



GS-15006

(Replaces GS-15005, DS-15010, and DS-15022)

General Supplemental Specifications for Highway and Bridge Construction

Effective Date
April 17, 2018

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

TABLE OF CONTENTS

Division 11. General Requirements and Covenants.....	1
1101.03, Definition of Terms.....	1
1102.01, Competency and Qualification of Bidders.....	1
1102.05, Issuance of Proposals.....	1
1102.09, E.....	1
1102.11, Proposal Guaranty.....	1
1103.01, Consideration of Bids.....	2
1104.09, Right-of-Way.....	2
1105.03, Working Drawings.....	2
1105.04, Conformity With and Coordination of the Contract Documents.....	4
1105.11, D.....	4
1105.13, Protection of Water Quality and Wetlands.....	5
1105, Control of Work.....	10
1106.07, B.....	10
1107.06, B, Buy America.....	11
1107.06, Federal Requirement.....	11
1108.02, A, 1.....	11
1108.02, C, 1, Specified Start Date.....	11
1108.02, E, 2.....	11
1108.03, C.....	12
1108.03, D.....	12
1109.03, B, 2, g.....	12
1109.05, A, 2.....	12
1113, Electronic Document Storage.....	12
Division 20. Equipment Requirements.....	14
2001.12, G.....	14
2001.12, H.....	14
2001.19, B, 4.....	14
Division 21. Earthwork, Subgrades, and Subbases.....	15
2101.01, A.....	15
2101.03, Construction.....	15
2101.04, A, 2.....	15
2101.04, B, 1.....	15
2101.05, Basis of Payment.....	15
2102.03, F, 3, a, 2.....	15
2102.03, F, 3, a, General.....	15
2102.04, A, 8, Contractor Furnished Select Treatment.....	15
2102.05, A, 8, Contractor Furnished Select Treatment.....	16
2106.03, E.....	16
2107.03, C, 1.....	16
2107.03, H, 1.....	16
2107.03, I, 1.....	16
2116.02, A, 1, b.....	16
2122.02, A, Hot Mix Asphalt Mixture (1,000,000 ESAL Base Mixture).....	16
2122.02, B, 3.....	17
2122.02, C, 1, Hot Mix Asphalt Mixture.....	17
2122.05, A, 2, c.....	17
2122.05, A, 3.....	17
2122.05, C, Resurfacing or Overlay of Existing Paved Shoulders.....	17
Division 22. Base Courses.....	17

2213.02, A, 1, HMA Base Widening.....	17
2213.03, E, Preparation of Subgrade.....	17
2213.03, F, 1, HMA Base Widening.....	18
2213.03, I, Winter Seal.....	18
2213.04, G, Samples.....	18
2216.03, A, 2, a, 1.....	18
2216.03, A, 2, a, 2.....	18
2216.03, A, 2, b.....	19
2216.03, D, 2.....	19

Division 23. Surface Courses..... 19

2301.03, K, 3, b.....	19
2301.03, U, 1.....	19
2301.03, U, 5.....	19
2301.04, A, 2.....	19
2301.05, A, Portland Cement Concrete.....	19
2301.05, D, 2.....	20
2303, Flexible Pavement.....	21
2304.02, A, PCC Option.....	40
2304.02, B, HMA Option.....	40
2304.03, A, 2.....	40
2304.03, B, HMA Option.....	41
2310.01, Description.....	41
2310.02, A, 3.....	41
2310.02, B, Hot Mix Asphalt Stress Relief Course.....	41
2310.03, B, 2, a.....	41
2310.03, C, 2, Joints.....	41
2310.03, D, 3.....	42
2316.02, A, 6, b.....	42
2316.02, B, 2, c.....	42
2318.02, A, 2.....	42
2318.03, A, 1.....	42
2320.02, A, 1.....	42
2320.02, B, Aggregate.....	42
2320.03, A, Equipment.....	43
2320.04, A, Aggregate for Microsurfacing.....	44
2320.04, C, Emulsified Asphalt for Microsurfacing.....	44

Division 24. Structures..... 44

2401.03, A, Notification for Complete Removal of Bridges.....	44
2401.05, Basis of Payment.....	45
2402.03, Construction.....	45
2402.04, B, 4.....	45
2402.04, Method of Measurement.....	45
2402.05, Basis of Payment.....	45
2403.02, B, 3, Entrained Air Content.....	46
2403.03, F, 5, e.....	46
2404.03, E.....	46
2405.03, H, 1, General.....	46
2405.03, H, 2, Bridge Bearings.....	46
2408.02, Materials Requirements, Identification, and Fabrication.....	46
2408.02, B, 1.....	47
2408.02, Q, 1, a, 4.....	47
2408.03, B, Welding.....	47
2408.03, Q, Assembling Steel.....	51
2408.03, S, 5, a, 6.....	51
2412.02, Materials.....	51
2412.03, C, Placing Concrete.....	51

2412.03, E, Curing Concrete Decks.....	51
2412.03, E, 2.....	52
2413.02, D, 1, b.....	52
2413.03, C, Preparation of Surface for Deck Repair.....	52
2413.03, F, Curing.....	52
2413.03, H, 10.....	53
2416.03, A.....	53
2416.03, C.....	53
2416.03, D, 2, a, 1, Class B Bedding.....	53
2416.03, D, 4, d.....	53
2416.04, B.....	53
2417.02, Materials.....	53
2417.03, A, 1.....	54
2417.03, C, 1, Class B Bedding.....	54
2417.04, B.....	54
2417.04, D, 1.....	54
2418.01, Description.....	54
2419.01, E.....	54
2423.01, Description.....	54
2426.02, B, 2, Regular Repair.....	54
2428.04, B, 1.....	55
2428.05, B, 3.....	55
2431.02, B, 4, b.....	55
2432.02, B, 4, b.....	55
2433.02, B, 6.....	55
2433.03, L, 1, b, 4.....	55
2433.05, A, 2.....	55
2435.03, A, 3, b.....	56
2435.03, A, 7.....	56
2435.03, A, 9, Adjustment Ring(s).....	56
2435.03, A, 11, Infiltration Barrier.....	56
2435.03, A, 12, Backfill and Compaction.....	56
2435.03, A, 13, Bedding and Backfill Under Interstate and Primary Roads.....	56
2435.03, D, 3, c.....	56
2435.03, E, 1, a.....	57
2435.03, E, 4, Storm Sewer.....	57
2435.05, A, 2.....	57
2435.05, B, 2.....	57
Division 25. Miscellaneous Construction.....	57
2501.05, E, 1.....	57
2502.02, Materials.....	57
2502.03, A, 8.....	58
2502.03, C, 10.....	58
2503.01, Description.....	58
2503.03, D, 2, Reinforced Concrete Pipe, Reinforced Concrete Arch Pipe, and Reinforced Concrete Elliptical Pipe.....	58
2504.03, D, Gravity Main Pipe Jointing.....	58
2504.03, L, 5, a.....	58
2504.05, D, 1, b.....	59
2511.02, B, Hot Mix Asphalt.....	59
2511.03, B, 1, General.....	59
2512.03, C, 3.....	59
2513.02, Materials.....	60
2513.03, A, 2, b, 2.....	60
2513.03, A, 2, b, 4.....	60
2513.03, A, 2, b.....	60
2517.02, B, HMA Paving Projects.....	60
2522.03, E, Lighting Tower.....	60
2522.03, E, 1, Wind Velocity.....	60

2522.03, E, 4, Anchor Bolts, Washers, and Nuts.....	60
2522.03, E, 7, b.....	61
2522.03, G, 1, a.....	61
2523.02, B.....	61
2523.03, G, Foundations.....	61
2524.03, A, 1, b.....	62
2524.03, A, 2, Milepost Markers.....	62
2524.03, A, 4, b.....	62
2524.03, B, Erection of Signs, Reference Location Signs, and 6 Inch by 6 Inch Route Markers.....	62
2524.03, B, 2, Delineators, Milepost Markers, and 6 by 6 Inch Route Markers.....	62
2524.04, F, Delineators, Milepost Markers, and 6 by 6 Inch Route Markers.....	63
2524.05, F, Delineators, Milepost Markers, and 6 by 6 Inch Route Markers.....	63
2524.05, I, Excavation in Unexpected Rock.....	63
2525.03, E, 2, Traffic Signal and Pedestal Poles and Pedestrian Push Button Posts.....	63
2526, Construction Survey.....	64
2527.02, D, 2, c, 4.....	69
2528.01, A, 8.....	70
2528.01, A, 10.....	70
2528.01, C, 1.....	70
2528.01, C, Traffic Quality Control.....	70
2528.03, C, 1.....	70
2528.03, I, 2, b, 4.....	70
2528.03, Construction.....	70
2528.03, M, 5.....	71
2528.03, M, Limitations.....	71
2528.04, J, 2, a.....	71
2529.02, A, Hot Mix Asphalt Mixture.....	71
2529.02, B, 4, Cement.....	71
2529.02, B, 9, Concrete Mixers.....	72
2529.03, G, 3.....	72
2529.03, G, 4.....	72
2529.03, H, 1.....	72
2529.03, H, 2, d.....	72
2530, Partial Depth Finish Patches.....	72
2532.03, B, 3, a.....	80
2535.03, A, 2.....	81
2540.02, Materials.....	81
2543.02, A.....	81
2548.03, Construction.....	81
2550.04, Traffic Control.....	81
2552.02, B, Bedding (Class I) Material.....	81
2552.02, C, Backfill Material (Under Interstate and Primary Roadways).....	82
2552.02, D, Backfill Material (Other Areas).....	82
2552.02, F, Stabilization (Foundation) Material.....	82
2552.03, E, Pipe Bedding and Backfill Material.....	82
2554.04, A, Pipe and Fittings.....	83
2554.04, B, Valves, Fire Hydrants, and Appurtenances.....	83
2554.05, A, Pipe and Fittings.....	84
2554.05, B, Valves, Fire Hydrants, and Appurtenances.....	84
2556, Dowel Bar Retrofit.....	84
Division 26. Roadside Development.....	87
2601.01, Description.....	87
2601.03, A, 7, a.....	87
2601.03, A, 14, Straw Mulching Machine.....	87
2601.03, A, 15, a.....	87
2601.03, A, 15, b.....	87
2601.03, A, Equipment.....	87
2601.03, B, 4, b, 1.....	87

2601.03, B, 4, c, 1.....	88
2601.03, B, 4, d, 2, Seeding and Fertilizing with Hydraulic Seeder.	88
2601.03, C, 2, b, Seed Mixture.....	88
2601.03, C, 2, d, Application Dates.....	88
2601.03, C, 3, a, Preparation and Application.....	88
2601.03, C, 4, a, Preparation and Application.....	88
2601.03, C, 4, b, Seed Mixture.....	89
2601.03, C, 5, a, Preparation and Application.....	89
2601.03, C, 5, b, Seed Mixture.....	89
2601.03, C, 7, d, Application Dates.....	89
2601.03, C, Types of Seeding.....	89
2601.03, E, 2, a, Straw Mulch.....	90
2601.03, E, Mulching.....	90
2601.03, G, 3, d, 4.....	90
2601.03, G, 3, e, Watering Sod.....	90
2601.03, G, 3, f, Urban, Island, and Safety Rest Area Sodding.....	91
2601.03, H, Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Outlet or Channel Scour Protection (Transition Mat).....	91
2601.03, H, 5, a, 2.....	91
2601.03, H, 5, b, Fertilizing.....	91
2601.03, Construction.....	91
2601.04, A.....	92
2601.04, D.....	92
2601.04, E.....	92
2601.04, H.....	92
2601.05, A, 2.....	93
2601.05, A, 6.....	93
2601.05, A, 10, b.....	93
2601.05, A, 11.....	93
2601.05, A, 12.....	93
2601.05, A, 14.....	93
2602.01, D, 2.....	93
2602.03, A.....	93
2602.03, E.....	94
2602.03, L, 1.....	94
2602.03, L, 7.....	94
2602.03, L, 8.....	94
2602.03, M, Mobilizations, Emergency Erosion Control.....	94
2602.04, K, Mobilizations, Erosion Control.....	94
Division 41. Construction Materials.....	95
4100.06, A.....	95
4108.01, Fly Ash.....	95
4115.01, Description.....	95
4118, Pipe Bedding Material.....	95
4119, Pipe Backfill Material Under Interstate and Primary Roadways.....	95
4126, Aggregate for Polymer-Modified Microsurfacing.....	96
4127.01, Description.....	96
4127.02, Coarse Aggregate.....	97
4127.03, A.....	97
4128, Stabilization (Foundation) Material.....	97
4134.02, Gradation.....	98
4136.03, Expansion Joint Fillers and Seals.....	98
4137, Asphalt Binder.....	98
4143.01, B, 4.....	99
4149.02, A, Sanitary Sewer (Gravity Mains).....	99
4149.02, B, 3, Sewage Air Release Valve.....	99
4149.03, Storm Sewer Pipe.....	100
4149.03, E, Jointing Material for Concrete Apron.....	100

4149.04, H, 1.....	101
4149.04, J, 1, Infiltration Barrier.....	101
4149.04, K, Invert.....	101
4151.03, Reinforcement for Structures.....	102
4151.07, A, Reinforcement Couplers.....	105
4152.02, Structural Steel.....	105
4153.06, B, 1.....	106
4154, Fence Materials.....	107
4155.04, B, 3.....	110
4155.05, C.....	110
4160.01, General Requirements.....	110
4161.03, A.....	111
4161.03, B, 6, Handling Treated Products.....	111
4161.03, B, 7, b.....	111
4164.01, A.....	111
4169.02, A.....	112
4169.07, B, Hydraulic Mulches.....	112
4169.10, Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Outlet or Channel Scour Protection (Transition Mat).....	114
4169.10, A, Wire Staples.....	114
4169.10, F, Outlet or Channel Scour Protection (Transition Mat).....	114
4169.12, Perimeter and Slope Sediment Control Device.....	114
4171.04, Cast Iron Detectable Warning Panels.....	115
4171.05, Steel Detectable Warning Panels.....	115
4185.02, A, 3.....	115
4185.02, A, 4.....	115
4185.02, B, Anchor Bolt and Slip-Base Plate Fasteners for Lighting Poles.....	116
4185.02, D, 2.....	117
4186.09, A, 4, b.....	117
4186.09, B, Type B Signs.....	117
4186.09, C, Delineators, Milepost Markers, and 6 Inch by 6 Inch (150 mm by 150 mm) Route Markers.....	118
4186.09, C, 2.....	118
4186.10, C, Posts for Delineators, Milepost Markers, and 6 Inch by 6 Inch Route Markers.....	118
4187.01, C, 3, Anchor Bolts, Nuts, and Washers.....	118
4188, Traffic Control Devices.....	119
4189.04, A, 2, c.....	119
4189.05, Poles, Heads, and Signs.....	119
4189.05, D, 2.....	121
4196.01, B, 2, Subsurface Drainage.....	121
4196.01, B, 3, Embankment Erosion Control.....	121
4196.01, B, 5, a.....	121
4196.01, B, 6, Bridge Abutment Backfill Fabric.....	122
Appendix.....	124
Appendix.....	124

Division 11. General Requirements and Covenants.

Section 1101

1101.03, Definition of Terms.

Add the Article:

Holidays.

The following holidays are observed by the Department:

- New Year's Day, January 1,
- Martin Luther King, Jr.'s Birthday, third Monday in January,
- Memorial Day, last Monday in May,
- Independence Day, July 4,
- Labor Day, first Monday in September,
- Veterans Day, November 11,
- Thanksgiving Day, fourth Thursday in November,
- Friday after Thanksgiving, and
- Christmas Day, December 25.

Section 1102

1102.01, Competency and Qualification of Bidders.

Replace the second sentence of Article A:

To prequalify, a prospective bidder shall complete the required sections, including Bidder Status Form, of the "Contractor's Financial - Experience - Equipment Statement" (Form 650004) and submit it to the Department.

Add to the end of Article H:

Bidders shall complete Bidder Status Form portion of Form 650004.

1102.05, Issuance of Proposals.

Replace the first sentence:

Requests for proposal forms to bid construction and maintenance contracts ~~must~~ and a Bidder Status Form shall be filed by noon of the working day prior to the letting.

1102.09, E.

Replace the Articles:

5. For Federal-aid contracts, certifies acknowledgment of the limitations of lobby activities shown in the bidding documents, ~~and~~
6. For Federal-aid contracts, certifies the bidder does not maintain segregated facilities., and

Add the Article:

7. Certifies Bidder Status Form on file with the Office of Contracts is accurate.

1102.11, Proposal Guaranty.

Replace Articles C and D:

- C. A Proposal Guaranty/Bid Bond (Form ~~434084~~ 518003) may be used for the proposal guaranty in lieu of that specified above, using the electronic bid bond verification feature authorized by the Department. Bid bonds will be declared invalid and bid proposals will not be considered if any of the following items are omitted or incorrect:
 - Date of Letting
 - Bid Order Number
 - Name of Contractor
 - ~~Original~~ Digital Signature of Contractor: In case of joint venture bid, all contractors must sign.
 - Name of the Surety Company

- ~~Original~~ Digital Signature of Surety (if Surety's limitation is less than the amount of the bid bond, a certificate of reinsurance must be attached).
- D. A Contractor's Annual Bid Bond (Form 650043) may also be used for the proposal guaranty in lieu of that specified above. The Annual Bid Bond shall contain the following items:
- Name of Contractor
 - ~~Digital~~ Original signature of the Contractor
 - Date of signature
 - Name of Surety Company
 - ~~Digital~~ Original signature of the Surety

Section 1103

1103.01, Consideration of Bids.

Add the Article:

- K. For failure to have Bidder Status Form on file with Office of Contracts.

Section 1104

1104.09, Right-of-Way.

Add to the beginning of the second paragraph:

Contractor shall not remove trees outside the construction limits, including areas in divided medians and inside of interchanges, without approval of the Engineer.

Section 1105

1105.03, Working Drawings.

Delete Article B and **Renumber** Articles C, D, and E:

~~B. For projects on the Secondary Road System (non-Primary projects), working drawings shall be submitted to the Engineer unless noted otherwise in the contract documents.~~

~~C B.~~

~~D C.~~

~~E D.~~

Replace and **Renumber** Articles F and G:

F E. Electronic Submittals.

1. For projects on the Secondary Road System (non-Primary and Interstate projects), working drawings shall be submitted to the Engineer unless noted otherwise in the contract documents.
- 4 2. For Primary and Interstate projects (and when specified for Secondary Road System projects), ~~electronic submittals may be made via email and sent to the following email addresses corresponding to the review office identified in Table 1105.03-4 shall be made via electronic document management system (Doc Express).~~ ~~or~~ If noted in the contract documents, submittals shall also be made to the consultant email address indicated on the contract documents:.

REVIEW OFFICE

Bridges and Structures
Design (Soils Design Section)
Traffic and Safety

EMAIL ADDRESS

Bridges.Structures@dot.iowa.gov
Soils.Design@dot.iowa.gov
Traffic.Safety@dot.iowa.gov

~~2. Provide a courtesy copy of the submittal to the Engineer and District Materials Engineer.~~

~~3. When the contract documents specify submittals to be sent to the design consultant's email address, the review office shall be courtesy copied, in addition to the Engineer and District Materials Engineer.~~

- ~~4. Electronic submittals shall be sent from the Contractor's email address that is applicable to the project. Emails sent from subcontractor's, fabricator's, and supplier's email address will not be accepted. Emails from personal email addresses are discouraged and may require authentication by the Engineer prior to acceptance for review.~~
- ~~5. Submittals shall be limited to 15 MB attachment file size. Split larger files and send in multiple emails.~~
- 6 a.** The submittal file shall be Portable Document Format (PDF) sized to print on 11 inch by 17 inch (279.4 mm by 431.8 mm) or 8.5 inch by 11 inch (215.9 mm by 279.4 mm) paper. Full size print documents cannot be accepted in electronic format. Minimum resolution of 300 dpi (118 dots/cm) is recommended. Ensure document submitted is legible. Submittal files in other formats (e.g. CAD files) will not be accepted.
- 7 b.** Provide project number and submittal description in the email subject line for the document title in Doc Express. The email Doc Express submittal will serve as the transmittal log and shall include, by virtue of the user login, the Contractor's name, address, and telephone number, and the fabricator's name, address, and telephone number (if applicable) in the body of the email, or on the electronic attachment.
- 8 c.** Shop drawings submitted electronically via email Doc Express will be tracked, processed, and returned to the Contractor via email Doc Express. Paper copies will not be distributed.

G. Paper Submittals.

For Primary and Interstate projects, all paper submittals shall be processed by the Contractor and sent to the review office identified in Table 1105.03-1 below with a copy of the cover letter sent to the Engineer and District Materials Engineer. The cover letter shall include the following information:

- ~~Date of submittal or resubmittal~~
- ~~Project number~~
- ~~Description of submittal~~
- ~~Contractor's name, address, and telephone number~~
- ~~Number of submittal copies~~
- ~~Fabricator's name, address, and telephone number (if applicable).~~

When the contract documents specify submittals to be sent to the design consultant, copies of the cover letter shall be sent to the review office, as well as the Engineer and District Materials Engineer.

Table 1105.03-1: Review Offices for Working Drawings

DESCRIPTION	REVIEW OFFICE	NUMBER OF COPIES ^(a)	REVIEW TIME (calendar days)
Falsework for slab bridges	Bridges and Structures	2-(6)	30
Cofferdam design (when required)	Bridges and Structures	2-(6)	30
Reconstruction of substructure (detailed plans for supporting the superstructure)	Bridges and Structures	2-(6)	30
Steel Structures	Bridges and Structures	2-(7)	30
Detail plans for falsework or centering support of steel structures (i.e. erection plans)	Bridges and Structures	2-(6)	30
Steel and aluminum pedestrian hand rails and aesthetic fences	Bridges and Structures	2-(7)	30
Highway sign support structures (i.e. bridge-type trusses, cantilevers trusses, & bridge mounts)	Bridges and Structures	2-(7)	30
Precast concrete (i.e. deck panels, RCB culverts, noise wall panels, arch sections, etc.)	Bridges and Structures	2-(8)	30
Tower lighting	Bridges and Structures	2-(7)	30
Highway lighting	Traffic & and Safety	2	30
Highway signing steel breakaway posts	Traffic and Safety	2	30

Traffic signalization ^(b)	Traffic and Safety	2	30
Highway signing - Type A and B signs	Traffic and Safety	2	30
Bridge components	Bridges and Structures	2 (7)	30
Pre-engineered steel truss recreational trail bridge	Bridges and Structures	2 (8)	30
MSE, segmental, and modular block retaining walls (Preliminary and final submittals shall include design calculations, shop drawings, and field construction drawings)	Design (Soils Design Section)	Preliminary submittal: 3 design calculations, 3 shop drawings, & and 3 field construction drawings	30
		Final submittal: 3 design calculations, 3 shop drawings, & and 3 field construction drawings	14
Soil nail and tie-back retaining walls (Submittal includes final design plans)	Design (Soils Design Section)	6 final design plans	60
Intermediate foundation improvement (IFI) (i.e. stone columns, geopiers, etc.) (Submittal shall include design calculations and field construction drawings)	Design (Soils Design Section)	4 design calculations & and 8 field construction drawings	30
Removal of box girder bridges	Bridges and Structures	2 (5)	30
Structural erection manual	Bridges and Structures	2 (6)	30
Temporary shoring	Bridges and Structures	2 (6)	30
Temporary sheet pile retaining wall	Bridges and Structures	2 (6)	30
Architectural mock-ups ^(a)	Bridges and Structures	4	30
Architectural paving ^(a)	Bridges and Structures	4	30
Architectural paint color samples and manufacturer data ^(a)	Bridges and Structures	3	30
Architectural concrete texture form liner samples and drawings ^(a)	Bridges and Structures	3	30
Architectural concrete sealer samples and manufacturer data ^(a)	Bridges and Structures	3	30
Architectural ornamental brick ^(a)	Bridges and Structures	3	30
<p>(a) Number of copies only applies to paper submittals. Number of copies in parenthesis is the number required for full size prints. Full size prints are any print exceeding 11 inches by 17 inches (279.4 mm by 431.8 mm). Submittals of physical samples shall be through the Engineer.</p> <p>(b) Submittal time shall be within 45 calendar days from the date of award of contract.</p>			

1105.04, Conformity With and Coordination of the Contract Documents.

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

D. Should there be a discrepancy between a contract document and a document (e.g.: ASTM, AASHTO, MUTCD, etc.) referenced by a contract document, the referenced document shall carry the same hierarchy as the contract document from which it is referenced. Should there be a discrepancy between the contract documents and a referenced document, the contract documents govern unless obviously incorrect.

D E.

E F.

F G.

G H.

1105.11, D.

Replace the Article:

For structures, the following equipment and material loads shall apply:

1. Only ~~legal load~~ vehicles and equipment with legal load axle configuration will be permitted on structures unless specifically allowed by the contract documents or approved by the Engineer.
2. ~~Legal load v~~ Vehicles and equipment will be subject to weight restrictions according to the posted limits.
3. All loads in spans where critical or damaged members, as indicated in the contract documents or identified by the Engineer, are being repaired or replaced shall be subject to the approval of the Engineer.
4. Material loads stored on the structure shall be limited to a maximum weight of 20 tons. Distribution of load shall be governed by the following:
 - a. If the material load is greater than 200 pounds per square foot and less than 500 pounds per square foot, the loaded area will be restricted to an area 5 feet by 10 feet (50 square feet) with a clear spacing of 15 feet between loaded areas.
 - b. If the material load is less than or equal to 200 pounds per square foot, the loaded area is only restricted by the 20 ton maximum.
5. Construction vehicles and equipment not involved with the loading and unloading of stored material shall be restricted from operating within 10 feet of the area where the material is stored.
6. All vehicle, equipment, and material loads exceeding the limitations as stated above shall be ~~submitted to the Engineer for checking and review prior to subjecting the loads to the structure~~ subject to the Engineer's review and approval. The Contractor shall ~~include in their submittal~~ submit all details, calculations, and assumptions necessary to determine that the structure is capable of supporting the proposed loading. Unless waived by the Engineer, ~~the~~ calculations shall be certified by a Professional Engineer licensed to practice engineering in the State of Iowa.

The above submittal requirements shall also apply to cranes or other construction equipments when:

- a. Other components are added resulting in overall weight greater than legally allowed or granted by special permit.
- b. The operational weight including construction loads is greater than legally allowed or granted by special permit.
- c. Load distribution is altered during operation due to the use of outriggers or other devices.

1105.13, Protection of Water Quality and Wetlands.

Renumber, Retitle, and Replace the Article:

~~1105.13 PROTECTION OF WATER QUALITY AND WETLANDS.~~ 1107.18 ENVIRONMENTAL PROTECTION.

A. Protection of Water Quality and Wetlands.

- A 1.** The Contractor shall comply with the requirements of the Clean Water Act (33 U.S.C. 1344 and 33 CFR 323) and Executive Order 11990. When it becomes necessary for the Contractor to work in waters of the United States, the Contractor shall be aware that a Section 404 permit and Section 401 Water Quality Certification may be required.
- B 2.** When required, the Contracting Authority will obtain a Section 404 permit and Section 401 Water Quality Certification for essential work on the right-of-way prior to the award of the contract. The Contractor shall adhere to the requirements of the permit. Activities occurring in or across waters of the United States not specifically reviewed and approved in the permit are not authorized. If the Contractor desires to use construction methods that are not specifically approved by the permit, the Contractor shall be responsible for obtaining approval in the form of a new Section 404 permit from the U.S. Army Corps of Engineers and possibly DNR. The Contractor shall not use construction methods that require additional mitigation by the Contracting Authority. The Contractor will not be granted additional compensation or contract time due to their request for a new permit. If, however, due to no fault of the Contractor, a Section 404 permit modification involving activities within the right-of-way is deemed necessary by the Engineer, additional contract time and/or compensation may be considered.

