings. Precast coping units shall be mixed, cast, and cured with the same concrete mixture and in the same manner as used for construction of the panels. Cast-in-place coping may be constructed in the same manner or Class C structural concrete may be used; however, the aggregates shall meet the same quality requirements as are specified in Article 011XX.03, A, 1.

F. Subdrains.
The subdrains shall be installed behind the bottom course of panels in direct contact with the granular backfill material. A second subdrain shall be installed at the base of the temporary excavation backslope, behind the reinforced earth zone, and at an elevation similar to the subdrain behind the bottom course of panels. If required, vertical pipes shall be placed as shown on the plans. The subdrain shall be installed as shown in the construction drawings to maintain gravity flow of water to outside of the reinforced earth zone. The subdrain should outlet into a storm sewer access or along a slope at an elevation lower than the lowest point of the pipe within the reinforced earth zone.

The contract documents may require additional subdrain at the base of the granular backfill in a core-out, if used.

Porous backfill, in accordance with Section 4131 of the Standard Specifications, shall be placed around the subdrain to a minimum cover of 3 inches (75 mm).

G. Backfill Placement.
Backfill placement shall closely follow the erection of each lift of panels. At each level for earth reinforcing, backfill should be roughly leveled before placing and connecting reinforcement. Reinforcing shall be placed normal to the face of the wall. The placement of lifts shall closely follow panel erection. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density.

At the end of each day's operations, the Contractor shall shape the last level of backfill so as to permit runoff of rainwater away from the wall face.

Backfill shall be compacted in accordance with Article 2107.08 of the Standard Specifications. The Granular Backfill in the reinforced zone and any Granular Backfill placed behind the reinforced zone shall be placed as shown in the construction drawings in maximum 8 inch (200 mm) lifts and compacted to a minimum 95% of standard Proctor density (ASTM D 698). The moisture limits shall be between 1% under optimum moisture to not more than 2% over optimum moisture content. Backfill compaction shall be accomplished without disturbance or distortion of earth reinforcing and panels. Tamping-type rollers or other rollers which damage the reinforcing shall not be used. The required compaction in a strip 3 feet (1 m) wide adjacent to the backside of the wall shall be achieved using light mechanical tampers; however, compaction within this strip will not be subjected to density testing.

Granular Backfill and/or other materials placed in a core-out or other remedial/ground improvement location shall be compacted to a minimum of 98% of Standard Proctor density or as otherwise defined in the construction documents.

H. Earth Reinforcing Placement.
Tie strips or mesh shall be placed in horizontal layers as detected in the construction drawings. When tie strips or mesh cannot be placed as detailed in the plans, the Contractor shall submit a modified placement plan as recommended by the Wall Design Engineer for approval by the Engineer.

I. Surface Water Control
The cross sections in the contract documents will show excavation for any temporary backslope behind the reinforced earth zone. The backslope shall be protected from surface water which will affect stability of the backslope. Positive control and discharge shall be provided for surface water in the area behind the backslope. If a gravity outlet is available, the base of any core-out excavation shall be drained by temporary trench outlet or subdrain until Granular Backfill is installed in the core-out.

011XX.05 METHOD OF MEASUREMENT.
The work involved in construction of Mechanically Stabilized Earth Retaining Walls will be measured as follows:

A. Mechanically Stabilized Earth Retaining Wall.
The Engineer will measure the area of Mechanically Stabilized Earth Retaining Wall in square feet (square meters), from measurements of the front face of the wall in place. The height will be measured from the top of the leveling pad to the top of the wall, including coping.

B. Granular Backfill Material.
The quantity of Granular Backfill material, in tons or cubic yards (megagrams or cubic meters), that is placed in the reinforced earth zone; identified as an MSE wall design requirement in the contract documents for any core-out or other remedial/ground improvement location; or placed in the temporary excavation zone behind the reinforced earth zone as shown in the contract documents, will be measured in tons or cubic yards (megagrams or cubic meters).

C. Excavation.
Excavation for preparing the reinforced earth zone for construction of the wall and any core-outs or other remediations/ground improvement areas included in the contract documents will be classed and measured according to Section 2102 of the Standard Specifications.

011XX.06 BASIS OF PAYMENT.
Payment for construction of Mechanically Stabilized Earth Retaining Walls, satisfactorily placed, will be as follows:

A. Mechanically Stabilized Earth Retaining Wall.
For the number of square feet (square meters) of Mechanically Stabilized Earth Retaining Wall

constructed, the Contractor will be paid the contract unit price per square foot (square meter). This payment shall be full compensation for furnishing and erecting the MSE retaining wall including the design, foundation preparation, leveling pad, panels, coping, earth reinforcement placement, and subdrains in accordance with the contract documents. Subdrains within core-out areas, if required in the contract documents, will be measured and paid for separately.

B. Granular Backfill Material.
For Contractor furnished Granular Backfill material for the reinforced earth zone; any core-outs or other remedial/ground improvement locations; and placed in the temporary excavation zone behind the reinforced earth zone as shown in the contract documents, the Contractor will be paid for the quantity of material furnished, hauled, actually placed, and compacted for the contract unit price per ton or cubic yard (megagram or cubic meter) up to the contract quantity.

If the Contractor determines that the slope shown for the temporary excavation zone in the contract documents is not adequate for safety, they shall provide written notification to the Engineer, including a copy of a slope stability analysis, and identification of the additional quantity of Granular Backfill that will be needed, before the work begins. The slope stability analysis shall be done by a Professional Engineer licensed in the State of Iowa. The cost of the slope stability analysis shall be the responsibility of the Contractor. If approved by the Engineer, the additional quantity for Granular Backfill will be adjusted in accordance with Article 1109.03, A, of the Standard Specifications.

C. Excavation.
For the quantity of each class of excavation for preparing the reinforced earth zone and any core-outs or other remediation/ground improvement areas included in the contract documents for construction of the wall, the Contractor will be paid as provided in Article 2102.14, A, of the Standard Specifications. This will normally be included for payment with other excavation required by the contract documents.

If the Contractor determines that the slope shown for the temporary excavation zone in the contract documents is not adequate for safety, they shall provide written notification to the Engineer, including a copy of a slope stability analysis, and identification of the additional quantity of excavation that will be needed, before the work begins. The slope stability analysis shall be done by a Professional Engineer licensed in the State of Iowa. The cost of the slope stability analysis shall be the responsibility of the Contractor. If approved by the Engineer, the additional quantity for excavation will be adjusted in accordance with Article 1109.03, A, of the Standard Specifications.