C 3. Projects regulated by the requirements of a Clean Water Act Section 404/401 Permit will be identified in the contract documents. The Contractor shall comply with the following requirements in order to meet the general conditions of Clean Water Act Section 404/401 Permits.

~~1. Historic or Archaeological Remains.~~

~~The Contractor shall comply with Article 2102.03, J.~~

2 a. Inspection.

The Contractor shall allow representatives from the DNR or U.S. Army Corps of Engineers to inspect the work any time deemed necessary to ensure that the work is being accomplished in accordance with the terms and conditions of the contract documents and permit.

3 b. Timing.

The Contractor is encouraged to conduct construction activities during a period of low flow unless otherwise agreed upon by the Engineer.

4 c. Vegetation Clearing.

Clearing of vegetation, including trees located in or immediately adjacent to waters of the state, shall be limited to that which is absolutely necessary for construction of the project as indicated in the contract documents. Vegetative clearing material shall not be disposed of in a waterway or wetlands unless otherwise indicated in the contract documents.

5 d. Disposal and Handling.

Construction debris shall be disposed of at upland, non-wetland locations so that it cannot enter a waterway or wetland. ~~Construction equipment, activities, and materials shall be kept out of the water to the maximum extent possible.~~ Equipment for handling and conveying materials during construction shall be operated to prevent dumping or spilling the materials into waterbodies, streams, or wetlands except as approved by the Engineer. Care shall be taken to prevent petroleum products, chemicals, or other deleterious materials from entering waterbodies, streams, or wetlands.

6 e. Erosion Control and Sediment Controls.

Erosion control features shall be installed by the Contractor in accordance with Sections 2601 and 2602.

7 f. Revegetation.

Disturbed areas not covered with revetment shall be seeded in accordance with Section 2601.

8 g. Temporary Fills.

If temporary crossings, causeways, or work pads are needed for the work, then temporary structures and fills shall be constructed in accordance with Section 2547.

9 h. Flowable Mortar.

Flowable mortar shall be installed in accordance with Section 2506.

10 i. Bridge Removal.

When bridge removal is identified in the contract documents, the bridge and piers shall be removed in accordance with Section 2401. Debris from bridge removal that falls into the water shall remain there only temporarily and shall be removed by the Contractor.

11 j. Revetment.

Revetment materials shall comply with Section 4130.

~~12. Threatened/Endangered Bats.~~

~~To protect threatened/endangered bats, trees shall be removed in accordance with Article 2101.01, unless otherwise directed in the contract documents. The Contractor shall limit removal of forest cover to those areas which are absolutely necessary for the construction of the work.~~

13 k. Navigation.

No activity shall cause more than a minimal adverse effect on navigation. Safety lights and signals required by the contract documents shall be installed on authorized facilities in navigable waters of the United States. Payment will be made in accordance with Article 1109.03.

14 l. Aquatic Life Movements.

When indigenous aquatic life has been identified in the contract documents, no activity shall substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area.

15 m. Spawning Areas.

When spawning areas and spawning seasons have been identified in the contract documents, the Contractor shall limit activities in spawning areas during spawning seasons and avoid these areas. Contractor's activities that result in physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area will be prohibited, unless otherwise indicated in the contract documents.

~~16. Migratory Bird Breeding Areas~~

~~When migratory bird breeding areas have been identified in the contract documents, activities in waters of the United States that serve as breeding areas for migratory birds shall be avoided by the Contractor.~~

~~17. Shellfish Beds.~~

~~When shellfish beds have been identified in the contract documents, no construction activity shall occur in areas of concentrated shellfish populations.~~

18 n. Suitable Material.

No activity shall use undesirable material (e.g. trash, debris, car bodies, asphalt, etc.). Discharged material or material used for construction shall be free from toxic pollutants in toxic amounts in accordance with Section 307 of the Clean Water Act.

19 o. Water Supply Intakes.

Unless otherwise indicated in the contract documents, no activity shall occur in the proximity of a public water supply intake, except where the activity is for repair or improvement of public water supply intake structures or adjacent bank stabilization.

20 p. Adverse Effects From Impoundments.

If construction activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, or restricting its flow shall be minimized.

21 q. Management of Water Flows.

To the maximum extent practical; the pre-construction course, condition, capacity, and location of open waters shall be maintained by the Contractor during construction, including stream channelization and storm water management activities. Temporary stream diversion shall be done in accordance with Section 2418.

22 r. Equipment.

- 1) Heavy equipment working in wetlands or mudflats shall be placed on mats, or other measures shall be taken to minimize soil disturbance.
- 2) Unless otherwise indicated in the contract documents, heavy equipment shall not be used or operated within the stream channel. If in-stream work is unavoidable, it shall be performed in such a manner as to minimize the duration of the disturbance, turbidity increases, substrate disturbance, bank disturbance, and disturbance to vegetation.

23 s. Threatened and Endangered Species.

~~No activity will be authorized which will jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or will destroy or adversely modify the critical habitat of such species. Activities shall be completed in accordance with Article 1107.18, B, 1.~~

24 t. Historic Properties.

No activity will be authorized which violates the requirements of Section 106 of the National Historic Preservation Act.

25 u. Mitigation.

The work shall be constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States at the project site (i.e., on site).

26. ~~Active Nests of Migratory Birds.~~

~~To protect migratory birds, do not conduct construction activities where active nests are present between the dates of April 1 and July 15, inclusive or until the birds have fledged and left the nest. Active nests are nests containing eggs or young of migratory birds.~~

~~Beginning on the date the contract is fully executed, the contractor shall remove all non-active, existing migratory bird nests and monitor to prevent the establishment of active nests. Prior to that date, the Contracting Authority is responsible to remove all non-active, existing migratory bird nests and monitor to prevent the establishment of active nests.~~

~~If evidence of migratory bird nesting is discovered after beginning work, or in the event that migratory birds nests become established, immediately stop work and notify the Engineer.~~

B. Threatened and Endangered Species.**1. Threatened and Endangered Species.**

No activity will be authorized which jeopardizes the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or will destroy or adversely modify the critical habitat of such species.

2. Threatened and Endangered Bats.

To protect threatened/endangered bats, trees deemed suitable habitat shall be removed in accordance with Article 2101.01, A, unless otherwise directed in the contract documents. The Contractor shall limit removal of forest cover to those areas which are absolutely necessary for the construction of the work. Areas of suitable habitat for threatened and endangered bats shall be determined by the Contracting Authority.

3. Working in Topeka Shiner Watersheds.

When critical habitat for Topeka shiner is identified in the contract documents, the following special conditions shall be implemented:

- a. The Contractor shall not deposit sweepings, washings, treatment chemicals, or grouting and bonding materials in the stream or into any location where such pollutants can be washed in the stream by runoff water.
- b. To protect Topeka Shiners during their peak spawning period, Contractor shall not conduct project activity within the stream bed between the dates of May 15 and July 31, inclusive. Constructing or removing temporary crossings, causeways, and weirs is prohibited between those dates as well. Previously constructed crossings, causeways, and weirs may remain in place between those dates.
- c. Prompt attention is required for placing and maintaining temporary erosion control measures to minimize unnecessary sediment loading of the stream. Within one week of land disturbance at the project site, place appropriate temporary erosion control measures (e.g. silt fencing, hay bale ditch checks, erosion control blankets, rock ditch checks, etc.) and/or temporary grass seeding.
- d. Within one month (or during the next appropriate seeding period) following completion of construction, reseed all areas denuded of vegetation as a result of the permitted action, including all borrow areas that drain into the stream, using a permanent seed mix.
- e. The Contractor shall not take sand for use in mixing concrete and/or asphalt from the project site, unless indicated otherwise in the contract documents.
- f. The Contractor shall protect off-channel wetland complexes, such as old oxbow meanders, that are present near the project area.
- g. The Contractor shall locate and protect temporary storage and/or staging facilities for waterways, tributaries, or drainageways within the project areas. In the event of an accidental spill, follow established state and federal spill reporting procedures. For Iowa DOT projects, immediately notify the Office of Location and Environment.

4. Mussel/Shellfish Beds.

When mussel/shellfish beds have been identified in the contract documents, no construction activity shall occur in areas of concentrated shellfish populations.

C. Active Nests of Migratory Birds.

1. To protect migratory birds, the Contractor shall not conduct construction activities where active nests are present. Active nests are likely to be present between the dates of April 1 and July 15. Active nests are nests containing eggs or young of migratory birds.
2. Prior to the date the contract is fully executed, the Contracting Authority will be responsible to remove non-active, existing migratory bird nests and monitor to prevent the establishment of active nests.
3. Beginning on the date the contract is fully executed, the Contractor shall remove non-active, existing migratory bird nests and monitor to prevent establishment of active nests. Only costs associated with removing nests prior to initial mobilization will be paid as extra work as per Article 1109.03, B.
4. In the event that active nests are discovered, stop work and notify the Engineer.

D. Cultural Resources.

1. No activity will be authorized which violates the requirements of Section 106 of the National Historic Preservation Act.
2. When required, the Contracting Authority will obtain Section 106 authorization for essential work on the right-of-way prior to the award of the contract. The Contractor shall adhere to the requirements of the authorization.
3. The Contractor shall comply with Article 2102.03, J, if historic, cultural or archeological remains and artifacts are discovered while accomplishing the work under contract.

E. Regulated Materials.

1. The Contractor shall comply with Article 1107.07, C.
2. The removal, transport, and disposal of asbestos from buildings and structures scheduled for demolition or renovation shall be done in accordance with Section 2536.
3. The removal of underground tanks and remediation of petroleum contaminated soil shall be done in accordance with Section 2537.
4. The salvage, removal, and disposal of buildings and other obstructions from the project site shall be done according to in accordance with Section 2538.

F. Noise.

The Contractor shall comply with Article 1107.07, D.

G. Loess Hills Protection.

1. The following definitions apply to this specification:
 - a. **Loess Hills.**

A distinctive topographic landform encompassing over 640,000 acres in portions of seven Iowa counties: Plymouth, Woodbury, Monona, Harrison, Pottawattamie, Mills, and Fremont. The Loess Hills extend nearly 200 miles in a narrow band adjacent to the Missouri River floodplain, and are characterized by distinctive topographic features such as steep, narrow ridge crests, peaks, saddles, and numerous steep side slopes, branching spurs, and precipitous bluffs. The western boundary of the Loess Hills is generally defined by the sheer, nearly vertical faces rising from the adjoining Missouri River floodplain. The topography along the eastern boundary is more gradual and the soil types tend to be gradational; therefore, soil borings will be used to define Loess soils material, using a 50 foot or greater measurement to refine boundaries. Less than 50 foot Loess soils depths will not be considered Loess Hills.
 - b. **Special Landscape Areas.**

Twelve areas within the Loess Hills encompassing approximately 92,000 acres, and provide clusters of exemplary remnant prairie and geological/topographical features. The Special Landscape Areas

are found along the western margins of the Loess Hills where the loess is the deepest, the topographic relief is greatest, and the exposure to sun and wind provide favorable conditions for prairie communities. The rugged topography within these areas also has served to protect inaccessible prairies from intensive livestock grazing and other human-induced disturbance. The Special Landscape Areas were identified by National Park Service, in coordination with advocacy organizations and Iowa DNR staff, while conducting the Loess Hills of Western Iowa Special Resources Study in 2002.

c. Glenwood Locality.

The Glenwood Locality, located in Mills County, contains a rich and diverse prehistoric archeological record that spans 12,000 to 13,000 years.

2. The Contractor shall ensure areas (including haul roads and staging areas) selected for furnishing borrow or for waste or disposal of excess material (excavated material or broken concrete), do not impact or encroach upon the western face of the Loess Hills landform, any of the twelve Special Landscape Areas located within the Loess Hills landform, or the Glenwood Locality.
3. The Contractor shall avoid areas (including haul roads and staging areas) for furnishing borrow or for waste or disposal of excess material (excavated material or broken concrete), that exhibit natural vegetation, which is defined as herbaceous or woody vegetation that is unmodified by human activities, vegetation that has been altered by humans but has retained or regained characteristics of an undisturbed community, or vegetation that has been planted by humans but is not actively maintained for agricultural/commercial purposes. Areas that have been cultivated and planted to non-native grasses, legumes, or grass-legume mixtures for purposes of livestock grazing, seed production, or hay crops shall not be given consideration as natural vegetation, except in cases where threatened or endangered species are present.

1105, Control of Work.

Add the Articles:

1105.17, Subsoil Tillage.

Prior to placement of topsoil and/or stabilizing crop seeding, perform subsoil tillage to an average depth of 16 to 20 inches on stockpile areas, haul roads, and areas used for storage of equipment. Till at 3 foot maximum centers and at right angles to finished slope.

Equip tillage equipment with arrowhead type shoe providing lateral displacement and limit movement of subsoil to the surface. Obtain Engineer's approval for equipment.

It is intended that following subsoil tillage, the area remain in a loosened condition. Additional compaction or operation of heavy equipment, other than that required for topsoil placement and shaping, will not be allowed on areas tilled.

This work shall be considered incidental to other work on the project and will not be paid for separately.

1105.18, Topsoil on Haul Road.

Before placing a construction haul road, strip topsoil from within proposed haul road footprint to a depth of 8 inches and stockpile. After haul road has been removed, prepare disturbed area according to Article 1105.17, and place topsoil over disturbed area to a minimum depth of 4 inches.

This work shall be considered incidental to Mobilization and will not be paid for separately.

Section 1106

1106.07, B.

Add as the fifth bullet:

- **Regulated Materials.**

Section 1107

1107.06, B, Buy America.

Replace the Article:

~~On all contracts~~ Per Materials I.M. 107, all products of iron, steel, or a coating of steel which are incorporated into the work shall be of domestic origin and shall be melted and manufactured in the United States. The Engineer may allow minimal amounts of these materials from foreign sources, provided the cost does not exceed 0.1% of the contract sum or \$2,500, whichever is greater. This amount shall include transportation, assembly, and testing as delivered cost of foreign products to the project. ~~Per Materials I.M. 107, miscellaneous steel or iron components, subcomponents, and hardware, as defined by FHWA, will not be subject to Buy America requirements.~~

1107.06, Federal Requirement.

Add the Article:

C. Use of United States-Flag Vessels.

In accordance with 46 CFR 381.7(b), on all Federal-Aid contracts, the Contractor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50% of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.
2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in Article 1107.06, C, 1, to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.
3. To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract.

Section 1108

1108.02, A, 1.

Replace the second sentence:

The proposal form may also indicate the contract period by a Completion Date ~~for non-highway type contracts (e.g. buildings, furnishing materials, etc.).~~

1108.02, C, 1, Specified Start Date.

Replace the Article:

Except as noted in Article 1108.02, E, 2, f, ~~W~~working days will be charged to the Contractor starting on the Specified Start Date, ~~but not prior to 15 calendar days after the contract has been signed by the Contracting Authority.~~ Starting work prior to the Specified Start Date will be considered upon request, and working days will be charged when work starts.

1108.02, E, 2.

Replace the Article:

Working days will be charged beginning with the following circumstances:

- ~~a. On the date specified for projects with a Specified Start Date.~~
- b. On the date that has been agreed to at the preconstruction conference for ~~projects~~ contracts with an Approximate Start Date.
- c. On the start date indicated in the Notice to Proceed for ~~projects~~ contracts with an Approximate Start Date.
- d. On the day following the date the site becomes available if the Contractor is already working ~~on the site~~ onsite for ~~projects~~ contracts with an Approximate Start Date.

- e. On the date the Contractor begins work prior to the Late Start Date.
- f. On the date specified for projects contracts with a Late Start Date or Specified Start Date, and the Contractor has not ~~begun~~ started work prior to that date. However, working days will not be charged prior to 15 calendar days after the contract has been signed by the Contracting Authority all required entities, ~~as long as~~ provided the Contractor furnished the signed contract, performance bond, and proof of insurance within the time allowed by Article 1103.07; and has not ~~begun~~ started work on the contract.

1108.03, C.

Delete the second sentence:

~~The Contractor should request a determination of the holidays to be observed at the beginning of each calendar year.~~

1108.03, D.

Add the Articles:

- 3. **Thanksgiving Day** – No work will be allowed the preceding Wednesday and the Friday, Saturday, and Sunday following Thanksgiving Day.
- 4. **Christmas Day and New Year's Day** -- When Christmas Day and New Year's Day are observed as a State Holiday on Monday, no work will be allowed beginning the preceding Friday through the holiday. When Christmas Day and New Year's Day are observed as a State Holiday on Friday, no work will be allowed the preceding Thursday through the following Sunday.

Section 1109**1109.03, B, 2, g.**

Replace the first sentence:

Rental rate for machinery, tools, or equipment (except small hand tools which may be used) and fuel and lubricants shall be based on the average monthly rental rate published in the ~~RENTAL RATE BLUE BOOK~~ by Equipment Watch Cost Recovery.

1109.05, A, 2.

Replace the Article:

On contracts for which the contract sum is \$10,000 or more, payments may be allowed based on value of processed or fabricated materials or rolled steel products which have been delivered on the work or 90% of the value of processed or fabricated material, or rolled steel products, reserved for the project and stored elsewhere ~~within Iowa or in other locations where there is routine inspection by Departmental personnel,~~ provided the materials ~~are of acceptable quality~~ conform to the requirements of the contract and the manner of storage is satisfactory to the Engineer. Contractor is responsible for damages and material losses until the material is incorporated into the work and the work is accepted.

Section 1113**1113, Electronic Document Storage.**

Add the Section:

1113.01 GENERAL.

Electronic Document Management shall be used for electronic document storage on contracts where the Department is the Contracting Authority. This requirement may be used on other contacts when specified in the contract documents.

This specification contains requirements for collection and management of electronic documents through the use of Doc Express at <https://docexpress.com>. Doc Express is a web based document management program which accepts electronic documents and provides security as appropriate for each submittal.

The Contracting Authority will perform setup of Doc Express in accordance with project requirements. Doc Express is the complete and officially recognized construction document management system for contract documents required by the Contracting Authority.

Costs associated with the use of Doc Express are incidental to Mobilization. Contract item progress payments will be withheld until documentation is provided as defined in this specification.

A. Structure.

The framework utilizes basic contract drawers to store project documents.

Within each drawer are types used to group similar items together. A complete listing of the types in each drawer can be seen when submitting a document to that drawer in Doc Express.

B. Security.

As requested, each user within an organization will be assigned an account within Doc Express by their own organization. Access to Doc Express will be tracked through the use of the user's unique email address and password. User permissions will be defined within Doc Express for each specific contract.

1. **Prime** - The Contractor will be assigned Prime permission to submit documents and view all documents submitted into Doc Express - including those submitted by the Contracting Authority and users with an Associate level permission.

The Prime can grant access to all associates to all drawers except the Payroll drawer to which only the Prime should have access.

2. **Associate** - Subcontractors and suppliers will be assigned Associate permission which will authorize any user associated with the respective subcontractor or supplier to submit documents but can view only those documents submitted by that respective entity. An Associate user is not able to view documents submitted by a Prime, Contracting Authority, or other Associate users.
3. **Reviewer** - Reviewer permission allows the user to only view all documents and will typically be assigned to those that will oversee the specific contract, but are not responsible for daily tasks.
4. **Contracting Authority** - A formal permission level is not assigned. Contracting Authority staff has the ability to submit, receive, audit, or reject a document.

Documents submitted into Doc Express are secure. Security of the program will not allow modifications to a submitted document by any user. The user, or another user within the organization, who submitted the document may delete the submittal from Doc Express as long as the document has not been received, rejected, or had a comment attached.

The Payroll drawer has a more restrictive security setting. Only the user who submits a payroll document or a Contracting Authority user specifically assigned to access payroll information for the specific contract can view the payroll document. Other Prime users will not be able to view the submitted payroll document nor will other Contracting Authority users.

C. Document Types.

Doc Express will accept all types of electronic documents including, but not limited to, Microsoft Excel files, Microsoft Word documents, Adobe Portable Document File (PDF), Tagged Image File (TIFF), and Joint Photographic Experts Group (JPEG). The maximum size limit of a file is 50 MB, but uploading and opening of the document will take longer as the file size increases. Preference should be given to smaller file sizes anytime they can be used.

1113.02 RESPONSIBILITIES.

A. Contracting Authority.

1. Contract set-up including drawer and type creation within a contract with applicable Prime, Associate, and Reviewer permissions.
2. The Construction Project File will be maintained in Doc Express. The Contracting Authority will submit to the appropriate drawer and type, all construction related documents generated by the Contracting Authority.

3. Review and verify that the documentation submitted meets the applicable submittal requirements. The review of documents will be made promptly from when the documents were able to be verified. Contractor payment may be withheld for contract documents not submitted.

B. Contractor.

1. Verify subcontractors and suppliers involved with the project have access to contract in Doc Express. Add any subcontractor or supplier which was omitted from the set-up performed by the Contracting Authority.
2. Submit electronic documentation per type defined in Doc Express. Each electronic submittal may contain multiple pages of documentation but shall provide information required for the specified type only.
3. Provide daily or weekly statements that show an itemized summary of the quantity of certified non-proportioned material delivered to the project site. The statement is to include a total for the day or week provided and a running total for the amount delivered to the project to date.
4. Submit the invoice, certified bill of materials, or bill of lading for each shipment as documentation to allow the Contracting Authority to authorize progress payments for:
 - Corrugated Metal Culvert Pipe – Materials I.M. 441.
 - Precast Concrete – Materials I.M. 445.
 - Plastic Pipe – Materials I.M. 446.

C. Shared Contracting Authority and Contractor/Supplier Responsibilities.

Doc Express will store final versions of documentation required for the contract. Some documents require involvement and coordination between the Contracting Authority and Contractor to reach a final version. This shared responsibility will be coordinated to prevent incomplete or redundant data from being electronically stored.

Division 20. Equipment Requirements.

Section 2001

2001.12, G.

Add to the end of the Article:

- Provide a manufacturer produced tank stick.

2001.12, H.

Delete the Article:

~~H. Calibrate distributors initially at the Iowa DOT Materials Laboratory. Verification of a manufacturer's calibration may be made by the Iowa DOT Materials Laboratory or by a District Materials Office. Have distributor calibrations certified annually by either the Iowa DOT Materials Laboratory or District materials personnel. If distributors are found to have inaccurate calibrations, have distributors recalibrated by the Iowa DOT Materials Laboratory before further use.~~

2001.19, B, 4.

Replace the Article:

A screed extension may be used, provided it has a screed plate with vibration.

a. Flush-mounted Screed Extension.

If the extension exceeds 1 foot, extend the auger as well.

b. Offset-mounted Screed Extension.

Operate screed unit to produce a uniform distribution of mixture ahead of the extension.

c. Other extensions will be allowed for placing fillets or short or irregular tapers.

Division 21. Earthwork, Subgrades, and Subbases.

Section 2101

2101.01, A.

Replace the Article:

Clearing: Cut and remove trees 3 inches or more in diameter. Cutting shall be performed between October 1st and March 31st. Tree felling will only require trees to be cut 3 to 4 feet above ground line.

2101.03. Construction.

Add the Article:

G. Perform tree felling in areas as shown in the contract documents. Grubbing and removal of felled trees or other material will be completed by others. Move felled trees to avoid interference with drainage ways and keep within the right-of-way, unless indicated otherwise in the contract documents.

2101.04, A, 2.

Add after the first sentence:

Units for tree felling will be equivalent to clearing units.

2101.04, B, 1.

Replace the Article:

The area in acres will be based on that the quantity shown in the contract documents, ~~computed from a need line, or computed from a right-of-way line if the limits are not shown for this item in the contract documents.~~ If limits for this item are not shown in the contract documents, they will be calculated from a need line or right-of-way line as indicated in the plans.

2101.05. Basis of Payment.

Replace the first sentence:

Payment for Clearing and Grubbing, removal of trees, stumps, logs and down timber, hedge rows, brush, field fence, ~~and growing corn,~~ and tree felling will be made at the contract unit price per unit or per acre as indicated below.

Section 2102

2102.03, F, 3, a, 2.

Replace the Article:

Contractor may elect to substitute with special backfill material or modified subbase material as shown in the contract documents at no additional cost to the Contracting Authority. If special backfill material or modified subbase material is used in lieu of select soil material, provide for suitable surface and subsurface drainage of this material and provide suitable soils in lower portion of original subgrade treatment layer at no additional cost to the Contracting Authority. However, use the same type of select treatment material across a set of lanes being constructed.

2102.03, F, 3, a, General.

Add the Article:

4) To stabilize granular soil select treatments, incorporate 3 inches of special backfill into the top of the select treatment. Payment for this work is incidental to Contractor Furnished Select Treatment.

2102.04, A, 8, Contractor Furnished Select Treatment.

Add as the second sentence:

Shrinkage will not be included in the quantity.

2102.05, A, 8, Contractor Furnished Select Treatment.

Add as the third sentence:

Moisture control of select soil treatment is incidental to Contractor Furnished Select Treatment and will not be paid for separately.

Section 2106**2106.03, E.**

Replace the Article:

The Engineer will determine elevations of settlement plates in accordance with Article 2526.03, ~~GE~~.

Section 2107**2107.03, C, 1.**

Replace the Article:

~~Where the height of proposed embankment at the center line is 5 feet or less, remove sod (after thorough disking) from the area. Place the sod on the area to be occupied by the outer portion of the embankment as provided in Article 2107.03, D. Strip topsoil as required by the contract documents.~~

2107.03, H, 1.

Replace the Article:

The contract documents will ~~show~~ indicate areas in which where to construct embankments ~~shall be constructed~~ with moisture and density control. ~~The~~ When a specific depth is required, the contract documents will also ~~show~~ indicate the distance below the elevation of the completed grading work to which such methods are to be applied. Unless specified otherwise in the contract documents, maintain moisture content within the limits of -2.0% and +2.0% of optimum moisture content for maximum dry density.

2107.03, I, 1.

Replace the Article:

The contract documents will ~~show~~ indicate:

- ~~a. Areas in which~~ where to construct embankments ~~are to be constructed~~ with moisture control.
- ~~b. The~~ When a specific depth is required, the contract documents will indicate the distance below the elevation of the completed grading work to which such methods are to be applied.
- ~~c. The moisture limits.~~ Unless specified otherwise in the contract documents, maintain moisture content within the limits of -2.0% and +2.0% of optimum moisture content for maximum dry density.

Section 2116**2116.02, A, 1, b.**

Replace the Article:

Foamed Asphalt using PG 52 -34S ~~or PG 46-34~~ asphalt binder meeting requirements of Section 4137.

Section 2122**2122.02, A, Hot Mix Asphalt Mixture (1,000,000 ESAL Base Mixture).**

Replace the title and Article:

~~Hot Mix Asphalt Mixture (1,000,000 ESAL Base Mixture).~~

Use materials specified in a 1,000,000-ESAL Standard Traffic (ST) base mixture with PG 58-28S binder according to Section 2303.

2122.02, B, 3.**Replace** the Article:

For shoulder construction in which PCC is placed over HMA asphalt, thoroughly clean the surface by brooming prior to placing concrete. When HMA asphalt is to be placed over HMA asphalt, prepare the surface according to Article 2303.03, C, 4.

2122.02, C, 1, Hot Mix Asphalt Mixture.**Replace** the title and Article:**Hot Mix Asphalt Mixture.**

- a. Prior to placement, tack coat the pavement edge.
- b. Proportion, mix, place, and compact HMA asphalt mixture to the width, thickness, grade, and slope shown in the contract documents, according to the requirements of Section 2303.

2122.05, A, 2, c.**Renumber** the Article:

3. Separate payment will not be made for:

2122.05, A, 3.**Renumber** the Article:

4. Furnish samples as specified in Section 2303 or 2301, with payment to be made as specified.

2122.05, C, Resurfacing or Overlay of Existing Paved Shoulders.**Replace** the Article:

For HMA asphalt of the type, width, and thickness specified and satisfactorily constructed, payment will be according to Article 2303.05.

Division 22. Base Courses.

Section 2213

2213.02, A, 1, HMA Base Widening.**Replace** the title and Article:**HMA Asphalt Base Widening.**

Use 1/2 inch or 3/4 inch ~~4,000,000 ESAL~~ Standard Traffic (ST) Base mixture. For base widening for shoulders, use PG 58-28S binder.

- ~~a. Use mixture specified on the contract documents.~~
- ~~b. Meet requirements of Section 2303, as specified.~~

2213.03, E, Preparation of Subgrade.**Replace** Articles 1 and 2:

1. Cut the trench to the width of the widening shown in the contract documents. Ensure ~~if the existing pavement is HMA, saw or trim the~~ a vertical edge of existing asphalt (if any) to a vertical line flush with the ~~edge of the existing concrete~~ pavement by sawing or milling, if needed. At the Contractors option, this trim line may be made at any uniform distance in from the edge of ~~the~~ existing concrete, but not to exceed 3 inches.
2. For HMA asphalt base widening, tack coat the edge of the old pavement at a rate of 0.10 to 0.15 gallon per square yard according to Article 2303.03, C, 2, b. A waiting period will not be required before placing the widening.

2213.03, F, 1, HMA Base Widening.

Replace the title and Article:

HMA Asphalt Base Widening.

- ~~a.~~ Limit the compacted thickness of the top layer to no more than 2 inches. The maximum thickness of lower layers may exceed 3 inches if the Contractor demonstrates the thicker layers have compaction and riding characteristics within conformance to that expected from a 3 inch thick layer. Avoids dumping base material on the surface of the pavement. Immediately remove, by brooming, base material spilled on adjacent pavement.
- ~~b.~~ Spread base material so that after compaction, the constructed width conforms to the design dimension.
- ~~c b.~~ Promptly and thoroughly compact each layer. Compact to the density specified in Article 2303.03, C, 5 for Class I compaction.
 - For widening in a travel lane apply Class I compaction per Article 2303.03, C, 5, b.
 - For widening in non-travel lane apply Class II compaction per Article 2303.03, C, 5, c.
- ~~d.~~ The percent of compaction will be based on the laboratory density obtained for that day's mixture.
- ~~e c.~~ Succeeding layers of base material may be placed as soon as the previous layer has been compacted. Take density samples from the compacted material and test according to Article 2303.03, D.
- ~~f d.~~ When the contract for base widening does not include resurfacing:
 - Ensure the final surface of the widening is flush with, or not more than 1/8 inch below, the surface of the old pavement.
 - Limit compacted thickness of top lift to no more than 2 inches.

2213.03, I, Winter Seal.

Delete the Article:

~~I. Winter Seal.~~

- ~~1.~~ Prime HMA base which is not covered with upper base or surface in the same construction season in which it is built. The Engineer may require an application of a winter seal consisting of:
 - The bituminous material used as the primer or tack coat applied at 0.12 gallon per square yard, and
 - A sand cover applied at 10 to 15 pounds per square yard, according to Section 2307.
- ~~2.~~ Winter seal that the Engineer requires will be paid for as provided in Article 1109.03, B.
- ~~3.~~ Except where road closure is provided in the contract documents, traffic will be allowed to use the road from the time construction is stopped until work is resumed the following season. Make required repairs to the base when construction is resumed, at no additional cost to the Contracting Authority.

2213.04, G, Samples.

Replace the Article:

Article 2303.04, HG, applies for HMA base widening.

Section 2216**2216.03, A, 2, a, 1.**

Delete Article c and **Renumber** Article d:

- ~~e)~~ The roller tires shall be inflated to the pressure necessary to obtain proper surface contact pressure to satisfactorily seat pavement slabs.
- ~~d c)~~ At the Contractor's option, the roller tires may contain liquid.

2216.03, A, 2, a, 2.

Replace the Article:

Weight body suitable for ballasting to a minimum gross load of 50 30 tons. The ballast shall allow gross roller weight (mass) to be readily determined and controlled to maintain a minimum gross roller weight (mass) of 50 30 tons.

2216.03, A, 2, b.

Delete the Article:

- ~~b. Tow the roller with a rubber tired prime mover.~~

2216.03, D, 2.

Replace the Article:

Roll the cracked pavement until seated to the Engineer's satisfaction. The intent is to:

- ~~• Load the roller so that satisfactory seating can be reasonably assured by one complete coverage by the roller, and~~
- Accomplish seating with a minimum damage to aggregate interlock at the cracks.

Division 23. Surface Courses.

Section 2301

2301.03, K, 3, b.

Replace the first sentence:

Protect concrete pavement less than 36 hours old as shown in Table 2301.03-42.

2301.03, U, 1.

Replace the first sentence:

The time for opening pavement for use will be based on the restrictions listed in Table 2301.03-23, with flexural strength determined from beam specimens made during the progress of the work.

2301.03, U, 5.

Replace the first sentence:

At the Contractor's option, when Type I/II cements are used, ~~Class C~~ fly ash may be substituted for up to 10%, by weight, of the cement in Class M concrete mixtures.

2301.04, A, 2.

Replace Articles c and d:

- ~~c. Coring of pavement and other work for thickness determination may be waived by mutual agreement for Determine thickness for sections of the same design thickness less than 5000 3500 square yards or less, by probing plastic concrete in accordance with Materials I.M. 396.~~
- d. Only sections which are cored will be included in the thickness index determination. Areas not cored or probed will be paid for at the contract unit price.

2301.05, A, Portland Cement Concrete:

Replace Articles 2 and 3:

- 2. For sections greater than 3500 square yards, Ppayment for the quantities of pavement in square yards will be at a percentage of the contract unit price according to Table 2301.05-1.

Table 2301.05-1: Payment Schedule for Quantities of Pavement

Thickness Index Range	Percent Payment	Thickness Index Range	Percent Payment
0.00 or more	103	-0.56 to -0.60	91
-0.01 to -0.05	102	-0.61 to -0.65	90
-0.06 to -0.10	101	-0.66 to -0.70	89
-0.11 to -0.15	100	-0.71 to -0.75	88
-0.16 to -0.20	99	-0.76 to -0.80	87
-0.21 to -0.25	98	-0.81 to -0.85	86

-0.26 to -0.30	97	-0.86 to -0.90	85
-0.31 to -0.35	96	-0.91 to -0.95	84
-0.36 to -0.40	95	-0.96 to -1.00	83
-0.41 to -0.45	94	-1.01 to -1.05	82
-0.46 to -0.50	93	-1.06 to -1.10	81
-0.51 to -0.55	92	-1.11 or less	80

For sections 3500 square yards or less, payment for the quantities of pavement in square yards will be at a percentage of the contract unit price according to Table 2301.05-2

Table 2301.05-2: Payment Schedule for Quantities of Pavement 3500 square yards or less

Thickness Deficiency (TD)	8 inch or less Percent Payment	9 inch Percent Payment	10 in or greater Percent Payment
-0.15 or more	100	100	100
-0.16 to -0.25	95	96	96
-0.26 to -0.50	91	92	93
-0.51 to -0.75	85	87	88
-0.76 to -1.00	80	82	84
-1.00 inch or less	2301.05, A, 4	2301.05, A, 4	2301.05, A, 4

Individual probing test results greater than or equal to the design thickness minus 3/8 inch are considered complying. When an individual probing test result is greater than design thickness minus 1 inch but less than design thickness minus 3/8 inch, take corrective action. When an individual probing test result is less than design thickness minus 1 inch, the Engineer will determine core locations to determine the area of deficient pavement thickness.

- Use the following formula to determine the thickness index for the a section of pavement thickness greater than 3500 square yards

Where: $TI = (\bar{X} - S) - T$

TI = thickness index for the section.

\bar{X} = mean core length for the section.

T = design thickness.

S = core length standard deviation (of the sample) for the section.

Use the following formula to determine the thickness deficiency for a section of pavement 3500 square yards or less:

Where: $TD = (\bar{X} - T)$

TD = thickness deficiency for the section.

T = design thickness.

\bar{X} = mean probe depth for the section.

2301.05, D, 2.

Replace the ninth bullet:

Placing, finishing, texturing, ~~grooving~~, and curing.

Section 2303**2303, Flexible Pavement.****Replace the Section:****2303.01 DESCRIPTION.**

- A. Design, produce, place, and compact flexible paving mixtures using proper quality control. Construct to the dimensions specified in the contract documents.
- B. A surface course is the top lift. An intermediate course is the next lower lift or lifts. Use intermediate course mixtures for leveling, strengthening, and wedge courses. A base course is the lift or lifts placed on a prepared subgrade or subbase.

2303.02 MATERIALS.**A. Asphalt Binder.**

Use the specified Performance Graded (PG) asphalt binder meeting the requirements of Section 4137. For shoulder mixtures refer to Section 2122. For base widening mixtures refer to Section 2213. Adjustments to the contract binder grade may be required according to Article 2303.02, C, 6.

B. Aggregates.**1. Individual Aggregates.**

- a. Use virgin mineral aggregate as specified in Section 4127.
- b. When specified, furnish friction aggregate from sources identified in Materials I.M. T203.
 - 1) **Friction Classification L-2.**
Use a combined aggregate such that:
 - a) At least 80% of the combined aggregate retained on the No. 4 sieve is Type 4 or better friction aggregate, and
 - b) At least 25% of the combined aggregate retained on the No. 4 sieve is Type 2 or better friction aggregate, and
 - c) For Interstates and all mixtures designed for ~~30,000,000 ESALS and higher~~ Very High Traffic (VT), the fineness modulus of the combined Type 2 aggregate is at least 1.0. Calculations for fineness modulus are shown in Materials I.M. 501.
 - d) On Interstates and all mixtures designed for ~~30,000,000 ESALS and higher~~ Very High Traffic (VT), if 40% or more of the total aggregate is a limestone as defined in Materials I.M. T203, at least 30% of the combined aggregate retained on the No. 4 sieve is Type 2 or better friction aggregate and at least 25% of combined aggregate passing No. 4 sieve is Type 2 or better friction aggregate.
 - 2) **Friction Classification L-3.**
Use a combined aggregate such that:
 - a) At least 80% of the combined aggregate retained on the No. 4 sieve is Type 4 or better friction aggregate, and
 - b) At least 45% of the combined aggregate retained on the No. 4 sieve is Type 3 or better friction aggregate, or if Type 2 is used in place of Type 3, at least 25% of the combined aggregate retained on the No. 4 sieve is Type 2.
 - 3) **Friction Classification L-4.**
Use a combined aggregate such that at least 50% of the combined aggregate retained on the No. 4 sieve is Type 4 or better friction aggregate.

2. Combined Aggregates.

- a. Use a combined aggregate meeting the requirements in Materials I.M. 510.
- b. When mixtures include RAM, use a combined aggregate gradation consisting of a mixture of RAM aggregate and virgin aggregate.

C. Recycled Asphalt Materials.

- 1. RAM includes RAP and RAS. The designations Classified and Unclassified are exclusively for the use of RAP in HMA.

2. Identify each RAP stockpile and document Classified and Unclassified RAP stockpiles as directed in Materials I.M. 505. Do not add material to a Classified RAP stockpile without the approval of the District Materials Engineer.
3. The Engineer may reject a RAP stockpile for non-uniformity based on visual inspection. Work the stockpiles in such a manner that the materials removed are representative of a cross section of the pile.
4. Place stockpiles of RAP as directed in Materials I.M. 505. Do not use RAP stockpiles containing concrete chunks, grass, dirt, wood, metal, coal tar, or other foreign or environmentally restricted materials. RAP stockpiles may include PCC (not to exceed 10% of the stockpile) from patches or composite pavement that was milled as part of the asphalt pavement.
5. When RAP is taken from a project, or is furnished by the Contracting Authority, the contract documents will indicate quantity of RAP expected to be available and test information, if known. RAP not used in HMA becomes the property of the Contractor.
6. For mix design purposes, the Contracting Authority will test samples of the RAM. The aggregate gradation and amount of asphalt binder in the RAM will be based on the Contracting Authority's extraction tests. For mixtures containing RAM, adjust the contract binder grade as directed in Materials I.M. 510. No adjustments will be made to the contract unit price for required changes to the asphalt binder grade. RAP may be used in accordance with Materials I.M. 510 Appendix C. For surface mixtures, 70% of the total asphalt binder shall be virgin.
 - a. **Classified RAP.**
 - 1) Classified RAP is one of the following
 - RAP from a documented source.
 - RAP from an undocumented source meeting quality control sampling, testing, and reporting requirements in Materials I.M. 505. Material shall be tested at a lab designated by the Engineer according to Iowa Test Method 222 at no additional cost to the Contracting Authority.
 - 2) Classified RAP may be used in mixtures for which the RAP aggregate meets the quality requirements for the mixture design per Materials I.M. 510 Appendix A.
 - 3) When from a documented source, credit will be given for frictional aggregate and crushed particles used in the original pavement to be reclaimed as determined in the paving history (or mix design when paving history is unavailable).
 - 4) For all other Classified RAP, credit for crushed particles shall be the percent of aggregate retained on the No. 8 sieve from Engineer's extraction test. No friction credit will be given.
 - b. **Unclassified RAP.**
 - 1) Any stockpiled RAP not meeting the requirements of Classified RAP shall be designated as Unclassified RAP. No frictional aggregate credit or aggregate crushed particles credit will be given for Unclassified RAP.
 - 2) When an Unclassified RAP stockpile is characterized by sampling and testing for mix design, no material can be added to the stockpile until the project is completed.
7. Pre-consumer or post-consumer shingles that have been processed, sized, and ready for incorporation into an asphalt mixture constitute RAS material.
8. Up to 5% RAS by weight of total aggregate may be used in the design and production of an asphalt mixture. The percentage of RAS used is considered part of the maximum allowable RAP percentage. Unless explicitly stated otherwise in this specification or Materials I.M. 505, use RAS according to the same requirements as prescribed for RAP material.
9. RAS shall be certified from an approved supplier designated in Materials I.M. 506. Material processed prior to Iowa DOT source approval will not be certified.

D. Flexible Paving Mixture.

1. The JMF is the percentage of each material, including the asphalt binder, to be used in the asphalt mixture. Ensure the JMF gradation is within the control points specified for the particular mixture designated.

2. The basic asphalt binder content is the historical, nominal mixture asphalt binder content, expressed as percent by weight (mass) of the asphalt binder in the total mixture. Apply the values in Table 2303.03-1, based on mixture size and type.
3. If the asphalt binder demand for the combination of aggregates submitted for an acceptable mix design exceeds the basic asphalt binder content (see Table 2303.02-1) by more than 0.75%, include an economic evaluation with the mix design. For economic evaluation, provide an alternate mix design utilizing aggregates which results in an optimum binder content not exceeding basic asphalt binder content by more than 0.75% and documentation of costs associated with hauling both proposed aggregates and alternate aggregates to plant site. Alternate JMF shall meet requirements of Section 2303.

Table 2303.02-1: Basic Asphalt Binder Content (%)

Size	Aggregate Type	1 inch	3/4 inch	1/2 inch	3/8 inch
Intermediate and Surface	Type A	4.75	5.50	6.00	6.00
Intermediate and Surface	Type B	5.25	5.75	6.00	6.25
Base	Type B	5.25	6.00	6.00	6.25

4. Use a mixture design meeting gyratory design and mixture criteria corresponding to the design level specified in the contract documents. The Engineer may approve mixtures substitutions meeting guidelines in Materials I.M. 511. When a commercial mix is specified, use a 1/2 inch 300K surface mixture or higher for JMF approval.
5. For shoulders placed as a separate operation refer to Section 2122. When paving the shoulder with the mainline the Contractor has the option to substitute the mainline intermediate or surface mixture for a specified shoulder mixture at the Contractor's expense.
6. For base widening refer to Section 2213. When an adjoining surface is designed for ~~300,000 ESALs or less~~ Standard Traffic (ST) and is paved during the same project, use a base mixture at same ~~ESAL level~~ traffic designation used in surface mixture.
7. WMA refers to asphalt concrete mixtures produced at temperatures approximately 50°F or more below those typically used in production of HMA but no higher than that shown in Article 2303.03, C, 3, d, 2, a. Temperature reductions may be achieved through additives or water injection systems.
8. Submit a mixture design complying with Materials I.M. 510. Propose both a production and a compaction temperature between 215°F and 280°F for WMA mixture designs.
9. Produce and place WMA mixtures meeting the same requirements established for HMA mixtures. Equivalent WMA mixtures may be substituted for HMA mixtures unless it is prohibited by the specifications.

E. Other Materials.

1. Tack Coat.

Tack coat may be SS-1, SS-1H, CSS-1, or CSS-1H. Do not mix CSS and SS grades. RC-70 and MC-70 may also be used prior to May 1 and after October 1, at the Contractor's option. ~~An equivalent trackless product approved on AASHTO's Product Evaluation Listing (APEL) may be used when ambient temperatures are at least 55°F.~~

2. Anti-strip Agent.

- a. Perform a moisture sensitivity evaluation of the proposed asphalt mixture design in accordance with Materials I.M. 319 for the following mixtures when placed in travelled lanes:

- 1) Mixtures for Interstate and Primary highways designed for ~~30,000,000 ESALS~~ and higher Very High Traffic (VT), and
- 2) Mixtures for Interstate and Primary highways containing quartzite, granite, or other siliceous (not a limestone or dolomite) aggregate obtained by crushing from ledge rock in at least 40% of the total aggregate (virgin and recycled) or at least 25% of the plus No. 4.

For the purpose of evaluating moisture sensitivity of a proposed mix design, Contractor may test proposed JMF from plant produced material placed off-site at no additional cost to the Contracting Authority.

- b. Sample and test plant produced mixture for moisture susceptibility in accordance with Materials I.M. 204 Appendix F and Materials I.M. 319 for bid item plan quantities of more than 1000 tons as follows:
 - 1) For mixtures satisfying Article 2303.02, E, 2, a.
 - 2) For conditions satisfied in Article 2303.02, E, 2, f.
- c. Moisture susceptibility testing will not be required for base repair, patching, temporary pavement, or paved shoulders. Moisture susceptibility testing for mixture bid items of 1000 tons or less is only required on the mix design for mixtures satisfying Article 2303.02, E, 2, a.
- d. Use the following minimum stripping inflection point (SIP) requirements for plant produced material based on traffic designation:

PG High Temperature, °C	SIP, Number of Passes ^{1,2}	
	< 3,000,000 ESALS	≥ 3,000,000 ESALS
58	10,000	14,000
64	10,000	14,000
70	10,000	14,000

Table 2303.02-1: Minimum Stripping Inflection Point

Traffic Designation	SIP, Number of Passes ^{1,2}
S	10,000
H, V	14,000

Note 1: If ratio between creep slope and stripping slope as defined in Materials I.M 319 is less than 2.00, the SIP is invalid.

Note 2: Minimum SIP for mixtures placed as base widening is 5000 passes.

When notified of non-compliant results, the Engineer may suspend paving operations until an approved “significant mix change” is implemented.

- e. When the Contractor’s mix design SIP results are below the minimum specified in Article 2303.02, E, 2, d, an anti-strip agent will be required. Plant produced material with anti-strip shall be tested to verify the minimum SIP is achieved.
- f. The Engineer may require an evaluation of the test method in Materials I.M. 319 for plant produced mixture at any time.
- g. The following anti-strip agents may be used:
 - 1) **Hydrated Lime.**
Meet the requirements of AASHTO M 303, Type I or ASTM C 1097, Type S. Hydrated lime will not be considered part of the aggregate when determining the job mix formula.
 - 2) **Liquid Anti-strip Additives.**
For each JMF, obtain approval for liquid anti-strip additives blended into the binder. Approval will be based on the following conditions:
 - a) The asphalt binder supplier provides test results that the additive does not negatively impact the asphalt binder properties, including short term and long term aged properties.
 - b) The design is to establish the additive rate that produces the maximum SIP value.
 - 3) **Polymer-based Liquid Aggregate Treatments.**
For each JMF, obtain approval for polymer-based liquid aggregate treatments. Approval will be based on the design establishing the optimum additive rate that produces the maximum SIP value. See Materials I.M. 319 for additional information.

3. Sand for Tack Coats.

Use sand meeting the requirements of Gradation No. 1 of the Aggregate Gradation Table in Article 4109.02.

4. WMA Technologies.

Chemical additives, organic additives, zeolites, or water injection systems may be used at the rate established by the mixture design in the production of WMA. Once production of a bid item has begun with a WMA technology, continue its use throughout the remainder of the bid item's production unless otherwise approved by the District Materials Engineer.

2303.03 CONSTRUCTION.**A. General.**

1. The Contractor is responsible for all aspects of the project.
2. Provide quality control management and testing, and maintain the quality characteristics specified.
 - a. Apply Article 2303.03, D to asphalt mixture bid items when the plan quantity is greater than 1000 tons.
 - b. Apply Article 2303.03, E, for asphalt mixture bid items that have a plan quantity of 1000 tons or less as well as patching, detours, and temporary pavement bid items. For items bid in square yards, apply Article 2303.03, E when the plan quantity by weight (estimated with a unit weight of 145 pounds per cubic foot unless otherwise stated on the plans) does not exceed 1000 tons.

B. Equipment.

Use equipment meeting the requirements of Section 2001 with the following modifications:

1. Plant Calibration.

- a. Calibrate each plant scale and metering system before work on a contract begins. Use calibration equipment meeting the manufacturer's guidelines and Materials I.M. 514.
- b. The Engineer may waive calibration of permanent plant scales when a satisfactory operational history is available. The Engineer may require any scale or metering system to be recalibrated if operations indicate it is necessary.
- c. Make calibration data available at the plant.
- d. Calibrate each aggregate feed throughout an operating range wide enough to cover the proportion of that material required in the JMF. Make a new calibration each time there is a change in size or source of any aggregate being used.
- e. For continuous and drum mixing plants, calibrate the asphalt metering pump at the operating temperature and with the outlet under pressure equal to that occurring in normal operations.

2. Paver.

Apply Article 2001.19. Spreaders described in Article 2001.13, D, may be used to place paved shoulders. Spreaders used to place the final lift of paved shoulders shall meet additional requirements of Article 2001.19.

3. Rollers.

- a. For initial and intermediate rolling, use self-propelled, steel tired, pneumatic tired or vibratory rollers meeting the requirements of Article 2001.05, B, C, or F. Their weight (mass) or tire pressure may be adjusted when justified by conditions.
- b. For finish rolling, use self-propelled, steel tired rollers or vibratory rollers in the static mode that meet the requirements of Article 2001.05, B, or F.

4. Scales.

Apply Article 2001.07, B, to paving operations regardless of the method of measurement.

C. Construction.**1. Maintenance of the Subgrade and Subbase.**

- a. Maintain completed subgrade and subbase to the required density, true cross section, and smooth condition, prior to and during subsequent construction activities.
- b. If rutting or any other damage occurs to the subgrade or subbase as a result of hauling operations, immediately repair the subgrade and subbase. Such repair will include, if necessary, removal and replacement, at no additional cost to the Contracting Authority.

- c. Should traffic by others authorized to do work on the project be specifically permitted by the Engineer to use loads which exceed the Contractor's established limit, the Contracting Authority will pay repair costs for repairs directed by the Engineer.

2. Preparation of Existing Surfaces.

a. Cleaning.

Clean and prepare existing surface according to Article 2212.03, B, 1.

b. Tack Coats.

- 1) Apply tack coats when the entire surface area on which the coat is to be applied is free of moisture. Do not apply them when the temperature on the surface being covered is less than 25°F.
- 2) Place a tack coat to form a continuous, uniform film on the area to be covered. Tack coat may be diluted with water at a 1:1 ratio to improve application. Unless directed otherwise, spread tack coat at the following undiluted rates:
 - New HMA Surface: 0.03 to 0.05 gallon per square yard
 - Milled HMA/CIR Surface: 0.05 to 0.07 gallon per square yard
 - PCC/Existing HMA Surface: 0.04 to 0.06 gallon per square yard
- 3) Tack the vertical face of exposed, longitudinal joints as a separate operation at a rate from 0.10 to 0.15 gallon per square yard. Tack before the adjoining lift is placed. Lightly paint or spray vertical surfaces of all fixtures, curbs, bridges, or cold mixture with which the hot mixture will come in contact to facilitate a tight joint with the fresh mixture.
- 4) Limit tack coat application lengths to minimize inconvenience to the public. Keep applications within the hot mixture placing work area that is controlled by flaggers at each end. Plan applications so they will be covered with hot mixture when the work area is opened to traffic at the end of the days' work.
- 5) Allow tack coat to adequately cure prior to placement of HMA. If tack coat surface becomes dirty from weather or traffic, thoroughly clean and, if necessary, retack. A light application of sand cover may also be required for excessive application rates, breakdowns, and short sections remaining at the end of a day's run.

3. Handling, Production, and Delivery.

Ensure plant operation complies with the following requirements:

a. Handling Mineral Aggregate and RAM.

Apply Materials I.M. 505 and Materials I.M. 508.

b. Handling Asphalt Binder.

Maintain asphalt binder temperature between 260°F and 330°F. Heat modified asphalt binder according to the supplier's recommendations.

c. Handling Anti-Strip Agents.

1) Hydrated Lime.

a) Added to a Drum Mixer.

- (1) Add hydrated lime at the rate of 0.75% by weight of the total aggregate (virgin and RAM) for Interstate and Primary projects. Add hydrated lime to a drum mixer using one of the following methods:

- (a) Add to virgin aggregate on the primary feed belt, as a lime water slurry.

- (b) Add to the outer drum of a double drum system away from heated gas flow and prior to the addition of the virgin asphalt binder.

- (2) Alternative methods for mixing will be allowed only with the Engineer's approval. Do not introduce hydrated lime directly into a single drum mixer by blowing or by auger.

b) Added to a Batch Plant.

Add hydrated lime at the rate of 0.5% by weight of the total aggregate (virgin and RAM) for Interstate and Primary projects. Introduce it to a batch plant using one of the methods below. In any case, introduce the lime prior to the start of the dry mix cycle.

- (1) Place on the recycle belt which leads directly into the weigh hopper.

- (2) Add directly into the pugmill.

- (3) Add directly into the hot aggregate elevator into the hot aggregate stream.

c) Added to the Aggregate Stockpile.

Add hydrated lime at a rate established by the optimization of the SIP as determined by Materials I.M. 319. Add it to the source aggregates defined in Article 2303.02, E, 2, thoroughly mixed with sufficient moisture to achieve aggregate coating, and then place in the stockpile.

2) Liquid.

- a) When liquid anti-strip additives are used, employ equipment complying with the anti-strip manufacturer’s recommended practice to store, measure, and blend the additive with the binder.
- b) The additive may be injected into the asphalt binder by the asphalt supplier or the Contractor. If the Contractor elects to add the liquid anti-strip agent, they assume the material certification responsibilities of the asphalt binder supplier. Ensure the shipping ticket reports the type and amount of additive and time of injection.
- c) Ensure the asphalt supplier provides the Contractor and Engineer with the shelf life criteria defining when the anti-strip additive maintains its effectiveness. Do not use binder that has exceeded the shelf life criteria.
- d) When using polymer-based aggregate treatment, comply with the manufacturer’s recommended specifications and guidelines.

d. Production of Hot Mix Asphalt Mixtures.

- 1) Regulate the exact proportions of the various materials to be within the limits specified to produce a satisfactory asphalt coating and mixture.
- 2) Do not allow the temperature of the mixtures to fall outside the following parameters:
 - a) Keep the production temperature of WMA mixtures between 215°F and 280°F until placed on the grade. Maximum production temperature for WMA is 330°F after October 1st.
 - b) Do not produce WMA mixtures more than 10°F below the target temperature designated in the JMF without the approval of the Engineer.
 - c) Keep the production temperature of HMA mixtures between 225°F and 330°F until placed on the grade. Do not discharge HMA into the hopper when its temperature is less than:
 - (1) 245°F for a nominal layer thickness of 1 1/2 inches or less, or
 - (2) 225°F for a nominal layer thickness of more than 1 1/2 inches.
 - d) Flexible paving mixtures not meeting these requirements will be rejected.
 - e) Production temperature limits apply starting at point of discharge from mixer.
- 3) Minimize segregation to the extent that it cannot be visibly observed in the compacted surface.
- 4) Apply only approved release agents to trucks and equipment, as specified in Article 2001.01.
- 5) Except for an unavoidable delay or breakdown, provide continuous and uniform delivery of hot HMA to any individual spreading unit.

4. Placement.

- a. Clean each lift according to Article 2212.03, B, 1. If necessary, re-tack.
- b. Prior to placing the final lift, correct bumps or other significant irregularities that appear or are evident in the intermediate course or other lower course.
- c. Do not place HMA mixtures under the following circumstances:
 - 1) On a wet or damp surface.
 - 2) When road surface temperature is less than that shown in Tables 2303.03-1 and 2303.03-2.

Table 2303.03-1: Base and Intermediate Course Lifts of Asphalt Mixtures

Nominal Thickness - inches	Road Surface Temperature, °F
1-1/2 Less than 2	40
2 – 3	35
Over 3	35

Table 2303.03-2: Surface Course Lifts of Asphalt Mixtures

Nominal Thickness - inches	Road Surface Temperature, °F
1	HMA: 50 / WMA: 40
1 1/2	HMA: 45 / WMA: 40
2 and greater	40

- d. The Engineer may further limit placement if, in the Engineer’s judgment, other conditions are detrimental to quality work.
- e. Maintain a straight paving edge alignment. Correct edge alignment irregularities immediately.
- f. Base the minimum layer thickness on Table 2303.03-3. Minimum layer thickness does not apply to leveling/scratch courses.

Table 2303.03-3: Minimum Lift Thickness

Design Mix Size - inches	Minimum Lift Thickness - inches
3/8	1
1/2	1 1/2
3/4	2
1	3

- g. Complete each layer to full width before placing succeeding layers.
- h. While operating on the road surface, do not use kerosene, distillate, other petroleum fractions, or other solvents, for cleaning hand tools or for spraying the paver hopper. Do not carry containers of cleaning solution on or near the paver. When a solvent is used, do not use the paver for at least 5 hours after cleaning.
- i. After spreading, carefully smooth to remove all segregated aggregate and marks.
- j. When placing two adjacent lanes, pave no more than 1 day of rated plant production before paving the adjacent lane(s). Place the adjacent lane to match the first lane during the next day of plant production.
- k. At the close of each working day, clear all construction equipment from the roadbed.
- l. Prior to opening a lane to traffic, place fillets, safety edge, or full width granular shoulders according to Article 2121.03, C, 4. Place the material adjacent to and equal in thickness to the resurfacing. Fillet removal is incidental to the HMA mixture.

5. Compaction.

a. General.

- 1) Promptly and thoroughly compact each layer. Use mechanical tampers for areas inaccessible to the rollers.
- 2) Use a rolling procedure and compactive effort that will produce a surface free of ridges, marks, or bumps.
- 3) The quality characteristic is in-place air void content and will be based on the theoretical maximum specific gravity (G_{mm}) for that day's mixture.

b. Class I Compaction.

1) Applications.

Use Class I compaction for all courses for the traffic lanes, ramps, and loops on all roadways.

2) Test Strip Construction for Class I Compaction.

- a) For the purpose of evaluating properties of the asphalt mixtures and for evaluating an effective rolling pattern:
 - (1) Construct a test strip of the surface mixture prior to its placement on the surface course for Interstate highways, Primary highways, and ramps connecting Interstate and Primary highways.
 - (2) Construct a test strip of the intermediate mixture at the start of its placement on the intermediate course for Interstate highways, interstate-to-interstate ramps.
 - (3) Test strips for other mixtures may be constructed, but are not required.
- b) Test strips are not required when the entire production of the mixture bid item is placed in a single day.
- c) The quantity of mixture subject to the test strip production, will be pre-established with the Engineer and limited to a half day's production
- d) When the contract documents specify both intermediate and surface courses and a test strip is required, place a surface course test strip in lieu of intermediate mixture in a section of the intermediate course prior to actual surface course placement. If surface course and intermediate course are not placed the same calendar year, then place test strip at beginning of surface mix production.
- e) Only one test strip will be allowed for each mixture and shall be declared to the Engineer prior to placement. The Engineer may require additional test strips if a complying HMA mixture or rolling pattern was not established.
- f) Use test strip production control that meets the requirements of Article 2303.03, D, 3, b. The test strip will be an independent lot. Determine sublots in accordance with Table 2303.03-5.

c. Class II Compaction.

Intended for paved shoulders, temporary crossovers, onsite detours, base widening in a non-travel lane and other situations where Class I is not specified.

- 1) Establish a rolling pattern to verify adequate density.

- 2) At the Engineer's option, cores or gauge readings at the frequency designated in Materials I.M. 204 Appendix F for the first day of placement will be used. The Engineer may modify the sample size and frequency provided compaction is thorough and effective.
 - 3) The Engineer will accept the rolling pattern based on the average test results. When the average field voids is less than or equal to 8.0%, the pattern is considered thorough and effective.
 - 4) When the average field voids exceeds 8.0%, modify the rolling pattern. The Engineer may require additional testing until thorough and effective compaction is achieved.
 - 5) For areas inaccessible to rollers, use mechanical tampers or other approved compaction methods.
- 6. Joints and Runouts.**
- a. Construct longitudinal joints for courses on resurfacing projects within 3 inches of the existing longitudinal joint. Construct longitudinal joints to secure complete joint closure and avoid bridging of the roller. When the joint is completed, the hot side shall be no more than 1/4 inch higher than the cold side.
 - b. Saw transverse construction joint to a straight line at right angles to the center line to provide a full thickness vertical edge before continuing paving.
 - c. Place temporary runouts according to road standards. Remove temporary runouts before commencing paving. Runout removal is incidental to the HMA mixture.
- 7. Miscellaneous Operations.**
- a. **Leveling and Strengthening Courses.**
 - 1) Use the same mixture specified for the base or intermediate course.
 - 2) Compact leveling courses and intermediate mixtures placed as leveling/scratch courses (less than or equal to 1 inch plan thickness) using pneumatic and vibratory rollers.
 - b. **Wedge Courses.**
 - 1) Use the base or intermediate mixture to construct wedge courses used to secure desired curve super-elevation. When possible, spread using a finishing machine.
 - 2) Place wedge courses in compacted layers no thicker than 3 inches.
 - 3) On super-elevated curves which require wedge course placement, stage the shoulder construction. After completing each day's wedge placement operations and prior to suspending that day's construction activities, construct a full width shoulder on the high side up to the completed wedge course elevation. Shoulder construction staging will be considered incidental to shoulder construction.
 - 4) Use Class II compaction.
 - c. **Fixtures in the Pavement Surface.**
 - 1) Adjust manholes, intakes, valve boxes, or other fixtures encountered within the area to be covered by HMA to conform to the final adjacent finished surface. Payment for adjustment of manholes or intakes will be per Section 2435. Payment for adjustment of valve boxes and other fixtures will be per Section 2554. Unless specified otherwise in the plans, adjust fixtures:
 - Between placing the surface course and the layer preceding the surface course, or
 - After placing the surface course using a composite patch or PCC patch.
 - 2) Use PCC and HMA patch material complying with the requirements of Section 2529. Make patches large enough to accommodate the structure being adjusted.
 - 3) Unless otherwise approved, construct patches to be square. Orient them diagonally to the direction of traffic flow. Ensure the elevation of the adjusted fixture and patch does not differ from the elevation of the surrounding pavement surface by more than 1/4 inch.
 - 4) When shaping and compacting resurfacing near inlets to storm sewer intakes, shape to ensure maximum drainage into intakes.
 - d. **Fillets for Intersecting Roads and Driveways.**
 - 1) Shape, remove loose material, and tack the surface adjacent to the pavement. On the tack coated surface, place and compact the hot mixture in layers equal to the adjacent layer. Extend from the edge of the pavement as shown on the plans.
 - 2) Place and compact fillets at intersecting roads at the same time as the adjacent layer.
 - 3) Entrance fillets that are 8 feet or wider may be placed as a separate operation. Pave fillets which are 8 feet or wider with a self-propelled finishing machine described in Article 2001.19.
 - 4) The Engineer may approve other equipment for placement of fillets, based on a demonstration of satisfactory results.

e. Stop Sign Rumble Strips.

If the plans include the bid item Rumble Strip Panel (In Full Depth Patch), apply Section 2529. To meet the requirements of placing Stop Sign Rumble Strips before opening roadway sections to traffic, the Contractor may construct temporary rumble strip panels meeting the final pattern and location of the Stop Sign Rumble Strip indicated in the plans

f. Paved HMA Shoulders.

- 1) Compact paved HMA shoulders using one of the following methods:
 - a) Class II compaction (Article 2303.03, C, 5, c),
 - b) Same rolling pattern established for adjoining mainline or ramp driving lane, as determined by density coring.
- 2) Shoulder area will not be included in PWL calculations for field voids on adjoining mainline or ramp driving lane. A price adjustment may be applied to shoulder areas that do not adhere to the established roller pattern.

D. Quality Assurance Program.**1. General.**

Except for small quantities as defined in Article 2303.03, A, 2, follow the procedures and meet the criteria established in Articles 2303.02 and 2303.03, B, Section 2521, and Materials I.M. 510 and 511.

2. Mix Design - Job Mix Formula.

- a. The Contractor is responsible for the JMF for each mixture.
- b. Submit a completed JMF, using the computer format of Form 956, for approval to the materials lab designated by the Contracting Authority. Submit supporting documentation demonstrating the design process was followed and how the recommended JMF was determined. Include an economic evaluation when required. Include trial and final proposed aggregate proportions (Form 955) and corresponding gyratory data. In addition, submit sufficient loose mixture and individual material samples for approval of the design.
- c. Personnel preparing the JMF shall be Iowa DOT certified in HMA Level II.
- d. An approved JMF will be required prior to beginning plant production.

3. Plant Production.**a. General.**

All of the following qualify as a "significant mix change":

- A single occurrence of an aggregate interchange of greater than 5%.
- An aggregate interchange of greater than 5% from last approved JMF.
- A single occurrence of an asphalt content change greater than 0.2%.
- An asphalt content change greater than 0.2% from last approved JMF.
- A deletion or introduction of a new material into the mix.
- A change of additive dosage rate.
- A change of binder, aggregate, or additive source.

b. Production Control.

- 1) After the JMF is established, the combined aggregate gradation furnished for the project, asphalt binder content, asphalt film thickness, and laboratory air voids should consistently comply with the JMF target values and design criteria in Materials I.M. 510 Appendix A. Control them within the production tolerances given in Table 2303.03-4.

Table 2303.03-4: Production Tolerances

Measured Characteristic	Target Value (%)	Specification Tolerance (%) ^(a)
Cold feed gradation No. 4 and larger sieves	by JMF	± 7.0
Cold feed gradation No. 8	by JMF	± 5.0
Cold feed gradation No. 30	by JMF	± 4.0
Cold feed gradation No. 200	by JMF	± 2.0
Field laboratory air voids absolute deviation from target ^(b)	0.0	≤ 1.0
Daily asphalt binder content	by JMF	± 0.3

- (a) Based on single test unless noted otherwise.
- (b) When lab voids acceptance is not based on PWL.

- 2) The gyratory mix design gradation control points for the size mixture designated in the project plans will not apply to plant production control.
 - 3) Adjustments to the JMF target gradation and asphalt binder content values may be made.
 - a) The Contractor determines from quality control testing that adjustments are necessary to achieve the specified properties.
 - b) Consult with the Engineer regarding adjustments to the JMF.
 - c) Notify the Engineer if the average daily gradation for a mixture bid item is outside the production tolerances. If other production tolerances and mixture requirements of Materials I.M. 510 Appendix A are acceptable, a change in gradation target can be requested.
 - d) The Contractor's adjustment recommendations prevail provided all specifications and established mix criteria are being met for plant production.
 - 4) Calculate estimated film thickness every day of production according to Materials I.M. 501. Compliance is based on limits in Materials I.M. 510 Appendix A.
 - 5) Calculate absolute deviation from target lab voids according to Materials I.M. 501. To determine the moving average absolute deviation from target laboratory voids, use the average of the last four individual sample absolute deviations from target laboratory voids.
 - 6) Notify the Engineer whenever the process approaches a specification tolerance limit. When acceptance for lab voids is not based on PWL, cease operations when the moving average point for absolute deviation from target lab voids is outside the specification tolerance limit. Assume responsibility to cease operations, including not incorporating material which has not been placed. Do not start the production process again until notifying the Engineer of the corrective action proposed. The moving AAD may restart only in the event of a mandatory plant shutdown for failure to maintain the average within the production tolerance.
 - 7) After the second occurrence of the moving AAD falling outside the specification tolerance limit, the Engineer may declare the lot or portions of the lot defective.
- 4. Sampling and Testing.**
- a. General.**
 - 1) Perform sampling and testing to provide the quality control of the mixture during plant production. Certified Plant Inspection according to Section 2521 is required.
 - 2) Personnel involved in sampling and testing on both verification and quality control shall be Iowa DOT certified for the duties performed per Materials I.M. 213.
 - 3) Provide easy and safe access for Iowa DOT staff to the location in the plant where samples are taken.
 - 4) Maintain and calibrate the quality control testing equipment using prescribed procedures. Sample and test according to the specified procedures as listed in the applicable Materials I.M. and Specifications. When the results from a Contractor's quality control lab are used as part of product acceptance, the Contractor's quality control lab is required to be qualified.
 - 5) Identify, store, and retain all quality control samples and field lab gyratory specimens used for acceptance until the lot is accepted.
 - 6) Obtain verification samples at random times as directed and witnessed by the Engineer according to Materials I.M. 204 Appendix F. Secure all verification samples according to Materials I.M. 205 Appendix A. Store verification samples for the Contracting Authority until delivery to the Contracting Authority's lab.
 - 7) Deliver the Plant Report to the Engineer and the designated district materials laboratory daily. At project completion, provide the Engineer a copy of the reports, charts, and other electronic file(s) containing project information generated during the progress of the work.
 - b. Asphalt Binder.**
Sample and test asphalt binder to verify the quality of the binder grade. Do not sample when daily production is less than 100 tons of mixture.
 - c. Tack Material.**
Sample and test asphalt emulsions to verify residual asphalt content.
 - d. Aggregate Gradation.**
 - 1) Use cold feed or ignition oven gradation for aggregate gradation control to assure materials are being proportioned according to the specifications.

- 2) Take a minimum of one aggregate gradation for each day's production that exceeds 100 tons of mixture. When more than one sample in a day's production is tested, use the average gradation to determine compliance of the daily lot.
 - 3) Engineer will verify Contractor gradation with an ignition oven or a split cold feed sample. For ignition oven validation, split a cold feed sample with the Engineer to determine the need for a correction factor according to Materials I.M. 511. The Engineer may require additional cold feed split samples.
- e. **Uncompacted Asphalt Mixture.**
- 1) Sample the loose mixture according to Materials I.M. 322.
 - 2) Modify sampling location to include placement with mix stored from a previous day's production.
 - 3) The number of daily samples is defined in Table 2303.03-5 based on the day's estimated production. See Materials I.M. 511 for determining sample locations.

Table 2303.03-5: Uncompacted Mixture Sampling

Estimated Daily Production, Tons	Number of Samples
101-500	1
501-1250	2
1251-2000	3
2001-4500	4
Over 4500	5

- 4) Do not take samples from the first 100 tons of mix produced each day or the first 100 tons of mix following a significant mix change. When paving operations are staged so each day of placement is less than 100 tons for the entire production of the bid item, establish a sampling plan with the Engineer that includes a minimum of one sample per 2500 tons.
 - 5) Split samples for specimen preparation according to Materials I.M. 357.
 - 6) Paired sampling may also be accomplished by taking a bulk sample and immediately splitting the sample according to Materials I.M. 322 on the grade.
 - 7) Test the quality control sample of each production paired sample as follows:
 - a) Prepare and compact two gyratory specimens according to Materials I.M. 325G.
 - b) Determine the bulk specific gravity of compacted mixture (G_{mb}) at N_{design} for each specimen according to Materials I.M. 321. Average the results.
 - c) Determine the Theoretical Maximum Specific Gravity (G_{mm}) of the uncompacted mixture according to Materials I.M. 350.
 - d) Determine laboratory air voids for each sample according to Materials I.M. 501. Use the target laboratory voids listed in Materials I.M. 510 Appendix A unless otherwise specified in the contract documents.
- f. **Compacted Pavement Cores.**
- 1) The Engineer will determine the core locations. The length laid in each lot will be divided into approximately equal sublots. Obtain one sample at a random location in each subplot. Determine a new random location for the subplot when the designated core location falls on a runout taper at an existing pavement, bridge, or bridge approach section where the thickness is less than the design thickness.
 - 2) Take samples from the compacted mixture and test no later than the next working day following placement and compaction.
 - 3) Restore the surfaces the same day. Dry, fill with the same material, and properly compact core holes.
 - 4) Pavement core samples will be identified, taken possession of by the Engineer, and delivered to the Contractor's quality control field laboratory.
 - 5) The Engineer may either:
 - Transport the cores directly to the lab, or
 - Secure the cores and allow the Contractor to transport the cores to the lab.
 - 6) Prepare and test the cores according to Materials I.M. 320, 321, and 337.
 - 7) Cut and trim samples under the direction of and witnessed by the Engineer for tests of G_{mb} , thickness, or composition by using a power driven masonry saw.
 - 8) The compacted HMA pavement will be tested in a timely manner by the Engineer's personnel. The Engineer will test each lot of cores at the Contractor's field quality control laboratory. Cores may also be tested by the Contractor; however, the Contractor's test results will not be used for material acceptance.

5. Verification and Independent Assurance Testing.

- a. The Contractor's quality control test results will be validated by the Engineer's verification test results on a regular basis using guidelines and tolerances set forth in Materials I.M. 216 and 511.
- b. If the Engineer's verification test results validate the Contractor's test results, the Contractor's results will be used for material acceptance. Disputes between the Contractor's and Engineer's test results will be resolved according to Materials I.M. 511.
- c. The Engineer will randomly select one or more of the daily production verification samples. Some or all of the samples selected will be tested in the materials laboratory designated by the Engineer. The Engineer will use the verification test results to determine if the Contractor's test results can be used for acceptance.
- d. Personnel and laboratory equipment performing tests used in the acceptance of material are required to have participated in the statewide Independent Assurance Program according to Materials I.M. 207.

6. Acceptance of Asphalt Mixtures.**a. Lab Voids.**

- 1) Use the following methods of acceptance for laboratory voids:
 - a) For base widening, ramps and loops, shoulders, recreational trails, and other mixture bid items not placed in travel lanes of a permanent pavement, acceptance for laboratory voids will be based on a moving average absolute deviation (AAD) from target as defined in Materials I.M. 501. Use the production tolerance in Table 2303.03-4. During a day's production, if more than 100 tons of the bid item is placed in an area not listed above, apply Article 2303.03, D, 6, b, for entire production of bid item.
 - b) Determine PWL for each lot as defined in Materials I.M. 501. The PWL limits shall be +/- 1.0% from the target air voids. Each mixture bid item will constitute a lot. Lot size is defined as follows:
 - (1) No less than eight and no more than 15 sequential tests will constitute a lot (exceptions stated below).
 - (2) After the eighth test, all subsequent samples collected will also be included in the lot up to a maximum of 15.
 - (3) Once a lot has been established with at least eight tests, a new lot will begin the day following the fifteenth sample. Lots shall not contain partial days. When the fifteenth sample is reached, include all samples taken that day in the lot.
 - (4) If the bid item's production has ended and fewer than eight tests are available, those tests may be combined with the previous lot provided the maximum lot size has not already been reached. When combining results, if the day to be combined contains the fifteenth sample, include all samples for that day. Do not combine partial day's results.
 - (5) If samples cannot be combined with the previous lot due to maximum lot size restrictions or if fewer than eight tests are available for the entire production of a bid item, combine those tests into a single lot and use the AAD analysis in Materials I.M. 501.
 - (6) Test strips will be considered a separate lot.
 - (7) When the same mix type is produced for multiple bid items in one day from a single plant and the production going to each item exceeds 500 tons, assign all box samples to each bid item's existing lot for lab voids. In addition, assign the quantity of each bid item produced to its respective lot.
 - (8) When the same mix type is placed in both PWL and AAD areas in a single day on a single project, include all samples for that day in the PWL lot as well as the quantity of the mixture bid item produced and placed in the PWL area.
- 2) Determine the pay factor using the AAD procedure described in Materials I.M. 501 for mix in a PWL lot which is produced at irregular intervals and placed in irregular areas. The following items qualify as such and shall be combined into a single lot:
 - Asphalt mixture produced and placed on gores, detours, cross-overs, temporary pavements, turning lanes, and fillets,
 - Asphalt mixture produced and placed on ramps
 - Asphalt mixture produced and placed on shoulders.
 To be considered irregular, the production rate for mixture bid items described above is not to exceed 1000 tons in a single day.

b. Field Voids.**1) Class I.**

- a) A lot is considered to be one layer of one mixture bid item placed during a day's operation. The Engineer may approve classifying multiple layers of construction placed during a single day as a lot provided only one mixture was used.
- b) For the following situations sampling for field voids may be waived by the Engineer provided compaction has been thorough and effective, or sampling may be modified by mutual agreement to include more than one day's production provided samples are taken prior to trafficking:
 - When the day's operation is not more than 2500 square yards excluding areas deducted from the field voids lot,
 - When the day's operation is not more than 500 tons excluding quantities deducted from the field voids lot,
 - When the mixture is being placed in irregular areas, or
 - When placing strengthening courses.
- c) If a sample is damaged or measures less than 70% or more than 150% of the intended thickness, an alternate sampling location will be determined and used. Take samples from no less than 1 foot from the unconfined edge of a given pass of the placing equipment, from run-outs, or from day's work joints or structures.
- d) Use the following methods of acceptance for field voids:
 - (1) For mixture bid items placed in the following areas:
 - Base widening placed in a travel lane,
 - Ramps,
 - Bridge approaches placed as a separate operation,
 - Non-interstate travel lanes intended to be in service for fewer than 12 months,
 - State Park and Institutional roadways,
 - Recreational trails, and
 - Irregular areas identified by the Engineer that may include areas not suitable for continuous paving,

The Engineer will accept the field voids lot based on the average test results or an established effective rolling pattern when approved by the Engineer. Do not exceed 8.0% average field voids. The Engineer may modify the sample size and frequency provided compaction is thorough and effective. The Engineer may apply the pay schedule in Article 2303.05, A, 3, b, 3, to areas where thorough and effective compaction is not achieved.

- (2) For all other areas of Class I compaction, determine PWL as defined in Materials I.M. 501. The PWL limits shall be between 91.5% of G_{mm} (8.5% voids) and ~~98.5~~ 96.5% of G_{mm} (3.5% voids). Use maximum specific gravity (G_{mm}) results in field voids calculations as follows:
 - (a) When cores represent one day's production and more than one G_{mm} test result is available, use the average G_{mm} in the field voids calculation for all cores.
 - (b) When cores represent one day's production and only one G_{mm} test result is available, use the single G_{mm} test result in the field voids calculation for all cores.
 - (c) When the cores represent more than one day's production, use the average of all G_{mm} test results from all days corresponding with the cores.
- e) When the PWL falls below 80.0, use the procedure outlined in Materials I.M. 501 to identify outliers with 1.80 as the quality index criterion. Only one core may be considered an outlier in a single lot. If an outlier is identified, recalculate the PWL with the results of the remaining cores and determine whether the PWL is improved. Use the larger of the original and recalculated PWL to determine the pay factor.

2) For Class II apply Article 2303.03, C, 5, c.**c. Asphalt Film Thickness.**

A lot is considered one day's production of one mixture. When film thickness falls outside the limits in Materials I.M. 510 Appendix A, see Article 2303.05, A, 3, c, for payment adjustment.

d. Thickness.

- 1) The Engineer will measure cores, exclusive of thin surface treatments, according to Materials I.M. 337. Sampling frequency and lot definitions are as follows:
 - a) **Class I Compaction.**
The Engineer will obtain and test samples for each lot according to Materials I.M. 204 Appendix F. Density cores sampled as part of a field voids lot will be combined into daily lots

based on cores' intended thickness. Samples for thickness not tested for G_{mb} , because they are less than 70% of the intended thickness, are included for thickness. In these particular instances, do not measure the thickness of additional sufficiently thick samples used to determine field voids. When measuring density of top lift from a full depth core, measure thickness before trimming core for density testing.

b) Class II Compaction.

The Engineer will obtain and test samples full depth once the final lift is placed. The lot shall be defined as the length of a day's production of the final lift. Take a minimum eight cores from each lot. The Engineer may approve classifying multiple days of construction as a lot.

- 2) Provided there is reasonable assurance that the pavement complies with the required thickness, the Engineer may waive sampling for thickness for the following situations:
 - a) When an alternate method is deployed by the Engineer
 - b) When the day's operation is 2500 square yards or less.
 - c) When the mixture is being placed in irregular areas.
 - d) When the mixture is being placed next to structures.
 - 3) When the quality index falls below 0.00, the Engineer may declare the lot or parts of the lot defective. If the final lift has not been placed, the Engineer may approve additional thickness to be placed on succeeding lifts to ensure a final grade as intended. The unit price of the defective lot will be used for payment of the additional material.
- e. Smoothness.**
Construct pavement to have a smooth riding surface according to the following:
- 1) Apply Section 2317 to HMA surface mixture bid items of a Primary project if any individual HMA mixture bid item is 1000 tons or greater or 5000 square yards or greater. Apply Section 2316 to all other Primary projects with a surface course and when specifically required for other projects.
 - 2) When neither Section 2316 nor Section 2317 is applied to a project, the Engineer may check the riding surface for defects using one of the following criteria:
 - The surface shall not deviate from a straight line by more than 1/8 inch in 10 feet when measured longitudinally with a 10 foot straightedge.
 - The surface shall not contain any bump or dip exceeding 1/2 inch over a 25 foot length when measured with a method in Materials I.M. 341.

The Engineer may either require the defects be corrected according to Article 2316.03, B, 2, or apply a price adjustment.

E. Quality Control for Small HMA Paving Quantities.

1. General.

For small quantities, a lot will be the entire quantity of each HMA mixture bid item.

2. Mix Design.

- a. Prepare the JMF. Prior to production, obtain the Engineer's approval for the JMF. Comply with Article 2303.02 and Materials I.M. 510.
- b. For mixtures meeting the criteria in Article 2303.02, E, 2, a:
 - 1) An anti-stripping agent is required when the optimum dosage is greater than 0%.
 - 2) Use Materials I.M. 319 to optimize the design dosage rate.
 - 3) When prior-approved designs have demonstrated acceptable field SIP values, the anti-stripping agent and dosage from the JMF may be used in lieu of optimization testing.

3. Plant Production.

- a. Ensure production plant calibration for the JMF is current and no more than 12 months old.
- b. Use certified asphalt binder and approved aggregate sources meeting the JMF. Ensure the plant maintains an asphalt binder log to track the date and time of binder delivery. Ensure delivery tickets identify the JMF.
- c. Monitor the quality control test results and make adjustments to keep the mixture near the target JMF values.

4. Sampling and Testing.

a. Field Voids.

- 1) Take compacted mixture G_{mb} measurements, except when Class II compaction is specified, no later than the next working day following placement and compaction.
- 2) The Engineer may accept the void content of the compacted layer based on cores or calculations

- from density gauge measurements. The Engineer may waive field void sampling provided the compaction has been thorough and effective.
- 3) PWL for field voids will not apply to small quantities.
- b. **Lab Voids.**
Material sampling and testing is for production quality control. Acceptance of mixture is based on Contractor certification. Sampling and testing of uncompacted mixture is only required for mechanically placed mixture. Sample and test a minimum of one uncompacted mixture sample according to the Standard Specifications and Materials I.M.s using certified technicians and qualified testing equipment. The Engineer may approve alternative sampling procedures or may waive sampling of uncompacted mix and gradation if Contractor can provide plant reports from other recent project(s) demonstrating the JMF has been produced within specification. Take the sample between the first 100 to 200 tons of production. No split samples for agency verification testing are required.
 - c. **Binder.**
No binder sampling or testing is required.
 - d. **Moisture Sensitivity.**
Moisture susceptibility testing on plant produced mixture is not required.
 - e. **Gradation.**
Perform a minimum of one aggregate gradation.
5. **Certification.**
 - a. When the production tolerances in Table 2303.03-4 are not met, payment may be adjusted according to Article 1105.04.
 - b. When the production tolerances are met, provide a certification for the production of any mixture in which the requirements in this article are applied. Place the test results and the following certification statement on the Daily Plant Report.
“The mixture contains certified asphalt binder and approved aggregate as specified in the approved mix design and was produced in compliance with the provisions of Article 2303.03, E.”
 - c. The Daily Plant Report may be submitted at the end of the project for all certified quantities, or submitted at intervals for portions of the certified quantity.

2303.04 METHOD OF MEASUREMENT.

A. Hot Mix Asphalt Mixture.

1. **General.**
 - a. Removal of fillets is incidental to the contract unit price for the mixture.
 - b. If the Contractor chooses to place intermediate or surface mixture in lieu of base for the outside shoulders, the quantity will be calculated from the pavement and shoulder template. If placed as a separate operation, the quantity will be calculated from scale tickets. If the substitute mixture placed on the shoulder is for an intermediate course fillet only, include the quantity in the fillet for payment in the quantity placed in the adjacent intermediate course.
 - c. Payment for the quality control requirements for small quantities will not be measured separately.
2. **Measurement by Weight.**
 - a. The quantity of the type specified, expressed in tons, will be determined from the weight of individual loads, including fillets, measured to the nearest 0.01 tons.
 - b. Loads may be weighed in trucks, weigh hoppers, or from the weight from batch plants computed by count of batches in each truck and batch weight. Article 2001.07 applies. Segregate the weights of various loads into the quantities for each pay item.
3. **Measurement by Area.**
 - a. The quantity of the type specified, expressed in square yards, will be shown in the contract documents to the nearest 0.1 square yard. The area of manholes, intakes, or other fixtures will not be deducted from the measured pavement area.
 - b. When constructing shoulders on a basis of payment of square yards, inspection of the profile and elevation will be based on the completed work relative to the pavement edge. The Contractor is responsible for the profile and elevation of the subgrade and for thickness.

B. Asphalt Binder.

1. Measure the amount of asphalt binder by in-line flow meter reading, according to Article 2001.07, B.
2. Compute the asphalt binder quantity added to the storage tank using a supplier certified transport ticket accompanying each load.
3. The quantity of asphalt binder not used in the work will be deducted.
4. When the quantity of asphalt binder in a batch is measured by weight and is separately identified by automatic or semi-automatic printout, the Engineer may compute the quantity of asphalt binder used from this printout. By mutual agreement, this method may be modified when small quantities or intermittent operations are involved.
5. The Engineer will calculate and exclude the quantity of asphalt binder used in mixtures in excess of the tolerance specified in Article 2303.03, D, 3, b.
6. When payment for-HMA is based on area, the quantity of asphalt binder used will not be measured separately for payment.

C. Recycled Asphalt Pavement.

1. A completed Daily HMA Plant Report with the certification statement is required for measurement and payment for Contractor Certified HMA. The quantity of asphalt binder will be based on the approved JMF and any plant production quality control adjustments.
2. The quantity of asphalt binder in RAP incorporated into the mixture will be calculated in tons. This quantity shall be based on the actual asphalt binder content determined for the mix design from the results of the Engineer's extraction tests.
3. The quantity of asphalt binder in RAP, which is incorporated into the mix, will be included in the quantity of asphalt binder used.

D. Anti-strip Agent.

Will not be measured separately. The quantity will be based on tons of HMA mixture with anti-strip agent added.

E. Tack Coat.

Will not be measured separately.

F. Hot Mix Asphalt Pavement Samples.

Will not be individually counted for payment if furnished according to Article 2303.03, D, 4, or required elsewhere in the contract documents,

G. Recycled Asphalt Shingles.

67% of the asphalt binder from RAS which is incorporated into the mixture will be included in the quantity of asphalt binder used.

2303.05 BASIS OF PAYMENT.

The costs of designing, producing, placing, and testing bituminous mixtures and the cost of furnishing and equipping the QM-A field laboratory will not be paid for separately, but are included in the contract unit price for the HMA mixes used. The application of tack coat and sand cover aggregate are incidental and will not be paid for separately. Pollution testing is at the Contractor's expense. The installation of temporary Stop Sign Rumble Strips will not be paid for separately, but is incidental to the price bid for the HMA course for which it is applied.

The quality control requirements for small quantities are incidental to the items of HMA mixtures in the contract.

A. Flexible Paving Mixture.

1. Payment will be the contract unit price for Asphalt Mixture of the type specified per ton or square yard.
2. Payment for test strips will be the contract unit price for the test strip mixture bid item per ton regardless of lift placement.

3. Payment will be adjusted by the following Pay Factor for field voids, laboratory voids, and film thickness determined for the lot.

Multiply the unit price for the HMA bid item by the Pay Factor rounded to three decimal places.

a. Laboratory Voids.

- 1) Payment when PWL is used for acceptance:

PWL	Pay Factor
95.1 – 100.0	$PF = 0.006000 * PWL + 0.430$
80.0 – 95.0	1.000
50.0 – 79.9	$PF = 0.008333 * PWL + 0.3333$
Less than 50.0	0.750 maximum

When PWL is less than 50.0, the Engineer may declare the lot or parts of the lot deficient or unacceptable.

- 2) Payment when PWL lots are incomplete:

AAD from Target Air Void	Pay Factor
0.0 to 1.0	1.000
1.1 to 1.5	0.900
1.6 to 2.0	0.750
Over 2.0	0.500 maximum

When the AAD is more than 2.0, the Engineer may declare the lot or parts of the lot deficient or unacceptable.

- 3) Use the following payment schedule when a test strip is constructed:

AAD from Target Air Void	Pay Factor
0.0 to 1.5	1.000
1.6 to 2.0	$PF = 2.5 - AAD$
Over 2.0	0.500 maximum

When the AAD is more than 2.0, the Engineer may declare the lot or parts of the lot deficient or unacceptable.

b. Field Voids.

- 1) Payment when PWL is used for acceptance:

PWL	Pay Factor
95.1 – 100.0	$PF = 0.008000 * PWL + 0.240$
80.0 – 95.0	1.000
50.0 – 79.9	$PF = 0.008333 * PWL + 0.3333$
Less than 50.0	0.750 maximum

When PWL is less than 50.0, the Engineer may declare the lot or parts of the lot deficient or unacceptable.

- 2) Payment when a test strip is constructed:

Average Field Voids (Pa), %	Pay Factor
0.0 to 9.0	1.000
9.1 to 9.5	$PF = 10 - Pa$
Over 9.5	0.500 maximum

When the average air void content from a test strip exceeds 9.5%, the Engineer may declare the lot or parts of the lot deficient or unacceptable.

- 3) Payment when PWL is not used for acceptance:

Average Field Voids (Pa), %	Pay Factor
0.0 to 8.0	1.000
8.1 to 9.5	$PF = (11 - Pa) / 3$

Over 9.5 0.500 maximum

When the average air void content exceeds 9.5%, the Engineer may declare the lot or parts of the lot deficient or unacceptable.

c. Film Thickness.

When film thickness (FT) is outside the limits in Materials I.M. 510 Appendix A, apply the following pay factor:

Placement	Pay Factor	
	{Low Film (FT < LL)}	{High Film (FT > UL)}
Base/Shoulders	1 - (0.85 0.15*(LL - FT))	1 - (0.85 0.15*(FT-UL))
Intermediate	1 - (0.80 0.20*(LL - FT))	1 - (0.80 0.20*(FT-UL))
Surface	1 - (0.75 0.25*(LL - FT))	1 - (0.75 0.25*(FT-UL))

Where:

LL = Lower Limit (Materials I.M. 510, Appendix A)

UL = Upper Limit (Materials I.M. 510, Appendix A)

1. When basis of payment is by area, multiply add 1.0 to the pay factor (computed above) and divide by 0.5 2.0.
2. For FT < 7.0 or FT > 16.0, the Engineer may consider the lot defective. This applies to all lots (days) of production.
3. No film thickness price adjustment for the test strip (first day of production, if no test strip performed) for each job mix formula.
4. No film thickness price adjustment on temporary pavement.

d. Pavement Thickness

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

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

Table 2303.05-1: Payment Adjustment for Thickness

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

4. Payment for courses for which quality index (thickness) is not determined because of size or shape, and courses which are found to be deficient in average width, will be according to Article 1105.04.

B. Asphalt Binder.

1. Payment will be the contract unit price per ton for the number of tons of asphalt binder used in the work.
2. Payment for asphalt binder will be for new asphalt binder, the asphalt binder in the RAP which is incorporated in the mixture, and 67% of the asphalt binder from RAS which is incorporated into the mixture. The quantity of asphalt binder in RAM, which is incorporated into the mix, will be calculated in tons of asphalt binder in the RAM. This will be based on the actual asphalt binder content determined for the mix design from the results of the Engineer's extraction test.
3. When the basis of payment for HMA is in square yards, compensation for asphalt binder will be included in the contract unit price per square yard.

C. Recycled Asphalt Pavement.

RAP owned by the Contracting Authority will be made available to the Contractor for the recycled mixture at no cost to the Contractor other than loading, hauling, and processing as required for incorporation into the mix.

D. Anti-strip Agent.

1. When anti-strip agent is required, the incorporation of the anti-strip agent into the asphalt mixture will be considered as extra work ordered by the Engineer if the Contracting Authority's test results from the field produced mixture meet or exceed the minimum requirement established in Article 2303.02, E, 2, d . Payment will be made at the rate of \$2.00 per ton of asphalt mixture in which the anti-strip agent is incorporated.
2. Payment will be full compensation for designing, adding, and testing for anti-strip agent.

E. Tack Coat.

Incidental to HMA.

G. Hot Mix Asphalt Pavement Samples.

1. Payment will be the lump sum contract price.
2. Payment is full compensation for furnishing all samples for all courses or items of work, and for delivery of samples as specified in Article 2303.03, D, 4.

Section 2304**2304.02, A, PCC Option.**

Replace the title and Add the Article:

A. ~~PCC~~ Portland Cement Concrete Option.

3. For detour pavement left in place, meet requirements of Section 2301 for Class C PCC Pavement. Use Class 3 durability aggregate, or better, as defined in Article 4115.04.

2304.02, B, HMA Option.

Replace the title and Article:

B. HMA Hot Mix Asphalt Option.

Design a mixture per Materials I.M. 510 for the following:

1. For ~~detour pavement carrying less than 10,000,000 total 20 year ESALs, use HMA 1,000,000 ESAL surface or intermediate course, 1/2 inch or 3/4 inch, with PG 64-22 asphalt binder.~~ For detour pavements or median crossovers on interstates and multi-lane primary highways, use a 40,000,000 ESAL High Traffic (HT) surface or intermediate mixture, with PG 64-22S or PG 58-28H asphalt binder. The surface lift requires L-4 friction aggregate.
2. For ~~detour pavement carrying more than 10,000,000 total 20 year ESALs, use HMA 10,000,000 ESAL surface or intermediate course, 3/4 inch, with PG 64-22 asphalt binder.~~ For detour pavements on all other primary highways, use a 3,000,000 ESAL High Traffic (HT) surface or intermediate mixture with a PG 64-22S or PG- 58-28H asphalt binder.
3. For ~~median crossovers, use HMA 10,000,000 ESAL surface or intermediate course, 3/4 inch, with PG 64-22 asphalt binder. Apply compaction per Section 2303. The surface lift requires L-4 friction aggregate.~~ For detour pavements on non-primary projects use a 4,000,000 ESAL Standard Traffic (ST) surface or intermediate mixture with a PG 64-22S or PG 58-28H asphalt binder.

2304.03, A, 2.

Replace the Article:

Do not apply Articles 2301.03, H, 2; 3; and 4, b, unless stated otherwise in the contract documents.

2304.03, B, HMA Option.**Replace** the Article:

Meet the requirements of ~~Section~~ Article 2303.03, E.

Section 2310**2310.01, Description.****Replace** the Article:

Overlay an existing pavement with ~~one of the following types of~~ a PCC overlay. Existing pavements may include any of the following:

- A. ~~Bonded overlay:~~** a PCC overlay over an existing PCC pavement.
- B. ~~Unbonded overlay:~~** a PCC overlay over an existing pavement where a stress relief layer is placed on top of the existing PCC pavement or a PCC overlay over an existing composite pavement (flexible pavement over PCC).
- C.** Pavement with a stress relief layer placed over the top.
- C D. ~~Whitotopping:~~** a PCC overlay over an existing, full depth flexible pavement.

2310.02, A, 3.**Replace** the Article:

Unless otherwise specified, use coarse aggregate for ~~bonded~~ overlays over existing PCC pavement that is the same type of aggregate as the existing pavement.

2310.02, B, Hot Mix Asphalt Stress Relief Course.**Replace** the Article:

1. When required by the contract documents, ~~Use~~ an HMA stress relief course for ~~unbonded overlays~~ consisting of a nominal 1 inch course of HMA meeting the requirements of Section 2303.
2. Use PG 58-28S asphalt binder.
3. Use a mixture meeting the following:
 - a. ~~300,000 ESAL~~ Standard Traffic (ST), 3/8 inch HMA mix requirements.
 - b. Target air voids of 3.0%.
 - c. No maximum film thickness restriction and no minimum filler/bitumen ratio restriction.
 - d. Type B Aggregate (or better) with no percent crushed particle requirements and gradation falling below the restricted zone.

2310.03, B, 2, a.**Replace** the Article:

When required for ~~bonded~~ overlays over existing PCC pavement, prepare the surface by shot blasting, waterblasting, or scarifying. Scarify to a nominal depth of 1/4 inch.

2310.03, C, 2, Joints.**Replace** the Article:

- a. ~~Unbonded Overlays and Whitotopping.~~
Place joints as shown in the contract documents.
- b. ~~Bonded Overlays.~~
For overlays over existing PCC pavements:
 - 1) Place joints directly over joints and cracks in the existing pavement.
 - 2) Saw joints to the full depth of the overlay.
 - 3) Ensure joints are at least as wide as the joint or crack in the existing pavement.

2310.03, D, 3.**Replace the Article:**

Place ~~bonded~~ concrete overlays over existing PCC pavements between June 1 and September 30.

Section 2316**2316.02, A, 6, b.****Replace the Article:**

For through traffic lanes wider than 8.5 feet which requires matching the surface of the new pavement to the surface of an existing old pavement, the price reduction tables for Schedule A and B will be replaced by Schedule C. When the Profile Index is greater than 7.0 inches for schedule A segments or 22.0 inches per mile for Schedule B segments, calculate an Average Base Index (ABI) ~~will be calculated~~ for each segment as shown in Table 2316.02-1 ~~on lanes wider than 8.5 feet. This will be the smoothness base in inches per mile for payment for the new pavement unless specified otherwise. The requirements are shown in Schedule C.~~

2316.02, B, 2, c.**Replace the Article:**

~~Testing will be done at the quarter point of the traffic lanes~~ Determine pavement profiles for each lane according to procedures for one lane, as shown in Materials I.M. 341 except for main line traffic lanes which will be tested in the wheel paths. Round trace scallops to nearest 0.01 inch. Wheel paths are defined as 3 feet and 9 feet from center line or lane line. Average the two wheel path profile indexes for each segment. For projects with less than 0.5 miles of mainline paving, Contractor may elect to determine pavement profile in the quarter point unless another location is specified in the contract documents.

Section 2318**2318.02, A, 2.****Replace the Article:**

Foamed Asphalt using PG 52-34S ~~or PG 46-34~~ asphalt binder meeting the requirements of Section 4137 may be used on Interstate, Primary, Secondary, and local projects. For projects using PG 52-34S as the cold in-place stabilizing agent, meet the following requirements:

- Minimum $G^*/\sin\delta$ of 0.70 kPa for the original asphalt binder,
- Minimum $G^*/\sin\delta$ of 1.5 kPa for RTFO aged binder (Jnr waived), or
- Maximum $G^*\sin\delta$ of 5000 kPa for PAV aged binder (Jnr waived).

2318.03, A, 1.**Replace the third and fourth bullets:**

- Producing the properly sized RAP ~~or additional screening.~~
- ~~Crushing the RAP~~ Additional screening and/or crushing is allowed to produce properly sized RAP.

Section 2320**2320.02, A, 1.****Replace the Article:**

Use a blend of emulsified quick-set polymer-modified CSS-1H or CQS-1H asphalt and latex-based polymer.

2320.02, B, Aggregate.**Replace the Article:**

- ~~1. Use mineral aggregate composed of a combination of crushed stone and mineral filler meeting the following requirements based on the friction classification specified in the contract documents. Aggregate source frictional classifications can be found in Materials I.M. T-203.~~
 - ~~a. Friction Classification L-2.~~

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

- 1) ~~Table 4124.03-1 with the following exceptions:

 - ~~Maximum abrasion loss of 30%, and~~
 - ~~Sand equivalence of not less than 60.~~~~
- 2) ~~Objectionable materials limits in Table 2320.02-01.~~

b. ~~Friction Classification L-4.~~

Use Friction Type 4 or better crushed stone complying with the following:

- 1) ~~Table 4124.03-1, and~~
- 2) ~~Objectionable materials limits in Table 2320.02-01.~~

c. ~~No Special Friction Requirement.~~

Use Friction Type 5 or better crushed stone complying with the following:

- 1) ~~Table 4124.03-1, and~~
- 2) ~~Objectionable materials limits in Table 2320.02-01.~~

Table 2320.02-01: Maximum Permissible Amounts of Objectionable Material

Objectionable Materials	Maximum Percent Allowed	Test Method
Unsound chert particles retained on No. 4 sieve	0.5	Materials I.M. 372
Total of all unsound chert, shale, coal, and iron combined	1.0	Materials I.M. 372
Clay Lumps/Friable Particles	0.5	Materials I.M. 368
Organic Materials, except coal	0.1	Iowa DOT Materials Laboratory Test Method No. 215

- 2) ~~The job mix (target) gradation within the gradation band specified below. The percent passing shall not go from the high end to the low end of the range for any two consecutive screens.~~

Table 2320.02-2: Job Mix (Target) Gradation

	Sieve Size - Percent Passing							
	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
Quartzite/Granite/Slag	100	90-100	65-90	45-70	30-50	18-30	10-24	5-15
Limestone/Dolomite	100	70-90	45-70	25-50	15-35	10-25	5-20	5-15

Meet the requirements of Section 4126.

2320.03, A, Equipment.

Add the Article and renumber following Articles:

1. Machinery.

a. Self-propelled Machine.

Use a spreading machine designed and manufactured to perform microsurfacing work, including prewetting the surface. To mix the material, use an automatic sequenced, self-propelled microsurfacing mixing machine, able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, control setting additive and water to a revolving multi-blade double shafted mixer, and discharge the mixed product on a continuous flow basis. Use a mixing machine with sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, control additive and water to ensure a constant flow of a homogeneous slurry mixture.

b. Truck-mounted Machines.

- 1) Use truck-mounted machines specifically designed and manufactured to perform microsurfacing work. The machine shall supply a consistent amount of material to all parts of the spreader box to ensure complete and uniform coverage.
- 2) Operate a minimum of two truck-mounted machines. Cycle these truck-mounted units so mixture production is never delayed more than 15 minutes. Control forward speed of truck in a manner resulting in a uniform spread rate of material. If there is noncompliance with these requirements, stop production and make appropriate adjustments to the operation.
- 3) Finished surface, joints, and edges shall meet the requirements of Article 2320.03, F. If there is noncompliance with these requirements, stop production and make corrections to affected

areas. The Engineer may require a second lift, to correct widespread segregation or variations in the spread rate, at no additional cost to the Contracting Authority.

2. Use a screening unit to remove objectionable oversize material that may be encountered. Screen material before loading the mixing machine and/or weighing for payment.
- 2 3. Use equipment providing individual volume or weight controls for proportioning each material to be added to the mix. Calibrate and properly mark each material control device.
- 3 4. Equip the aggregate feed to the mixer with a revolution counter or similar device so that the amount of aggregate used may be determined at any time.
- 4 5. Use equipment with a positive displacement type emulsion pump equipped with a revolution counter or similar device so that the amount of emulsion used may be determined at any time.
- 5 6. Use a mixing machine equipped with a pressurized water system and a nozzle-type spray bar to provide water spray to the roadway surface immediately ahead of and outside the spreader box.
- 6 7. Use a mixing machine equipped with fines feeder that delivers a uniform, positive, accurately-metered, predetermined amount of mineral filler at the same time and location that the aggregate is fed.
- 7 8. Calibrate the mixing unit in the presence of the Engineer prior to the start of construction.
- 8 9. Provide nurse trucks to ensure that legal axle loads are maintained and a steady rate of progress in the laying of the microsurfacing is made.

2320.04, A, Aggregate for Microsurfacing.

Add to the end of the Article:

When slag is used, reduce aggregate quantity for pay by 25%.

2320.04, C, Emulsified Asphalt for Microsurfacing.

Add to the end of the Article:

When slag is used, reduce emulsion quantity for pay by 25%.

Division 24. Structures.

Section 2401

2401.03, A, Notification for Complete Removal of Bridges.

Replace the Article:

1. Notify the Iowa DNR ~~by mail and the Engineer,~~ with the "Asbestos Notification of Bridge Demolition and Renovation" form, no less than 10 business days prior to the start of bridge demolition. Iowa DNR form is available at <http://www.iowadnr.gov/Environmental-Protection/Air-Quality/Asbestos-Training-Fires>. Provide a copy of the submitted form to the Engineer.
2. If unable to begin work on the original intended start date, notify the Iowa DNR and the Engineer, by sending a revised "Asbestos Notification of Bridge Demolition and Renovation" form, of the new intended start date. Provide notification of the inability to commence work on the intended start date no later than 1 business day prior to the original intended start date. Failure to notify the Engineer of a change in start date 1 business day prior to the original intended start date will result in the need for a new 10 business day notification to the Iowa DNR and the Engineer.
3. The Contracting Authority has inspected the existing bridge for asbestos. Unless otherwise indicated in the contract documents, no asbestos was found, or it has been removed prior to the letting. The Contractor may use this information to complete the "Asbestos Notification of Bridge Demolition and Renovation" form.

2401.05, Basis of Payment.

Add the Article:

- C. Payment for Removal of Existing Bridge is full compensation for submittal of Asbestos Notification of Bridge Demolition form(s) and associated fees to Iowa DNR, removal of bridge according to contract documents, and transporting and disposal of materials.

Section 2402**2402.03, Construction.**

Add the Article and renumber existing Article:

J. Backfilling and Compaction of Pipe and Reinforced Box Culverts by Flooding.

1. Use floodable backfill material meeting the requirements of Section 4134. When required, use porous backfill material meeting the requirements of Section 4131.
2. When shown in the contract documents, use perforated subdrain meeting requirements of Section 4143.
3. When backfilling and compaction by flooding is required, backfill may be placed in lifts up to 2 feet thick. Place backfill simultaneously on both sides of culvert. Determine if pipe culverts need to be restrained and take appropriate actions to prevent floating of culverts during backfilling, flooding, and compaction.
4. Begin surface flooding for each lift at the inlet end of the culvert and progress to the outlet. To ensure uniform surface flooding and adequate compaction, fan-spray water in successive 6 to 8 foot increments using a 2 inch diameter hose for three minutes within each increment. Run hose fully, but with water pressure low enough to avoid eroding cohesive soil plugs.
5. After flooding, evaluate effectiveness of compaction with a vibratory pan compactor. If pan compactor produces visible compaction, repeat flooding process until pan compactor produces no visible compaction.

J K. Classification of Excavation.**2402.04, B, 4.**

Replace the first sentence:

For cast-in-place culverts, the amount of excavation measured for payment will be computed from an excavation centered on the center line of the culvert, to the required depth, length, and a width \geq 4 feet greater than the inside width of the culvert.

2402.04, Method of Measurement.

Add the Article:

I. Flooded Backfill.

Quantity of Flooded Backfill, in cubic yards, will be the quantity shown in the contract documents, including pipe culverts installed by fill installation. Quantity measured for payment will not be adjusted unless the quantity of culvert installed is adjusted.

2402.05, Basis of Payment.

Add the Article:

J. Flooded Backfill.

Contractor will be paid contract unit price for Flooded Backfill per cubic yard. Backfill material subdrains, restraining culverts against floating, and water required for flooding will not be measured separately for payment, but will be considered incidental to the contract unit price bid for Flooded Backfill.

Section 2403

2403.02, B, 3, Entrained Air Content.

Add to the end of the Article:

When concrete is placed by pumping, use a target value of 7.5% +/- 2.0%.

2403.03, F, 5, e.

Replace the first sentence:

If all concrete is at least 1 foot below ground water level, it may be placed at a temperature no less than 40°F and flooded to a minimum depth of 1 foot in lieu of other methods of protection and curing provided the water temperature is 50°F or greater.

Section 2404

2404.03, E.

Replace the Article:

Hold epoxy coated reinforcing steel in place with epoxy coated steel or plastic coated bar supports, and epoxy or plastic coated tie wires.

Section 2405

2405.03, H, 1, General.

Add the Article:

d. Unless otherwise specified in the contract documents, complete anchor bolt connections prior to subjecting the structural system to vehicle live load.

2405.03, H, 2, Bridge Bearings.

Add the Article:

c. Nut Tightening.

Tighten nuts to snug tight condition. Snug tight is defined as the full effort of one person on a wrench with a length equal to 14 times the bolt diameter, but not less than 18 inches. Apply full effort as close to the end of the wrench as possible. Perform tightening by leaning back and using entire body weight to pull firmly on the end of the wrench until the nut stops rotating. Perform a minimum of two separate passes of tightening. Sequence tightening in each pass so the nut on the opposite side, to the extent possible, is subsequently tightened until all nuts in that pass have been tightened.

Section 2408

2408.02, Materials Requirements, Identification, and Fabrication.

Replace the first paragraph:

Unless modified elsewhere in the contract documents, all fabrication to which this section applies shall be done in the United States and in steel fabrication shops and plants that are approved prior to the letting according to Materials I.M. 557. All main member fabrication, except bearing devices, shall be fabricated by plants certified as Category III, Major Steel Bridges, under the provisions of Simple, Intermediate, or Advanced Bridges according to the AISC's Quality Certification Program for Steel Bridge Fabricators. AISC categories are defined as follows:

- Simple bridges consist of unspliced rolled sections with no radius in the section.
- Intermediate bridges are typical bridges not requiring extraordinary measures. Typical examples include: (1) a rolled beam bridge with field or shop splices, either straight or with a radius over 500 feet; (2) a built up I-shaped plate girder bridge with constant web depth (except for dapped ends), with or without splices, either straight or with a radius over 500 feet; (3) a built-up I-shaped plate girder with variable web depth (e.g., haunched), either straight or with a radius over 1000 feet; (4) a truss with a length of 200 feet or less that is entirely or substantially pre-assembled at the certified facility and shipped in no more than three sub-assemblies.

- Advanced bridges require an additional standard of care in fabrication and erection, particularly with regard to geometric tolerances. Examples include tub or trapezoidal box girders, closed box girders, large or non-preassembled trusses, arches, bascule bridges, cable-supported bridges, moveable bridges, and bridges with a particularly tight curve radius.

Certification in a higher category qualifies all lower categories.

2408.02, B, 1.

Replace the eighth bullet:

- Bearing stiffeners ~~and bearing devices~~, and

2408.02, Q, 1, a, 4.

Replace the first sentence:

Achieve a sharp, angular blast profile of a minimum ~~1 mil~~ 1.5 mils and maximum 3 mils on all surfaces, including thermal cut edges.

2408.03, B, Welding.

Replace the Article:

- Current AWS standards in effect at the time of letting are applicable.
- ~~Comply with ANSI/AWS D1.1 Structural Welding Code procedures and requirements for the following items, except comply with AASHTO/AWS D1.5 as modified below for filler metal and welder qualification requirements.~~ Comply with ANSI/AWS D1.5 Structural Welding Code procedures and requirements for items in Article a below. Comply with ANSI/AWS D1.1 Structural Welding Code procedures and requirements for items in Articles b through e below.
 - Bridge Components and Miscellaneous Items. This includes bearing assemblies, sole plates, expansion joint devices, pile and appurtenances, drainage system components, guardrail connections, metal railing, chain link enclosures and wire fence components, conduit systems, and tread plates.
 - Traffic Signal Components.
 - Sign Support Components.
 - Lighting Structure Components.
 - Pre-Engineered Pedestrian Bridges.
- Comply with AASHTO/AWS D1.5-02, as modified by this specification, for welding and fabricating steel structures.
- Each of the modifications in this article is referenced by the appropriate paragraph number in AASHTO/AWS D1.5-02, to which it is a modification.

Table of Contents for Modifications to ANSI/AASHTO/AWS D1.5 95 Bridge Welding Code	
SECTION 1, GENERAL PROVISIONS	5.21 General Requirements
1.3 Welding Processes	Paragraph 5.21.4
Paragraph 1.3.1.1	Paragraph 5.21.6
Paragraph 1.3.1.2	Paragraph 5.21.6.1
Paragraph 1.3.2	
SECTION 3, WORKMANSHIP	5.23 Qualification Tests Required
3.2 Preparation of Base Metal	Paragraph 5.23.1
Paragraph 3.2.2	Paragraph 5.23.3
Paragraph 3.2.7	
3.5 DIMENSIONAL TOLERANCES	SECTION 6, INSPECTION
Paragraph 3.5.1.3	Part A, General Requirements
Paragraph 3.5.1.4	6.7 Nondestructive Testing
Paragraph 3.5.1.14	Subparagraph 6.7.1
	Subparagraph 6.7.1.2(1)
	Subparagraph 6.7.1.2(2)
3.7 REPAIRS	Part B, Radiograph Testing of Groove

Paragraph 3.7.4 Paragraph 3.7.7 Paragraph 3.7.8	Welds in Butt Joints 6.10 Radiograph Procedure Paragraph 6.10.5.4
SECTION 5, QUALIFICATION Part A, General Requirements 5.2 Qualification Responsibility	6.12 Examination, Report and Disposition of Radiographs Paragraph 6.12.3
Part B, Welder, Welding Operator, and Tack Welder Qualification	

SECTION 1. General Provisions

1.3 Welding Processes

ADD the following Paragraphs after the existing 1.3.1:

1.3.1.1 Welding of main members and welding of attachments thereto shall be performed using only shielded metal arc, flux cored arc, submerged arc, and/or stud welding processes. Unless otherwise approved by the Engineer, all welding of butt splices and flange to web welds and stiffeners to web welds shall be done using the submerged arc process. Shielded metal arc welding may be used for repairs to butt splices and flange to web welds.

1.3.1.2 The WPS shall be initialed by the welder and posted at the welder's workstation at all times during welding operations.

REPLACE Paragraph 1.3.2 with the following:

Electroslag (ESW) and electrogas (EGW) welding are specifically disapproved for use.

SECTION 3. Workmanship

3.2 Preparation of Base Metal

ADD the following paragraph before the existing first Paragraph 3.2.2:

For main members, thermal cutting is limited to oxygen cutting except that plasma arc cutting of web and stiffeners may be used when approved by the Engineer.

DELETE the last sentence of Paragraph 3.2.7 which reads "Excess Camber may be corrected by heating without the engineer's approval."

3.5 Dimensional Tolerances

REPLACE all of the text and tables of Paragraph 3.5.1.3 with the following:

Camber of main members of continuous or simple span bridges with lines composed of rolled beams, beams and girders, or girders, shall be fabricated so that when the members are assembled in laydown with bearing points accurately positioned as shown on the erection diagram, points on any member shall not vary in the offset position from that indicated in the erection diagram by more than $\pm 1/2$ inch.

The erection diagram on the shop drawings shall show camber offsets at bearing points and splice points, and at midpoints of individually cambered beams or girders.

REPLACE Paragraph 3.5.1.4 with the following:

Permissible variation in specified sweep for horizontally curved welded beams or girders is

$$\frac{\pm 1/8 \text{ in.} \times \text{No. of ft. of total length}}{10} \quad (\pm 1 \text{ mm/m of the total length})$$

provided the member has sufficient lateral flexibility to permit the attachment of diaphragms, cross-frames, lateral bracing, etc., without damaging the structural member or its attachments.

REPLACE Paragraph 3.5.1.14 with the following:

Mechanically connected joints and splices of main members with surfaces intended to be parallel planes shall be nearly parallel after connection, and the surfaces to be in contact shall have an offset no greater than 1/16 inch after all filler plates have been added, if any. The accuracy of the angle of connecting stiffeners, angles, or plates shall be ± 0.5 degrees, when measured at the hole locations.

3.7 Repairs

REPLACE Paragraph 3.7.4 with the following:

Prior approval of the Engineer shall be obtained for repairs to base metal, repair of major or delayed cracks, or for a revised design to compensate for deficiencies.

ADD the following paragraph before the existing Paragraph 3.7.7:

The approval of the Engineer is required for all corrections of mislocated holes.

ADD the following Paragraph after the existing 3.7.7:

3.7.8 The maximum number of repairs to unacceptable defects in a butt splice shall be three, i.e., the times a butt splice may be opened, welded closed, and resubmitted for NDT inspection, unless otherwise approved by the Engineer.

SECTION 5. Qualifications

Part A. General Requirements

5.2 Qualification Responsibility

REPLACE ADD the following paragraph after the first paragraph of Paragraph 5.2 with the following:

To qualify welding procedures, the Contractor shall produce test weldments, perform nondestructive testing and machine specimens for mechanical testing in accordance with this code. ~~The Contracting Authority will witness the production of test weldments and conduct mechanical tests.~~

Part B. Welder, Welding Operator, and Tack Welder Qualification

5.21 General Requirements

REPLACE Paragraph 5.21.4 with the following:

Shop welder's, welding operator's, or tack welders qualification herein specified shall be considered as remaining in effect from the end of the month in which the tests were taken, for a period of 1 year. The qualification for the above may be extended annually, based on a letter from the fabricator/Contractor certifying that they have been engaged in the process(es) for which they qualified without interruption of more than 6 months during the preceding twelve months, or by requalification.

Field welder's qualification herein specified will be considered as remaining in effect from the end of the month in which the test was taken, for a period of 4 3 years. ~~For field welders who have successfully passed their qualification tests without failure for 3 consecutive years, requalification will only be required every 2 years. Requalification may be required at any time there is a specific reason to question a welder's ability to make sound welds.~~

5.21.6 Responsibility

REPLACE Paragraph 5.21.6.1 with the following:

To qualify shop welders, welding operators, and tackers, the Contractor shall ~~furnish test weldments, and perform nondestructive testing in accordance with this code. The Contracting Authority shall witness the production of test weldments and conduct mechanical tests.~~ The Contractor may, at no additional cost to the Contracting Authority, engage an outside firm or agency to witness production of test weldments and conduct mechanical tests. The acceptance of work performed by an outside firm or agency is the prerogative of the Contracting Authority. The engineer may require recertification if there is specific reason to question the welder's ability.

Field welders shall be certified by a test facility with an accredited AWS Certified Welder Program as defined in the current AWS Standard QC 4. Welders shall be certified per the current QC 7 Standard for AWS Certified Welders. The code of acceptance shall be AWS Bridge Welding Code D1.5. Certification maintenance per applicable AWS Code of Acceptance shall be the responsibility of the certification holder. A copy of the current welder's certification from the AWS test facility shall be available to the Engineer upon request. The Engineer may require recertification if there is specific reason to question the welder's ability.

5.23 Qualification Tests Required

ADD Subparagraph 5.23.1 (5) after the existing 5.23.1 (4):

Plate weld tests may also be accepted for qualification of welding pipe piling of any diameter.

REPLACE Paragraph 5.23.3 with the following:

Tack Welder Qualification. A tack welder shall be qualified by fillet-weld-break specimen made using the same criteria as listed for plate-fillet welder qualification in Table ~~5-6~~ 5.8. The tack welder shall make a 1/4 inch maximum size tack weld approximately 2 inches long on the fillet-weld-break specimen, as shown in Fig. 5.28.

SECTION 6. Inspection

Part A. General Requirements

6.7 Nondestructive Testing

REPLACE last sentence of 6.7.1 with the following:

When required, testing of CJP groove welds in butt joints in compression or shear shall be done by RT.

REPLACE Subparagraph 6.7.1.2(1) with the following:

100% of each joint subject to tension or reversals of stress, except that on vertical butt weld splices in beam or girder webs, only 1/3 of the web depth beginning at the point, or points, or maximum tension need be tested. If unacceptable discontinuities are found in the first 1/3, the remainder of the weld shall be tested.

REPLACE Subparagraph 6.7.1.2(2) with the following:

50% of each joint subject to compression or shear in each main member including longitudinal butt weld splices in beam or girder webs. If unacceptable discontinuities are found in the first 50% of joint, the entire length shall be tested.

Part B. Radiographic Testing of Groove Welds in Butt Joints

6.10 Radiographic Procedure

ADD the following Paragraph after existing 6.10.5.3:

6.10.5.4 Where areas being radiographed are adjacent to the edge of the plate, edge block shall be used.

6.12 Examination, Report, and Disposition of Radiographs

REPLACE Paragraph 6.12.3 with the following:

Two sets of radiographs shall be taken for welds subject to radiographic testing, including any that show unacceptable quality prior to repair. One radiograph of each test shall, upon completion of Q.C. and Q. A. interpretation, be forwarded to the Office of Materials, Ames, Iowa. The second set of radiographs shall be retained by the Contractor as part of on-site inspection records. Upon completion of the project, this second set will become the property of the Contractor.

2408.03, Q, Assembling Steel.

Add the Article:

6. Unless otherwise specified in the contract documents, complete bolted and welded structural connections prior to subjecting the structural system to vehicle live load.

2408.03, S, 5, a, 6.

Replace Table 2408.03-2:

Table 2408.03-2: Minimum Bolt Tension

Bolt Dia. inches	Min. Bolt Tension, lbf.^(a)	Bolt Dia. inches	Min. Bolt Tension, lbf.^(a)
1/2	12,050	1 1/8	56,450
5/8	19,200	1 1/4	71,700
3/4	28,400	1 3/8	85,450
7/8	39,250	1 1/2	104,000
1	51,500		
^(a) Equal to the proof load (length measurement method) given in ASTM A-325 F 3125.			

Section 2412

2412.02, Materials.

Add the Article:

G. Meet requirements of Article 2403.02, B, 3 for entrained air content. When concrete is placed by pumping, use a target value of 7.05% plus or minus 2.0%.

2412.03, C, Placing Concrete.

Add the Article:

5. Concrete placement equipment proposed to be operated directly on bridge deck reinforcing steel shall be submitted to the Engineer with manufacturer's specifications for review/approval prior to use in concrete placement. Requests may require closer spacing of reinforcing bar supports and tying of all reinforcing bar intersections.

2412.03, E, Curing Concrete Decks.

Replace the first paragraph:

Use burlap with sufficient water that is prewetted by fully saturating, stockpiling to drain, and covering with plastic to maintain wetness prior to placement, to prevent absorption of moisture from the concrete surface. ~~Keep the burlap wet.~~

2412.03, E, 2.**Replace the Article:**

As soon as practical, but no later than 2 hours after placing the first layer, place a second layer of prewetted burlap on the deck.

Section 2413**2413.02, D, 1, b.****Replace the Article:**

Fly ash substitution up to 20% is ~~not~~ permitted for Class O PCC. The proportions for Class O mix with fly ash are in Materials I.M. 529.

2413.03, C, Preparation of Surface for Deck Repair.**Add to the end of the first paragraph:**

Deck repairs on concrete beam and steel girder bridges have no removal area restrictions. Deck repairs on continuous concrete slab bridges shall not extend below top mat of deck reinforcing without review and approval of the Engineer.

2413.03, F, Curing.**Replace the Article:**

Use burlap that is prewetted by fully saturating, stockpiling to drain, and covering with plastic to maintain wetness prior to placement.

1. Place a single layer of prewetted burlap on the concrete as follows:
 - a. **Interstate and Primary Projects.**
Place within 10 minutes after finishing. If Class O PCC is revibrated because of failure to meet density requirements with initial vibration, place the prewetted burlap within 10 minutes after finishing of the revibrated area.
 - b. **Other Projects.**
Immediately after final finishing, cover the area finished with white pigmented curing compound meeting the requirements of Article 4105.05, applied at a rate of no more than 135 square feet per gallon (3.3 square meters per liter). Place the prewetted burlap on the concrete within 30 minutes after the concrete has been deposited on the deck. If Class O PCC is revibrated because of failure to meet density requirements with initial vibration, this time limit will be extended by 15 minutes.
 - c. Failure to apply prewetted burlap within the required time is cause for rejecting the affected work. Remove surface concrete in the rejected area and replace at no additional cost to the Contracting Authority.
- ~~2. Cure the concrete as follows:~~
 - ~~a. For Class O PCC or Class HPC-O:~~
 - ~~1) Allow the surface to cure for at least 72 hours.~~
 - ~~2) Keep the burlap continuously wet by means of an automatic sprinkling or wetting system.~~
 - ~~3) Failure to apply wet burlap within the required time is cause for rejecting the affected work.~~
~~Remove the surface concrete in the rejected area and replace at no additional cost to the Contracting Authority.~~
 - ~~b. Prewet the burlap with sufficient water, prior to placement, to prevent absorption of moisture from the concrete surface.~~
2. Apply water to the burlap covering for a period of 72 hours. Use a pressure sprinkling system that is effective in keeping burlap wet during the moist curing period. The system may be interrupted to replenish water supply, during periods of natural moisture, or during construction contiguous to the concrete being cured. The Engineer may approve interruptions for periods longer than 4 hours on the basis of the method for keeping the concrete moist.
3. Maintain continuous contact, except as noted above, between all parts of the concrete deck and the burlap during the 72 hour moist curing period.

2413.03, H, 10.

Replace the first sentence:

Do not allow traffic on a finished surface course until 72 hours after placement ~~or 168 hours for Class HPC-O projects with greater than 1800 square yards.~~

Section 2416**2416.03, A.**

Replace Table 2416.03-1:

Table 2416.03-1: Minimum and Maximum Allowable Pipe Sizes

Culvert Use	Minimum Pipe Size in.	Maximum Pipe Size in.
Roadway Culvert	18	108
Entrance Culvert	18*	108

* 15 inch entrance pipes allowed on non-interstate and non-primary roadways.

2416.03, C.

Replace the second sentence:

Place embankment within the restrictions of Article ~~4405.13~~ 1107.18.

2416.03, D, 2, a, 1, Class B Bedding.

Replace the Article:

~~Class B bedding consists of a 2 inch cushion of sand shaped with a template to a concave saddle in compacted or natural earth to such a depth that 15% of the height of the pipe rests on the sand cushion below the adjacent ground line. Place Class B Bedding as shown in the contract documents.~~

2416.03, D, 4, d.

Add as the last sentence of the Article:

If backfilling and compaction by flooding is specified, comply with Article 2402.03, J.

2416.04, B.

Replace the Article:

~~Aprons: quantity shown in the contract documents~~ each apron installed will be counted for each size class.

Section 2417**2417.02, Materials.**

Replace the Article:

- A.** Use corrugated steel culverts ~~that meet the~~ meeting requirements of Section 4141., ~~or Section 4146~~ For primary and interstate projects, corrugated steel culverts shall be coated according to Article 4141.02. ~~When polyethylene culvert pipe is designated, meet requirements of Section 4146.~~
- B.** Use round culvert pipe, unless specified otherwise. When required, elongate round pipe. When specified, use arch type pipe.
- ~~**C.** When placing under roadway, use corrugated steel culverts coated according to Article 4141.02.~~
- D C.** A paved invert may be required according to the contract documents.

2417.03, A, 1.

Replace Table 2417.03-1:

Table 2417.03-1: Minimum Allowable Pipe Sizes

Culvert Use	Minimum Pipe Size in.
Roadway Culvert	18
Entrance Culvert	18*

* 15 inch entrance pipes allowed on non-interstate and non-primary roadways.

2417.03, C, 1, Class B Bedding.

Replace the Article:

When installing corrugated metal pipe or polyethylene pipe for roadway culverts, ~~use Class B Bedding described in Article 2416.03, D, 2~~ place Class B Bedding as shown in the contract documents.

2417.04, B.

Replace the Article:

Aprons: ~~quantity shown in the contract documents~~ each apron installed will be counted for each size class.

2417.04, D, 1.

Replace the Article:

Roadway culverts: Article 2402.04, E C, applies.

Section 2418**2418.01, Description.**

Replace the second sentence:

Temporary stream diversion involves diverting flow of a perennial stream around the construction site by use of either a diversion channel, pipe, or hose.

Section 2419**2419.01, E.**

Add to the end of the Article:

Section 2436: Precast Noise Wall
Section 2523: Highway Lighting

Section 2423**2423.01, Description.**

Replace the second sentence:

Design according to the contract documents and the applicable AASHTO ~~Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.~~ specifications for highway signs, luminaries, and traffic signals.

Section 2426**2426.02, B, 2, Regular Repair.**

Add as the second sentence:

Materials I.M. 447 provides for use of packaged, dry, combined materials for Class O PC concrete.

Section 2428

2428.04, B, 1.

Add to the end of the Article:

When the Engineer requires correction of a dip by grinding, and grinding would result in a cover concrete thickness less than 2 inches, use the following method to correct the dip:

- Identify limits of dip area,
- Saw cut 3/4 inches deep at the perimeter,
- Remove deck concrete to 1 inch below top mat of deck reinforcing, and
- Place a deck overlay patch in accordance with Articles 2413.03, D; E, 2 & 3; F; G; and H.

2428.05, B, 3.

Replace Table 2428.05-2:

Table 2428.05-2: Price Reduction

New Bridge Decks		Bridge Deck Overlays	
Initial Profile Index Inches Per Mile (mm/km) Per Segment	Dollars Per Segment	Initial Profile Index Inches Per Mile (mm/km) Per Segment	Dollars Per Segment
22.1 - 30.0 (351 - 470)	2000	15.1 - 20.0 (241 - 315)	1000
30.1 - 35.0 (471 - 550)	4000	20.1 - 25.0 (316 - 390)	2000
35.1 - 40.0 (551-630)	6000	25.1 - 30.0 (391 - 470)	3000
over 40.0 (over 630)	(a)	over 30.0 (over 470)	(a)
(a) Correction is required to an index of 15.0 inches per mile (240 mm/km) for overlays and to an index of 22.0 inches per mile (350 mm/km) for new decks.			

Section 2431

2431.02, B, 4, b.

Replace the Article:

Provide Standard Road Plan DR-305 Type A outlets and fit with ~~Standard Road Plan DR-304~~ rodent guards (complying with Materials I.M. 443.01).

Section 2432

2432.02, B, 4, b.

Replace the Article:

Provide a Standard Road Plan DR-305 Type A outlet fitted with a ~~Standard Road Plan DR-304~~ rodent guard (complying with Materials I.M. 443.01).

Section 2433

2433.02, B, 6.

Replace the Article:

Mid-range or high-range water reducer is required according to Materials I.M. 403.

2433.03, L, 1, b, 4.

Add to the end of the Article:

Concrete strength will be determined based on a cylinder test the day of the load cell test.

2433.05, A, 2.

Replace the fifth bullet:

CSL pipe and testing, investigation and remediation of shafts with defects or poor quality concrete (as defined by Publication No. FHWA-NHI-10-016 Drilled Shaft Manual) identified by CSL tests, shaft inspection, and

Section 2435**2435.03, A, 3, b.**

Replace the Article:

Precast Structures: If precast structure is provided, install 8 inch thick pad of ~~Class I~~ bedding material a minimum of 12 inches outside the footprint of the structure. For Non-Primary Road projects, use material meeting the requirements of Section 4118. For Interstate and Primary Road projects, use material meeting the requirements of Section 4119.

2435.03, A, 7.

Replace the title and Article:

Invert Fillet.

- a. Construct manhole ~~invert fillet~~ up to one half of pipe diameter to produce a smooth half pipe shape between pipe inverts.
- ~~b. Shape invert to provide a smooth transition between pipe inverts.~~
- ~~c~~ b. Slope ~~invert fillet~~ top toward pipe 1/2 inch per foot perpendicular to flow line.
- ~~d~~ c. For sanitary sewer, keep void between pipe and structure wall free of debris and concrete.
- ~~e~~ d. For precast ~~inverts~~ fillets, remove projections and repair voids to provide a hydraulically smooth channel between ends of pipes.

2435.03, A, 9, Adjustment Ring(s).

Replace the second sentence:

Bed each polyethylene or expanded polypropylene ring with the manufacturer's approved product and according to manufacturer's recommended installation procedure.

2435.03, A, 11, Infiltration Barrier.

Add the Article:

c. Heat Shrink Sleeve.

- 1) Ensure surfaces are clean, dry, and free of foreign objects and sharp edges.
- 2) Warm surface to drive off any moisture.
- 3) Cut sleeve to required length per manufacturer's requirements.
- 4) Apply primer to manhole and casting surface.
- 5) Place sleeve according to manufacturer's requirements.
- 6) Apply heat to sleeve, smooth out wrinkles, and remove trapped air.
- 7) Cut sleeve at the casting gussets. Reheat to place sleeve onto the casting.
- 8) Trim off excess material.

2435.03, A, 12, Backfill and Compaction.

Replace the title:

Backfill and Compaction (Non-Primary Road projects).**2435.03, A, 13, Bedding and Backfill Under Interstate and Primary Roads.**

Replace the title and Article:

Bedding and Backfill Under (Interstate and Primary Roads projects).

Place and compact the material according to Article 2552.03, E, 2.

2435.03, D, 3, c.

Replace the Article:

Remove and replace or modify existing riser section and/or top section, ~~as appropriate~~ according to the method approved by the Engineer.

2435.03, E, 1, a.**Replace the Article:**

Remove ~~invert fillet~~ as necessary to install pipe at required elevation and develop hydraulic channel.

2435.03, E, 4, Storm Sewer.**Replace the Article:**

- a. ~~Cut opening to manhole or intake to 3 to 6 inches beyond the outside of the pipe.~~ Cut and Chipped Opening.**
- 1) Use for pipe sizes 12 inches in diameter or larger.
 - 2) Saw opening to approximate dimensions with a masonry saw. Saw to depth sufficient to sever reinforcing steel.
 - 3) Remove concrete and expand opening to a diameter at no more than 4 inches larger than the outside diameter of the new pipe.
 - 4) Leave a minimum of 6 inches of manhole or intake wall above and on the sides of the pipe.
 - 5) Cut off all reinforcing steel protruding from the structure wall.
- b. Cored Opening.**
- 1) Core new openings in existing manholes or intakes for all pipes less than 12 inches in diameter.
 - 2) Opening to be no greater than 2 inches larger than the outside diameter of the pipe.
 - 3) Leave a minimum of 6 inches of manhole or intake wall above and on the sides of the pipe.
- b c. Fill opening between manhole or intake wall and outside of pipe with non-shrink grout or construct a concrete collar around the pipe according to Article 2435.03, E, 2.**

2435.05, A, 2.**Replace the Article:**

Payment is full compensation for excavation, furnishing (if required) and placing bedding and backfill material, compaction, base, structural concrete, reinforcing steel, precast units (if used), ~~inverts fillets~~, pipe connections, infiltration barriers, castings, and adjustment rings.

2435.05, B, 2.**Replace the Article:**

Payment is full compensation for excavation, furnishing (if required) and placing bedding and backfill material, compaction, base, structural concrete, reinforcing steel, precast units (if used), ~~inverts fillets~~, pipe connections, castings, and adjustment rings.

Division 25. Miscellaneous Construction.**Section 2501****2501.05, E, 1.****Replace the Article:**

Pile cut-offs not used as ~~extensions~~ on the same contract become the property of the Contractor. Steel pile cut-offs used as ~~extensions~~ on the same contract will not be paid for as additional plan quantity.

Section 2502**2502.02, Materials.****Add the Article:****E. Prefabricated Pavement Edge Drain (Fin Drain).****1. Core.**

Comply with the following requirements:

- Minimum compressive strength of 40 psi according to ASTM D 1621.
- Minimum flow rate of 15 gallons per minute per foot when measured under a gradient of 0.1 at a minimum compressive stress of 10 psi according to ASTM D 4716.

2. Engineering Fabric.

Meet the requirements of Article 4196.01, B, 2.

3. Inspection and acceptance will be according to Materials I.M. 442.

2502.03, A, 8.

Replace the second and third sentences:

Drive the posts 3 feet into the ground ~~and install 4 foot plastic sleeves over the posts.~~ If plastic sleeves are furnished by the Contracting Authority ~~furnishes sleeves,~~ install ~~the sleeves they furnish~~ over posts.

2502.03, C, 10.

Replace the Article:

Use trench rollers with a minimum trench wheel weight of 6000 pounds or a vibratory compactor wheel.

Section 2503**2503.01, Description.**

Add the Article:

F. Low clearance pipe is defined as either arch or elliptical pipe. Unless specified otherwise, Contractor may supply either pipe shape when low clearance pipe is specified.

2503.03, D, 2, Reinforced Concrete Pipe, Reinforced Concrete Arch Pipe, and Reinforced Concrete Elliptical Pipe.

Replace the Article:

- ~~a. Use cold applied bituminous or rubber rope gasket jointing materials unless specified otherwise.~~
 - ~~1) Apply joint material to entire tongue, or to top half of tongue and bottom half of groove, in sufficient quantity to fill the joint. Close the joint between pipes.~~
 - ~~2) Fill remaining voids in the joint, both inside and outside of pipe, with joint material. Smooth the joint material on the inside of pipes 24 inches and larger.~~
- b. If a rubber O-ring or profile gasket is specified for RCP, coat the rubber gasket and joint with soap based lubricant immediately prior to closing the joint.
- ~~c~~ a. Wrap non-sealed joints unless otherwise specified. ~~If wrapped pipe joint is specified,~~ c. Comply with the contract documents Standard Road Plan SW-211 for pipe joint wrapping. Wrap joints with engineering fabric meeting requirements of Article 4196.01, B, 3. Secure engineering fabric in place to prevent displacement while placing backfill material.
- ~~d~~ c. Place pipe such that joint openings on the outside or inside of the pipe do not exceed 1/8 inch at the bottom and 5/8 inch at the top.

Section 2504**2504.03, D, Gravity Main Pipe Jointing.**

Renumber Article 5 and **Add** the Article:

5. Polypropylene Pipe.

Coat gasket and bell with lubricant immediately prior to closing joint.

5 6. Connections between Dissimilar Pipes.

- a. Use manufactured adapters or couplings approved by the Engineer.
- b. Where adapters or couplings are not available, the Engineer may authorize use of a Type PC-2 concrete collar as shown in the contract documents.

2504.03, L, 5, a.

Replace the Article:

Perform deflection tests on all **PVC flexible** sanitary sewer mains, **excluding ductile iron pipe.** Also perform deflection tests on all HDPE storm sewer or culvert pipe 12 inches in diameter or greater.

2504.05, D, 1, b.**Replace the Article:**

Payment is full compensation for furnishing and installing both sanitary sewer pipe and casing pipe, trench excavation, dewatering, furnishing bedding material, placing bedding and backfill material, furnishing and installing annular space fill material, casing spacers, pipe connections, testing, and inspection.

Section 2511**2511.02, B, Hot Mix Asphalt.****Replace the Article:**

1. For sidewalks and recreational trails not adjacent to pavement, use ~~400,000 ESAL~~ Standard Traffic (ST), 3/8 inch HMA, according to Section 2303.
2. When the recreational trail or sidewalk is adjacent to the pavement and also functions as the pavement shoulder, use ~~4,000,000 ESAL~~ Standard Traffic (ST), 1/2 inch base mixture.
3. Use PG 58-28S or ~~PG 52-34~~ Performance Grade binder as specified in the plans.

2511.03, B, 1, General.**Replace the Article:**

- a. Widths shown in contract documents are minimums, excluding curbs or flares.
- b. The contract documents will contain sheets for construction of curb ramps, turning spaces, and transitions. Measure or stake as required to construct features.
 - 1) Verification of form work slopes at quadrants identified in the contract documents, by using a level or other means, is required prior to placing concrete if either of the following is met, ~~Engineer will provide staking for that quadrant and verify slopes during finishing:~~
 - Running Slope. Tolerance between design slope and maximum allowable slope is less than 1.0%.
 - Cross Slope and Turning Space Slopes. Tolerance of $\pm 0.5\%$ from design slope would exceed minimum or maximum allowable slope.
 - 2) If Construction Survey is not a bid item, Engineer will verify slopes of form work. If Construction Survey is a bid item, Contractor's surveyor shall verify form work slopes. If field adjustments outside the acceptable range indicated in the contract documents are necessary, notify the Engineer prior to construction.
- ~~c. If adequate construction tolerances are allowed, Engineer will not provide staking for construction of sidewalk or recreation trail. If field adjustments outside the acceptable range indicated in the contract documents are necessary, notify the Engineer prior to construction.~~
- ~~d c.~~ After concrete has been poured, verify slope compliance according to Materials I.M. 363.
- ~~e d.~~ At locations other than curb ramps, turning spaces, and transitions, ensure cross slope is between 0.5% and 2.0%. Ensure grade is within approximately 2.0% steeper than profile grade of adjacent roadway, or does not exceed 5.0%, whichever is steeper.
- ~~f e.~~ Install detectable warnings according to manufacturer's recommendations. Install detectable warnings for full width of curb ramp, excluding curbs and flares.

Section 2512**2512.03, C, 3.****Replace the Article:**

Place forms in a manner that ~~Ensures~~ the top face of forms curb does not vary from a true plane by more than 1/8 inch in 10 feet. Ensure the upstanding face, ~~including any extension,~~ does not vary from a true plane by more than 1/4 inch in 10 feet. Remove forms that are bent, twisted, warped, broken, or battered from the work. Allow Engineer to inspect and approve repaired forms before using.

Section 2513

2513.02, Materials.

Add the Article:

G. Micro Fibers.

Use 100% virgin polypropylene, fibrillated fibers complying with Materials I.M. 491.27.

2513.03, A, 2, b, 2.

Replace the Article:

Aggregates for Class BR. Use a well graded combination of aggregates complying with Materials I.M. 532 in Zone II-A or II-B. Meet requirements in Division 41 for each individual aggregate used.

2513.03, A, 2, b, 4.

Add to the end of the Article:

Target air may be adjusted by the Engineer based on random tests of consolidated concrete behind slip form machine. These additional random tests will be used to consider the need for a target change, and will not be used in the acceptance decision.

2513.03, A, 2, b.

Add the Article:

5) Micro Fibers. For slip form, Contractor may use synthetic fibers at an addition rate and using batching recommendations provided by manufacturer.

Section 2517

2517.02, B, HMA Paving Projects.

Replace the title and Article:

B. HMA Hot Mix Asphalt Paving Projects.

Use an High Traffic (HT) HMA surface mixture that is one mix level above the approaching surface course. Use asphalt binder meeting or exceeding PG 64-22S asphalt binder.

Section 2522

2522.03, E, Lighting Tower.

Replace the first sentence:

Ensure the structural design of the tower and its appurtenances meet the requirements of AASHTO 2013 "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, Fifth Edition 2009" and interims, with the following clarifications:

2522.03, E, 1, Wind Velocity.

Replace the title and Article:

Wind Velocity Speed.

Use a design wind velocity (V) of 90 mph basic wind speed (3 second gust) with a 50 year mean recurrence interval for strength design. ~~Fatigue requirements shall be Category I with 2nd second mode vortex shedding included.~~ Use HMLT Category I with yearly mean wind velocity of 11 mph for fatigue design.

2522.03, E, 4, Anchor Bolts, Washers, and Nuts.

Replace the title and Article:

Anchor Bolts, Nuts, and Washers, and Nuts.

~~a.~~ Ensure galvanizing for anchor bolts, washers, and nuts meets the requirements of ASTM F 2329 with zinc temperature bath limited to 850°F; or ASTM B 695, Class 55, Type I Coating.

- ~~b.~~—Furnish each anchor bolt with one leveling nut, ~~and two~~ one anchoring nuts, and one jam nut on the exposed end and one of the following on the embedded end: nut, nut and plate, or nut and anchor bolt assembly ring plate. Use anchor bolts, nuts, and washers that: ~~meet the requirements of~~ comply with Materials I.M. 453.08. ~~Anchor bolts shall be ASTM F 1554, Grade 105.~~ Meet the following requirements:
- a. **Anchor Bolts.**
 - 1) Use full-length galvanized bolts.
 - 2) Comply with ASTM F 1554, Grade 105, S4 (-20°F).
 - 3) Threads are to comply with ANSI/ASME B1.1 for UNC thread series, Class 2A tolerance.
 - 4) The end of each anchor bolt intended to project from the concrete is to be color coded to identify the grade.
 - 5) Do not bend or weld anchor bolts.
 - b. **Nuts.**
 - 1) Comply with ASTM A 563, Grade DH or ASTM A 194, Grade 2H.
 - 2) Use heavy hex.
 - 3) Use ANSI/ASME B1.1 for UNC thread series, Class 2B tolerance.
 - 4) Nuts may be over-tapped according to the allowance requirements of ASTM A 563.
 - 5) Refer to Articles 2522.03, H, 2, b through h for tightening procedure and requirements.
 - c. **Washers.**
Comply with ASTM F 436 Type 1.
 - d. **Galvanizing.**
Galvanize entire anchor bolt assembly consisting of anchor bolts, nuts, and washers (and plates or anchor bolt assembly ring plate, if used) according to the requirements of ASTM B 695, Class 55 Type 1 or ASTM F 2329 with zinc bath temperature limited to 850°F. Galvanize entire assembly by the same zinc-coating process, with no mixed processes in a lot of fastener assemblies.

2522.03, E, 7, b.

Replace the second and third bullets:

- ~~Radiographically inspect 100% of the full penetration sections of the longitudinal seam weld at the base plate connection location~~ the full length of all full-penetration sections of longitudinal seam welds on all tower poles, and
- ~~Use the magnetic particle method to inspect a random 10% of the partial penetration section of the longitudinal seam welds.~~ the partial-penetration section of longitudinal seam welds as follows: Inspect a random 25% of all tower poles, inspecting 4 inches in every 4 feet of weld length, starting from the connection end. If there are fewer than four tower poles, at least one pole shall be randomly selected.

2522.03, G, 1, a.

Replace the Article:

Ensure the luminaire frame and head frame assembly meet the requirements of ASTM A 709 Grade 50 36. For the purpose of Charpy V-notch toughness requirements, all steel ~~required to be ASTM A 709 Grade 50~~ used for the luminaire frame and head frame assembly shall meet impact requirements specified in Article 4152.02. Miscellaneous appurtenant steel components may be constructed using ASTM A 709 Grade 36 steel. Ensure all steel and the head frame dome are galvanized. Alternately, in a two cable lift system, the luminaire frame, head frame and miscellaneous appurtenant steel components will all be fabricated from ASTM A 240 Type 201LN stainless steel.

Section 2523**2523.02, B.**

Replace the Article:

Use cast-in-place concrete meeting the requirements of Section 2403 or precast materials meeting Section 2419.

2523.03, G, Foundations.

Replace the Article:

1. Construct cast-in-place concrete foundations for all lighting units not located on structures or barriers. Form and pour the top portion of all foundations in form work to at least 6 inches below the finished ground level. Precast foundations may be installed if allowed by the Engineer.

2. Ensure foundations conform to the details, including reinforcement and alignment to provide the correct overhang, as indicated in the contract documents. Ensure maximum exposed concrete above finished grade does not exceed 4 inches on all sides of finished foundation.
- 2 3. Ensure finished surfaces are smooth and free from stains and foreign material.
- 3 4. Construct or install an alternate foundation, as directed by the Engineer, when shale, sandstone, broken or shattered rock, solid rock, or other similar materials are encountered.
- 4 5. Place anchor bolts to provide for placement of nuts and washers on the top and bottom of the transformer base or pole flange, leaving ample room for adjustment and plumbing the pole. When slip bases are used, position anchor bolts so that they do not interfere with the operation of the slip base. Place anchor bolts according to Article 2405.03, H, 3.
6. When precast foundations are used, drill the hole a minimum 1 foot larger than the diameter of the foundation. Leave bottom of hole as undisturbed as possible. If caving soil or groundwater is present, remove prior to placing foundation. Place backfill consisting of Class B concrete.

Section 2524

2524.03, A, 1, b.

Replace the Article:

All traffic signs, except ~~milepost markers~~ reference location signs and 6 inch by 6 inch route markers, are classified into two groups, Types A and B, as indicated in the contract documents.

2524.03, A, 2, Milepost Markers.

Replace the title and Article:

~~Milepost Markers Reference Location Signs.~~

- a. Comply with the following:
 - Green reflectorized sheeting on flat aluminum or galvanized steel sheets as for Type A signs.
 - Reflectorized white message applied directly to the face material.
 - Dimensions as specified in the contract documents.
- b. Mount ~~milepost markers~~ reference location signs on posts of the type specified for delineators.

2524.03, A, 4, b.

Replace the Article:

Mount above ~~milepost markers~~ reference location signs on the same delineator post.

2524.03, B, Erection of Signs, Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

Replace the title:

Erection of Signs, ~~Milepost Markers Reference Location Signs,~~ and 6 Inch by 6 Inch Route Markers.

2524.03, B, 2, Delineators, Milepost Markers, and 6 by 6 Inch Route Markers.

Replace the title and Article:

Delineators, ~~Milepost Markers Reference Location Signs,~~ and 6 Inch by 6 Inch Route Markers.

- a. Drive the posts for delineators, ~~milepost markers~~ reference location signs, and 6 inch by 6 inch route markers. Provide a suitable driving cap. Attach signs and delineators after driving.
- b. Erect markers and delineators so that the signs and delineator reflectors will be at elevations called for in the contract documents. Ensure they are true to line and grade and are truly vertical. Where a ~~milepost marker~~ reference location sign is designated, attach the marker in place of a delineator. Where a 6 inch by 6 inch route marker is designated, attach it above the ~~milepost marker~~ reference location sign on the same post.
- c. Ensure delineator posts for these signs are plumb and firm in the ground, spaced as shown in the contract documents, and driven to the required lines and grades. Ensure that after driving, the top of the

post has substantially the same cross section dimensions as the body of the post. Battered heads will not be permitted. Remove from the site and replace (at no additional cost to the Contracting Authority) all posts which are bent or otherwise damaged to the extent that they are, in the Engineer's opinion, unfit in the finished work.

2524.04, F, Delineators, Milepost Markers, and 6 by 6 Inch Route Markers.

Replace the title:

Delineators, ~~Milepost Markers~~ Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

2524.05, F, Delineators, Milepost Markers, and 6 by 6 Inch Route Markers.

Replace the title and Article:

Delineators, ~~Milepost Markers~~ Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

1. Delineators and ~~Milepost Markers~~ Reference Location Signs:
 - a. Each for the various types.
 - b. Payment is full compensation for:
 - Furnishing, fabricating, and erecting the delineators or ~~milepost markers~~ reference location signs complete, including posts, reflector units, and frames for delineators, posts and ~~milepost marker signs~~ reference location signs,
 - Furnishing all necessary fittings and attachments, and
 - All labor necessary to complete the work.
2. 6 inch by 6 inch Route Markers:
 - a. Each.
 - b. Payment is full payment for furnishing, fabricating, and erecting the route marker to a ~~milepost marker post~~ reference location sign previously measured for payment, including all necessary fittings and attachments and all labor necessary to complete the work.

2524.05, I, Excavation in Unexpected Rock.

Replace the first sentence:

Excavation in unexpected rock for wood posts for Type A or B signs, steel posts for Type A or B signs, concrete footings for Type A or B signs, delineators, perforated square steel tube posts, and ~~milepost marker posts~~ reference location signs will be paid for as extra work in Article 1109.03, B.

Section 2525

2525.03, E, 2, Traffic Signal and Pedestal Poles and Pedestrian Push Button Posts.

Replace the Article:

- a. Erect poles and posts vertically under normal load.
- b. Securely bolt bases to the cast-in-place concrete foundations using the procedures in Articles 2522.03, H, 2, a through h.
 - ~~1) Mast Arm Poles: Provide footing type (A through F) as specified in the contract documents. Level by using two nuts on each anchor bolt or according to the manufacturer's recommendations.~~
 - ~~2) Pedestal Poles: Level by using metal shims and one nut on each anchor bolt or according to the manufacturer's recommendations.~~
 - ~~3) Pedestrian Push Button Posts: Weld the post to the base plate using a minimum 3/16 inch weld. Level by using two nuts on each bolt.~~
- c. Use a torque wrench to verify that a torque at least equal to the computed verification torque, T_v , is required to additionally tighten the top nuts. An inability to achieve this torque shall be interpreted to indicate the threads have stripped and shall be reported to the Engineer.

$$T_v = 0.12d_b F_t$$

Where:

T_v = verification torque (inch-kips)

d_b = nominal body diameter of the anchor rod (inches)

F_t = installation pretension (kips) equal to 50% of the specified minimum tensile strength of ASTM F 1554, Grade 36 rods, and 60% for the rest of threaded fasteners.

- e d. After leveling the poles, use non-shrink grout or a rodent guard between the pole base and foundation. When non-shrink grout is used, neatly finish exposed edges of grout to present a pleasing appearance, and place a weep hole in the grout.
- d e. Apply anti-seize compound to all mechanical fasteners on pole access doors.
- e f. Install pedestrian push button post caps with tamper-proof set screws per manufacturer's direction or by driving the cap a minimum of 1/2 inch onto the post.

Section 2526

2526, Construction Survey.

Replace the Section:

2526.01 DESCRIPTION.

Perform survey for construction projects.

2526.02 MATERIALS.

None.

2526.03 SURVEY.

- A. Furnish all survey necessary for construction of the project before work begins in the area. Comply with Iowa Code requirements, including monument preservation, under the direct supervision of an Iowa licensed land surveyor. Do not apply the provisions of Article 1105.15 to this work, except to preserve the original stakes set by the Engineer. Refer to Article 1105.16 for requirements when AMG is utilized. If, in the opinion of the Engineer, the Contractor has destroyed or disturbed any of the original survey stakes or benchmarks, the cost of replacing will be charged to the Contractor. Bring design errors discovered to the Engineer's attention for review prior to staking. Construction survey includes qualified personnel, equipment, and supplies required for, but not limited to, the following items:

1. Monument Preservation

Preserve existing monuments as required by Iowa Code.

4 2. Project Control.

a. Primary Control Monuments.

A primary control monument is a survey point the Contracting Authority establishes prior to project commencement. ~~These are shown in the contract documents.~~ The point will be established by placing a monument in the ground.

b. Secondary Control Monuments.

A secondary control monument is a survey point the Contractor establishes on grading or other projects specified in the plans, and preserves on all other projects.

- 1) The Engineer will provide monuments, similar to those the Department uses for GPS control.
- 2) Place secondary permanent horizontal control monuments, under the Engineer's direction, at locations likely to survive project construction and at intervals not to exceed 2640 feet. Place the monuments in the ground along the project corridor. Place at higher elevations along the corridor to provide a view of the immediate project topography and to provide for visible clear line of sight to the nearest secondary permanent control monument in either direction. Primary project monuments may be substituted if appropriate.
- 3) Plant secondary control monuments 1 to 4 inches below existing ground. Drive a metal fence post within 1 foot to mark their location.
- 4) Carefully determine project coordinates relative to the nearest primary project control monument using project coordinate values the Engineer has provided. Ensure the resulting error radius of the secondary monument does not exceed 0.10 feet \pm 2 ppm relative to the primary control. ~~Provide the Engineer with all the field data of the survey. The data may be either unedited printed or electronic formatted field data, or both. Provide the Engineer with an ASCII comma delineated file of the coordinates formatted as (Point Number, Northing, Easting, Elevation, Point Description, Feature).~~
- 5) Perform an independent traverse check between the secondary control monuments by observing distance and angular measurements or by use of GPS. ~~Provide the Engineer with all the field data for the traverse check. The data may be either unedited printed or electronic file, or both.~~

Provide the Engineer with a diagram indicating horizontal ground distances to nearest 0.01 foot and angles to at least the nearest 10 seconds between each secondary control monument. Ensure inverses between the coordinate pairs as determined in the previous paragraph do not exceed 0.10 feet of the direct measurements.

- 6) Replace secondary control monuments disturbed during construction activities using procedures outlined above, at no additional cost to the Contracting Authority.

c. ~~Durable Physical Objects.~~

- ~~1) Using measurements to the nearest 0.10 foot, reference each control monument to a minimum of three durable physical objects located 20 to 100 feet away from the monument. Durable physical objects could include trees, poles, fence posts, station marks in new roadway pavement, or metal fence posts.~~
- ~~2) Provide the Engineer with either a printed or electronic reference image (for example JPEG, TIFF, etc), or both, including each reference and project coordinate.~~

d c. Benchmarks.

- 1) Establish permanent vertical control benchmarks at all bridges and reinforced concrete box culverts within the project. Use an Iowa DOT brass plug on bridge barrier rail or headwall of reinforced concrete box culvert to indicate the benchmark. If the Engineer approves, a sawn "X" on bridge barrier rail or headwall of reinforced concrete box culvert may be used.
- 2) Transfer all benchmark elevations from construction plan benchmarks to the permanent benchmarks using the three-wire method or by trigonometric leveling. Use temporary benchmarks of reasonable stability to preserve the plan benchmarks.
- ~~3) Provide the Engineer with all field benchmark elevation data. The data may be either unedited printed or electronic formatted, or both. Provide the Engineer with the project x and y coordinates of all benchmarks along with an ASCII comma delineated file of the coordinates formatted as (Point Number, Northing, Easting, Elevation, Point Description, Feature).~~
- 4 3) Ensure benchmark level loops do not exceed an error of 0.05 feet times the square root of the loop's length in miles. Distribute the error equally along the loop on all intermediate traverse/benchmark points.

2 3. Grading.

a. General.

- 1) Survey right-of-way line between permanent right-of-way corners at 100 foot intervals, or less if needed, including borrows, temporary easements, and right of entry. Mark these points by placement of a metal pin or wood hub, flat, and lath at the same location as the slope stakes. Clearly mark the flat with the station number, distance from centerline, and elevation (cut or fill) to subgrade.
- 2) Take original and final elevations of all borrows. Provide original and final ~~graphical cross sections at 100 foot intervals, or less if needed~~ digital terrain model (DTM) in LandXML-format, suitable for use by the Engineer to calculate excavation quantities.
- 3) Set bridge berm slope stakes to establish all transitions, including the face of the berm. Set finish grade stakes (blue tops) on all roadway shoulder lines and roadway centerlines to project down the face of the bridge berm at the top, face of berm bench, and toe.
- 4) When Class 12 excavation is an item, ~~take cross section elevations at 100 foot intervals, or less if needed, and plot cross sections~~ provide original and final DTM in LandXML format for use by the Engineer to calculate the excavation quantities.
- 5) Use a lath to locate, on each side of roadway at the right-of-way line, agricultural drain tile shown in the contract documents. Clearly mark lath to show station location, distance from centerline, tile size and type, and flowline elevation.

b. Areas Constructed Without AMG.

- 1) Set slope stakes at 100 foot intervals, or less if needed, for embankment and excavation work including roadway, channel changes, and borrow areas. Interpolations may be necessary to match cross-sections. Set stakes at toe of foreslope or top of backslope, or both. Mark slope stakes with a flat and lath. Clearly mark flat with station location, distance, slope, and cut or fill information.
- 2) Set grade check stakes at 100 foot intervals for bottoms of subgrade treatments. Set stakes on centerline for two-lane roads and in median for four-lane roads. Mark grade check stakes with a lath. Clearly mark lath with station location and cut or fill information.
- 3) Set finish grade stakes (blue tops) at 100 foot intervals, or less if needed. Set blue tops at each shoulder line and each point where there is a change in cross slope. Mark blue tops with a wood hub and stake chaser or similar type tassel.

c. Areas Constructed with AMG.

- 1) Establish elevation of secondary control points using differential leveling from project benchmarks, forming closed loops. Provide a copy of new control point information to Engineer prior to construction work. Contractor is responsible for errors resulting from their efforts. Correct deficiencies to the satisfaction of the Engineer at no additional cost to Contracting Authority.
- 2) Set hubs at top of finished subgrade at hinge points on cross section at 1000 foot intervals on mainline and at least two cross sections on side roads and ramps. Establish these hubs, using means other than the machine guidance surface (such as plan typicals and cross sections), for use by Engineer to check accuracy of construction.
- 3) Provide grade stakes at critical transition points such as, but not limited to, PC's, PT's, super elevation points, and other critical points required for construction of drainage and roadway structures.

3 4. Bridges.

- a. Mark locations and elevations with metal pin or tack in a wood hub, flat, and lath. Clearly mark flat with the pier/abutment station location, design number, and offset distance from centerline of the approach roadway.
- b. Establish a minimum of three temporary benchmarks.
- c. Mark location of test pile with a wood hub.
- d. Perform an independent check of the above stakes. Independent check shall be performed by a second survey crew using their own calculations and equipment entries for staking bridge. Results and staking layout shall be sent to the Engineer prior to starting structure construction.
- e. Submit elevations of all completed substructure beam seats to the Engineer for review prior to installation of bearings and superstructure elements.
- f. Take elevations of beams as erected. Develop proposed final deck grades for review by the Engineer on an Excel spreadsheet format. Provide proposed final deck grades to the Engineer for determination of required deck grade adjustments and approval of final deck grades for deck construction. Locations for determining beam elevations are to be according to the plans.
- g. Provide the Engineer with a copy of the staking diagram prior to commencing work.

4 5. Reinforced Concrete Box Culverts.

- a. Mark locations and elevations with metal pin or tack in a wood hub, flat, and lath. Clearly mark the flat with the station location, design number, cut/fill elevation, and offset distance from the centerline of the culvert and back of parapet.
- b. Perform an independent check of the above stakes.
- c. Provide the Engineer with a copy of the staking diagram prior to commencing work.
- d. Report to the Engineer questionable flow lines and alignments that do not match existing drainage.

5 6. Pipe Culverts.

- a. Mark locations and elevations with metal pin or a wood hub, flat, and lath. Clearly mark the flat with the station location, cut/fill elevation, and offset distance to both ends or centerline of pipe.
- b. Report to the Engineer questionable flow lines and alignments that do not match existing drainage.

6 7. Sanitary and Storm Sewers.

Mark locations and elevations with metal pin or tack in a wood hub, flat, and lath. Clearly mark the flat with the station location, pipe number, cut/fill elevation, and offset distance to centerline of pipe.

7 8. Water Mains.

Mark locations and elevations with metal pin or tack in a wood hub, flat, and lath. Clearly mark the flat with the station location, pipe number, cut/fill elevation, and offset distance to centerline of pipe.

8 9. Intakes and Utility Accesses.

Mark locations and elevations with metal pin or tack in a wood hub, flat, and lath. Clearly mark the flat with the station location, intake or utility access number, cut/fill elevation (including bottom of well and form grade), and offset distance to the Station Location.

9 10. Pavements (PCC & HMA) and Overlays (PCC).**a. General.**

- 1) Obtain elevations of adjacent pavement and bridges at centerline, edge of pavement, and other locations necessary to characterize existing profile and cross slope. Obtain elevations at

maximum 10 foot intervals for a minimum of 100 feet. Adjust design profile grade and cross slope to provide a smooth transition, free of bumps and dips, from the new pavement to the existing pavement or bridge. Notify the Engineer when a smooth profile cannot be provided. Submit final elevations to the Engineer before paving begins.

- 2) For PCC and HMA pavements, ~~When~~ when a new profile grade is not included in the contract documents:
 - a) Obtain elevations of the existing pavement and bridges at 100 foot intervals on straight and level sections and 50 foot intervals on horizontal and vertical curves.
 - b) Using these elevations, design a profile grade and cross slopes to provide a smooth transition, free of bumps and dips, from the new pavement to the existing pavement or bridge. Design a smooth profile grade line to provide the required pavement or shoulder thickness as detailed in the contract documents. Notify the Engineer when a smooth profile cannot be provided. Submit final elevations to the Engineer before paving begins.
 - 3) For PCC overlays, when a new profile grade is not included in the contract documents:
 - a) Obtain elevations of existing pavement at centerline and both pavement edges for bonded overlays and projects including mainline stress relief course and/or pavement scarification.
 - b) Obtain elevations of existing pavement at centerline, quarter points, and both pavement edges for unbonded overlays and whitetopping projects when a stress relief course and/or pavement scarification are not included.
 - c) Obtain elevations at maximum 50 foot intervals on straight and level sections and at maximum 25 foot intervals on horizontal and vertical curves.
 - d) Using these elevations, design a profile grade and cross slopes to provide a smooth transition, free of bumps and dips, from the new pavement to the existing pavement or bridge. Design a smooth profile grade line to provide the required pavement or shoulder thickness as detailed in the contract documents. Notify the Engineer when a smooth profile cannot be provided. Submit final elevations to the Engineer before paving begins.
- b. Areas Constructed Without AMG.**
Mark locations and elevations with metal pin or tack in wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot intervals on straight and level sections and 25 foot intervals on horizontal and vertical curves. Clearly mark flat with station location, cut or fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.
- c. Areas Constructed With AMG.**
- 1) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot intervals on each side of pavement. Furnish x,y,z coordinates and station offset information for each point.
 - 2) Set paving hubs with cut or fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.

10. HMA Overlays

- ~~a. Reference and preserve existing control points located at each Point of Intersection (P.I.).~~
- ~~b. Obtain the Engineer's approval for the method used to reference points.~~
- ~~c. Reset Control Points after the work is complete.~~

11. PCC Overlays

a. General.

- ~~1) Obtain elevations of adjacent pavement and bridges at centerline, edge of pavement, and other locations necessary to characterize existing profile and cross slope. Obtain elevations at maximum 10 foot intervals for a minimum of 100 feet. Adjust design profile grade and cross slope to provide a smooth transition, free of bumps and dips, from the new pavement to the existing pavement or bridge. Notify the Engineer when a smooth profile cannot be provided. Submit final elevations to the Engineer before paving begins.~~
- ~~2) When a new profile grade is not included in the contract documents:

 - ~~a) Obtain elevations of adjacent pavement and bridges per Article 2526.03, A, 11, a, 1.~~
 - ~~b) Obtain elevations of existing pavement at centerline and both pavement edges for bonded overlays and projects including mainline stress relief course and/or pavement scarification.~~
 - ~~c) Obtain elevations of existing pavement at centerline, quarter points, and both pavement edges for unbonded overlays and whitetopping projects when a stress relief course and/or pavement scarification are not included.~~~~

- ~~d) Obtain elevations at maximum 50 foot intervals on straight and level sections and at maximum 25 foot intervals on horizontal and vertical curves.~~
- ~~e) Using these elevations, design a profile grade and cross slopes to provide a smooth transition, free of bumps and dips, from the new pavement to the existing pavement or bridge. Design a smooth profile grade line to provide the required pavement or shoulder thickness as detailed in the contract documents. Notify the Engineer when a smooth profile cannot be provided. Submit final elevations to the Engineer before paving begins.~~
- ~~3) Reference and preserve existing control points located at each Point of Intersection (P.I.).~~
- ~~4) Obtain Engineer's approval for method used to reference points.~~
- ~~5) Reset Control Points after work is complete.~~
- b. Areas Constructed Without AMG:**
 - ~~— Mark locations and elevations with metal pin or tack in wood hub (only tack one side), flat, and lath. Mark elevations on both sides of pavement at 50 foot intervals on straight and level sections and 25 foot intervals on horizontal and vertical curves. Clearly mark flat with station location, cut or fill information, and offset distance to edge of pavement. Include pavement cross slope information in superelevated curves.~~
- c. Areas Constructed With AMG:**
 - ~~1) When total stations are used for the AMG paving system, set additional control points at maximum 500 foot intervals on each side of pavement. Furnish x,y,z coordinates and station offset information for each point.~~
 - ~~2) Set paving hubs with cut or fill to finish pavement elevation at A, B, C, and D points along superelevated curve transitions and at station equation locations. Additional paving hubs will not be required for mainline pavement.~~

12 11. Structural Walls.

- a. Survey requirements for structural walls includes the following work types:
 - 1) Mechanically Stabilized Earth (MSE) Walls.
 - 2) Cast in Place (CIP) Retaining Walls.
 - 3) Soil Nail Walls.
 - 4) Tie Back Walls.
 - 5) Noise Walls.
 - 6) Modular Block Retaining Walls.
 - 7) Segmental Retaining Walls.
 - b. Mark locations and elevations with a metal pin or a wood hub, flat, and lath. Clearly mark the flat with the station location, cut/fill elevation, and offset distance to face of wall.
- B.** ~~Submit the method used to preserve project control to the Engineer for approval. Format the survey work documentation in a manner acceptable to the Engineer. Ensure monument preservation work is completed by a Professional Land Surveyor licensed in the State of Iowa in responsible charge, according to the provisions of Iowa Code 542B. Ensure all other survey work is completed by a Professional Engineer licensed in the State of Iowa in responsible charge or a Professional Land Surveyor licensed in the State of Iowa in responsible charge, according to the provisions of Iowa Code 542B. Submit a resume to the Engineer identifying the field survey personnel and their capabilities to perform the intended requirements.~~
 - C.** Obtain the Engineer's approval for the method of determining alignments and elevations and the method of preserving control points. This approval does not act to relieve the Contractor of the responsibility for the correctness of the survey work. Do not use plan cross-sections for vertical or horizontal control.
 - D.** ~~The Engineer will provide bench mark elevations, right-of-way corners, and reference control points on the original survey as shown in the contract documents. A GeoPak alignment will be provided if available.~~
 - E D.** Check tie-ins with existing roadways for correctness of alignment prior to construction staking.
 - F.** ~~When survey work is done under traffic, detail sheets in the contract documents will establish the required signing.~~
 - G E.** Establish benchmarks in the adjacent area before installing settlement plates in accordance with Article 2526.03, A, 4 2, d c.

- ~~1. Obtain Engineer's approval for method of determining alignments and elevations and the method of preserving control points. This approval does not relieve Contractor of the responsibility for correctness of survey work.~~
- ~~2. Do not use plan cross-sections for vertical or horizontal control. The Engineer will locate and determine elevations of settlement plates.~~

~~H. Replace land corners and permanent reference markers unless stated otherwise in the contract documents.~~

I F. All survey work documentation becomes the property of the Contracting Authority. Assemble required documentation into a single electronic package upon completion of the project and furnish to the Engineer. The work of this specification will be considered ~~finished~~ complete when the following documentation is furnished to and accepted by the Engineer:

1. ASCII comma delineated file of the coordinates formatted as (Point Number, Northing, Easting, Elevation, Point Description, Feature). Identify coordinate system used.
2. Monument preservation certificates.
3. Secondary control monument coordinates including traverse check.
4. Reference monument drawings.
5. Benchmark coordinates.
6. Required DTMs.
7. Bridge and box culvert staking diagrams.
8. Final profile grades.

J G. For the purpose of subcontracting, this item will be considered a specialty item.

2526.04 METHOD OF MEASUREMENT.

None. Lump sum item.

2526.05 BASIS OF PAYMENT.

- A.** Payment for Construction Survey will be paid for at the lump sum contract price.
- B.** Payment is full compensation for the survey work required for the project as let, including any interpolations that may be necessary between cross-section and field staking.
- C.** Payment for revisions after the letting will be paid for according to Article 1109.03, B.
- D.** Verifying form work slopes according to Article 2511.03, B, 1, b, shall be incidental to Construction Survey and will not be paid for separately.

Section 2527

2527.02, D, 2, c, 4.

Add to the end of the Article:

The Engineer will use the procedure in Materials I.M. 386 to determine retroreflectivity.

Section 2528**2528.01, A, 8.****Replace** the Article:

A list of approved Category II traffic control devices is found on the World Wide Web at the following URL:
http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/wzd/
https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/.

2528.01, A, 10.**Delete** the first bullet:

- ~~Iowa Department of the Blind: Director's Office, telephone: 515.281.1336, website: www.blind.state.ia.us.~~

Replace the second bullet:

National Federation of the Blind of Iowa: Affiliate President, telephone: 319.321.8769, email address: donna.prime@nfb.org <http://www.nfb.org/> <https://nfb.org/resources-iowa>.

2528.01, C, 1.**Replace** the Article:

Maintain a Traffic Control Technician on staff, even though the traffic control portion of the contract may be subcontracted. The Traffic Control Technician is required to have attended and passed the exam in an ATSSA Traffic Control Technician, IMSA Work Zone Traffic Control, Iowa AGC Traffic Control Technician class, Minnesota DOT Traffic Control Supervisor training class, or Texas Engineering Extension Service Work Zone Traffic Control training class. This Traffic Control Technician is responsible for overall management of the Contractor's quality control program for traffic control. Starting April 2018, the Traffic Control Technician shall retake and pass the exam in one of the approved classes every 5 years.

2528.01, C, Traffic Quality Control.**Add** the Article:

3. Employees who install and remove temporary traffic control signs and devices shall be supervised by a trained Traffic Control Technician per Article 2528.01, C, 1. When traffic control is installed or removed, the Traffic Control Technician who supervised the installation or removal of temporary traffic control devices and signs shall document in the daily traffic control diary what was installed or removed.

2528.03, C, 1.**Add** as the second sentence:

Ensure all channelizing devices meet the current requirements of the MUTCD and Section 4188.

2528.03, I, 2, b, 4.**Replace** the Article:

Meet materials requirements of Article 4188.065 for LED Floodlighting Luminaires.

2528.03, Construction.**Renumber** existing Article L and **Add** the Article:**L. Temporary Portable Rumble Strips**

Use temporary portable rumble strips of the type shown in the contract documents and meeting requirements of Article 4188.08.

1. Placement.

- a. A temporary portable rumble strip panel consists of three individual temporary portable rumble strips placed on roadway surface.
- b. Place centerline end of temporary portable rumble strip 6 inches from centerline of roadway perpendicularly extending its full length transversely across pavement surface.

- c. Place each individual temporary portable rumble strip 15 to 20 feet apart within the temporary portable rumble strip panel.

2. Maintenance.

Ensure temporary portable rumble strips maintain alignment within 6 inches perpendicular to centerline of roadway when measured from one end to the other end of the individual temporary portable rumble strip.

3. Removal.

When temporary traffic control requiring temporary portable rumble strips is no longer in operation, remove temporary portable rumble strips from roadway.

↳ M. Limitations.

2528.03, M, 5.

Replace the first sentence:

Personnel in the highway right-of-way shall wear orange or strong yellow green ANSI 107 Type R Class 2 apparel when exposed to traffic or construction equipment.

2528.03, M, Limitations.

Add the Article:

14. Active contractor vehicles and self-propelled equipment (except hand operated equipment) operating or parked within 15 feet of an open traffic lane (unless shielded by temporary or permanent barrier) and contractor, delivery, and service vehicles entering or exiting work area shall display cab roof mounted amber or yellow high intensity rotating, flashing, or oscillating warning lights. Repair or replace vehicle warning lights not functional or missing within 24 hours.

2528.04, J, 2, a.

Replace the second sentence:

If used less than 4 hours during a shift, one-half flagger will be counted.

Section 2529

2529.02, A, Hot Mix Asphalt Mixture.

Replace the Article:

Unless stated elsewhere in the contract documents, use HMA meeting or exceeding Section 2303 requirements for a 300,000 ESAL Standard Traffic (ST) surface mixture. ~~with Use an asphalt binder meeting or exceeding PG 64-22S or PG 58-28H Performance Graded asphalt binder.~~ Use an asphalt binder meeting or exceeding PG 64-22S or PG 58-28H Performance Graded asphalt binder.

2529.02, B, 4, Cement.

Replace Table 2529.02-1:

Table 2529.02-1: Cement Types and Maximum Allowable Substitution Rates

Patch Type	Cement Type	Maximum Allowable Substitution	Minimum Mix Temperature
5 Hour	Type I, Type II Type IS	0% Fly Ash 0% Fly Ash	75°F 80°F*
10 Hour	Type I, Type II Type IS	10% Fly Ash 0% Fly Ash	65°F 70°F*
24 Hour	Type I, Type II, Type IS	0% Fly Ash	50°F
* When a Type A Mid Range Water reducing admixture is used, limit the minimum mix temperature to that required when Type I/II cement is used.			

2529.02, B, 9, Concrete Mixers.**Replace the Article:**

For PCC patches, use Class M mixtures with calcium chloride. ~~The Engineer may waive the use of calcium chloride on patches cured longer than 10 hours.~~ Use Class M without calcium chloride for patches cured for 24 hours.

2529.03, G, 3.**Replace the fourth sentence:**

Cover the blanket-type cover completely with insulation board having the following properties: cellulosic fiber sheathing with a minimum nominal 3/4 inch thickness.

2529.03, G, 4.**Replace the Article:**

Cure PCC patches placed on multi-lane sections for a minimum of 10 hours before opening to traffic. Cure PCC patches placed on two-lane sections a minimum of 5 hours before opening to traffic. When allowed by the contract documents or Engineer, cure PCC patches without calcium chloride on multi-lane sections a minimum of 24 hours. These restrictions may be modified in the plans or by the Engineer for specific sections.

2529.03, H, 1.**Replace the Article:**

~~Profilometer~~ Smoothness testing and evaluation is required for each patch with a length of 50 feet or more. For full lane width patches, ~~P~~perform testing near the center of the traffic lane after the patch is placed. For partial lane width patches, perform testing in the patched wheel path.

2529.03, H, 2, d.**Replace the Article:**

Compare the new index with the ABI. Perform surface correction according to Article 2316.03 to a profile index less than the ABI when:

- 1) New profile index exceeds 12.0 inches per mile and exceeds ABI by more than 2.0 inches per mile.
- 2) New profile index exceeds 30.0 inches per mile and exceeds ABI.
- ~~1) If the new profilometer index does not exceed the ABI, the work is acceptable and no correction is required.~~
- ~~2) Corrective action is also not required if the new profilometer index is equal to or less than 12 inches per mile, regardless of the ABI.~~
- ~~3) If the new profilometer index is greater than 12 inches per mile and less than 30 inches per mile and is also within 2 inches per mile of the ABI, corrective action is not required.~~
- ~~4) If the new profilometer index is greater than 30 inches per mile, corrective action is required to reduce the new index at least to the ABI.~~

Section 2530**2530, Partial Depth Finish Patches.****Replace the Section:****2530.01 DESCRIPTION.**

- A. Remove pavement in areas designated in the contract documents or by the Engineer to be patches. This includes furnishing and placing patching material to provide a new traffic surface, and restoring the adjacent shoulder as shown in the contract documents. This work is in areas where the size, shape, and depth of patch depends on the extent of pavement deterioration and shall be determined during the removal operation.
- B. Partial depth finish patches may be identified and constructed as one of the following types:

1. Partial Depth PCC Finish Patches.

These patches are square or rectangular in shape. ~~Saw the edges.~~ They will be less than 6 feet in length when placed on a longitudinal or transverse joint or random crack. Removal may be by milling or other equipment. This type of patch will be identified by tabulation in the contract documents. The size and location for each lane will be shown.

2. Partial Depth PCC Joint and Crack Repair Patches.

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

3. Overdepth Patches.

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

2 4. Partial Depth Regular HMA Finish Patches.

These patches are in the shape of a square or rectangle. They have square corners and straight edges to allow almost all of the removal by a milling machine. An air hammer or saw may be necessary to complete removal along edges and at corners. This type of patch will be identified by tabulation in the contract documents. The size and location in each lane will be shown.

3 5. Partial Depth Irregular HMA Finish Patches.

These patches are not square or rectangular in shape. They have at least one side that is not straight or one corner that is not square which will prohibit complete removal by a milling machine. Other equipment such as an air hammer or saw may be necessary to accomplish the removal. This type of patch will be identified by tabulation in the contract documents. This tabulation will be an estimate of the number of patches per lane mile, and the estimated total area of patch.

2530.02 MATERIALS.

Meet the requirements for the type of material specified.

A. Hot Mix Asphalt Patching Material.

Unless stated elsewhere in the contract documents, use HMA meeting or exceeding Section 2303 requirements for a Standard Traffic (ST) 3/8 or 1/2 inch surface mixture. Use an asphalt binder that meets or exceeds PG 64-22S or PG 58-28H. For partial depth patches on HMA overlay projects, the binder grade specified for mainline intermediate or surface course may be substituted.

B. Portland Cement Concrete Patching Material.

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

1. Class A Patching Material.

- a. Use a modified Portland cement type manufactured to provide rapid set and high early strength. Meet the requirements of Materials I.M. 491.20.
- b. When a mortar is furnished, add the manufacturer's recommended quantity of coarse aggregate.

2. Class B Patching Material.

- a. Use high early strength rapid set (5 hour) PCC meeting the requirements of Materials I.M. 529 and the following requirements:
 - Use Class M mixture patching material with calcium chloride. Class M mixtures with calcium chloride are not to contain fly ash.
 - When calcium chloride is used in a mixture, place the concrete within 30 minutes after the introduction of the calcium chloride.
 - For coarse aggregate, meet the requirements of Section 4115 and Gradation No. 5, Aggregate Gradation Table, Appendix.

- b. When Class B patching material is furnished for partial depth patches, it may also be furnished for full depth patches.

3. Class C Patching Material.

- a. Use a PCC mixture with an early set that will allow time of opening to traffic in 24 hours to 36 hours as directed by the Engineer. For coarse aggregate, meet the requirements for Class B patching material. Use Class M mixture meeting the requirements of the current Materials I.M. 529 without the addition of calcium chloride.
- b. When Class C patching material is furnished for partial depth patches, it may also be furnished for full depth patches.

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

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

a. Slump.

- 1) Slump, measured according to Materials I.M. 317 prior to addition of calcium chloride solution, is to be between 1 inch and 2 1/2 inches as a target range, allowing a maximum of 3 inches. If calcium chloride solution is not to be added, the slump is to be between 1 inch and 3 inches as a target range, allowing a maximum of 4 inches.
- 2) When a Type A Mid Range water reducing admixture is used, the slump, tested prior to the addition of calcium chloride, is to be between 1 inch and 4 inches as a target range, allowing a maximum of 5 inches.

b. Air Entrainment.

The entrained air content of the unconsolidated concrete will be determined according to Materials I.M. 318, prior to addition of calcium chloride if it is to be added. When calcium chloride is to be added, air entrainment is to be 5.0%, with a tolerance of $\pm 2.0\%$. When no calcium chloride is to be added, air entrainment is to be 6.5%, with a tolerance of $\pm 1.5\%$.

c. Temperature.

The temperature of Class B patching material, as delivered to the job site, is to be as required in Article 2530.02, B, 4, d below. Ensure the temperature of Class C patching material, as delivered to the job site, is greater than 65°F. Heating the water, aggregate, or both, may be necessary to meet this requirement. The cost of heating is incidental to patching.

d. Cement.

- 1) For Class M concrete mixtures, meet the requirements of Section 4101.
- 2) Refer to Table 2530.02-1 for cement types and maximum allowable substitution rates. The maximum substitution for Type IS is not to exceed 25%.

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

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

e. Calcium Chloride.

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

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

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

- 2) The Engineer will check the solution concentration using a hydrometer according to Materials I.M. 373. Add the solution at the rate of 3.0 gallons per cubic yard of concrete. Calcium chloride solutions of different concentrations may be approved by the Engineer, provided appropriate adjustments in the total concrete composition are made.
 - 3) Agitate the mixture until the calcium chloride is completely in solution, and continue agitation, as necessary, to maintain uniformity.
 - 4) Except when using continuous mixing equipment described in Article 2001.20, E, ensure the calcium chloride solution is present in the mix for at least 2 minutes of mixing.
- f. Water Reducer.**
A Type A Mid Range water reducing admixture may be used. Use one listed in Materials I.M. 403, at the manufacturer's recommended dosage.
- g. Aggregate Durability.**
Unless specified otherwise, use coarse aggregate of the proper class of durability, as defined in Article 4115.04.
- h. Transit Mix Concrete.**
Use a mix from a plant from which the concrete can be delivered and placed within 60 minutes from the start of mixing. The time may be extended to 90 minutes when a retarding admixture, used according to Materials I.M. 403 including temperature dosage guidelines (and at no additional cost to the Contracting Authority), is added at the plant. Continuous mixing equipment using volumetric proportioning may be used according to Article 2001.20, E.
- i. Prepackaged Mixture.**
A prepackaged mixture, proportioned as specified above for Class B or Class C matching material, may be furnished as a Class B or Class C patching material with the Engineer's approval. The coarse aggregate for prepackaged mixtures is limited to that meeting the requirements of Article 4115.05. Mix prepackaged mixtures in an on-site paddle type mixer or proportion and mix with continuous mixing equipment using volumetric proportioning according to Article 2001.20, E.
- C. Joint Boards.**
Comply with the following:
1. Joint boards for recreating joints and cracks: use a resilient filler, cellulosic fiber, paraffin coated cardboard, or other compressible material of the proper shape to recreate the joint during placement of the patch material.
 2. Boards for recreating transverse joints: one piece, ~~so as to have no horizontal joints.~~ One piece boards will not be required in lengths exceeding 6 feet.
 3. Boards for recreating longitudinal joints: one piece. One piece boards will not be required in lengths exceeding 4 6 feet.
 4. Joints and open transverse cracks: use a board with a nominal width of 1/4 inch. Metal strips may be used for narrow cracks.
 5. Extend boards and metal strips into the pavement to the bottom of the patch.
 6. Use of a bond breaker on board surfaces is encouraged.
- D. Joint Sealer.**
Use joint sealer and backer rod meeting the requirements of Section 4136. Unless specified otherwise, use only hot poured joint sealer.
- E. Tack Coat Bitumen.**
For HMA patches, use tack coat bitumen as specified in Article 2303.02, E.

2530.03 CONSTRUCTION.

A. Equipment.

1. Remove existing surface material using a milling machine, jack hammers, or similar equipment. Hand equipment may be necessary to achieve a vertical edge and the designated shape.

~~2. Sawing equipment is required at edges from a milling operation.~~

~~3~~ 2. The following additional equipment is required for PCC patches:

- a. Sandblasting equipment for cleaning of the prepared patch area on PCC pavements.
- b. 15 pound (or less) air chisel to complete patch area preparation. A 30 pound air chisel may be used if its use does not result in significant damage to the patch area and edges.
- c. Air compressor that emits oil and moisture free air for cleaning the prepared area.
- d. On-site paddle type concrete mixer for mixing Class A patching material or other prepackaged mixtures.

B. Partial Depth Finish Patch Construction.

1. General.

- a. The tabulations for partial depth finish patches shown in the contract documents are for estimating purposes only. The Engineer will designate the location and limits of these patches.
- b. The shape and depth may be irregular so that hand operated equipment may be necessary for all or some of the removal.
- c. Remove the existing pavement material within the designated area to sound concrete as determined by the Engineer. All material removed not designated for salvage becomes the property of the Contractor and shall be removed according to Article 1104.08.

2. Hot Mix Asphalt Patches.

Construct partial depth HMA finish patches as follows:

a. Preparation of Patch Area.

- 1) Remove material to a minimum depth of 3 inches. Where this depth is adequate, make the prepared surface relatively even. The maximum depth is 75% of the pavement thickness, but no more than 9 inches.
- 2) Remove material so that the edges of all patch areas are vertical to a depth of 1 1/2 inches. Minor rounding of the bottom edge is permissible. Cut and remove exposed reinforcing steel. Clean the patch area.
- 3) Where removal to the depth described above leaves unsound concrete within the limits of the patch area, the Engineer may designate a part of the patch area as a full depth patch. Remove the concrete for the full depth, but removal to a depth greater than 12 inches will not be required. Consolidate the subgrade or subbase material with a mechanical tamper or other compaction equipment as directed by the Engineer.

b. Placing HMA Patch Material.

- 1) After removal of the old pavement, lightly tack the edges and bottom of the patch area. Deposit and compact the HMA patch mixture in layers as follows:
 - a) Deposit the upper 5 inches in at least two layers, with the top layer not exceeding 2 inches in thickness, when compacted. Lifts should be at least 3 times the mixture size.
 - b) Thoroughly compact each layer, while hot, using appropriate compaction equipment. Succeeding layers may be placed as soon as the preceding layer has been properly compacted.
 - c) Smooth the final layer with a steel tired finish roller meeting requirements of Article 2001.05, B or F. A roller meeting requirement of Article 2001.05, F, may be a small roller suitable for this type of operation.
 - d) Ensure the final compacted surface is level with, or not more than approximately 1/4 inch above, the surrounding pavement.
- 2) Open the patch to traffic after the mixture has cooled to provide stability; however, on two lane roadways, do not leave barricades in place overnight. If the patch becomes distorted beyond the smoothness requirements for any reason, smooth the surface within 1 working day by blading, scraping, filling, or by other approved means.
- 3) Prior to final acceptance, a finish patch shall be level with, or not more than 1/8 inch above, the adjacent pavement, and have a smooth riding surface.

c. Sealing Joints and Cracks.

- 1) Seal all edges of HMA patches to a width of 3 inches centered on the edge. Use CRS-2 bitumen applied with a "V" shaped squeegee tool. Blot excess bitumen material with sand.
- 2) When joint and crack sealing work is part of the contract, saw joints and cracks that cross areas of HMA finish patches to a width of 1/8 inch to 1/4 inch. Saw to the depth of the patch with a maximum depth of 3 inches. Perform this work within 3 working days after placement.

3. Portland Cement Concrete Patches.

Construct partial depth PCC finish patches as follows:

a. Preparation of Patch Area.

- 1) Remove concrete in designated repair area to a minimum width of 12 inches using either of the following methods:
 - a) Mill transversely or longitudinally matching general alignment of patch. Use a mill that produces patch edges with a 30 to 60 degree angle or chip back patch edges to a 30 to 60 degree angle. Chip out secondary spalling resulting from milling at no additional cost to the Contracting Authority.
 - b) Place 2 inch saw cuts along perimeter of patch area and chip back patch edges to a 30 to 60 degree angle.
- 2) If a joint or crack is within a patch area, construct the bottom edge of that patch to be at least 6 inches beyond the joint or crack.
- 3) Form or saw patch edges to prevent them from protruding beyond edge of existing pavement by more than 3/8 inch.
- 4) Each patch will have a generally rectangular area. Remove the PCC concrete in that area to a minimum depth of 2 inches. Many areas will require removal of unsound PCC concrete to a greater depth to reach sound concrete. The maximum depth is 75% one half of the pavement thickness but not more than 9 inches.
- 3) Milling will be allowed, but the depth within the designated patch area is to be at least 3 inches. Remove concrete from feathered runouts to a depth of 3 inches if within the designated patch area, or to a depth of 2 inches if outside the designated patch area. Saw these edges vertically. Ensure the prepared area has reasonably straight and vertical edges, not to exceed 1 inch in saw cut depth. Sawing will be required around the remainder of the patch perimeter, unless the Contractor demonstrates that an edge can be produced that is true and vertical, without sawing.
- 5) Do not damage steel reinforcement during removal process. Damaged steel will be the responsibility of the Contractor. If the end of a dowel bar is exposed, cut or remove dowel. Place duct tape, form oil, grease, or other method approved by the Engineer as a bond breaker on exposed dowels not removed.
- 4) 6) When removal to the maximum depth leaves unsound concrete within the patch area, the Engineer may designate a part of the patch area as an full depth overdepth patch. Remove the concrete for the full depth of the existing pavement, but no more than 12 inches. Consolidate the subgrade or subbase material using a mechanical tamper or other compaction equipment as directed by the Engineer. Furnish and install No. 4 tie bars at mid-depth of existing pavement using an approved non-shrink grout. Place bar to provide a minimum 2 inch concrete cover.
- 5) 7) When it is necessary to go below reinforcing steel to reach sound concrete, cut the reinforcing steel flush with the perimeter edges of the patch and remove.
- 6) 8) Clean the patch area by sandblasting, followed by cleaning with compressed air. The completed surfaces are to appear surface dry to visual examination.
- 7) 9) Recreate a joint or crack in the patch area with a joint board of the proper size and shape. Extend the board to the bottom of the area to be patched, so as to separate completely all patching material on both sides. Use a board of a width approximately equal to the joint or crack. For wide openings, several thicknesses may be used. For patches 6 feet or greater in length:
 - a) Longitudinal joints may be reestablished by sawing to a depth of 1/3 the pavement thickness.
 - b) With approval of the Engineer, transverse joints may be reestablished by sawing the full depth of the patch when use of a form board will not allow complete separation of patch material on both sides of joint.

b. Placing PCC Patch Material.

- 1) Scrub a cement-sand-water grout of creamy consistency onto the patch surfaces, including the edges. Grout shall consist of two parts of Type I or Type I/II Portland cement and one part sand mixed with water. Mix grout by mechanical means. Place the patch material before the grout dries. If grout dries before placement of patch material, clean patch area again by sandblasting and air blasting, then reapply grout.
- 2) Mix Class A patching material with water and coarse aggregate, if required. Place the properly mixed material in the patch area, consolidate and worked into place in a manner that will provide good bonding. Level it with the adjacent pavement to provide a smooth riding surface not varying from existing pavement surface by more than 1/8 inch when measured with a 10 foot straightedge placed over patch. Replace or grind patch to correct deficiencies. Texture patches longer than 1 foot in the manner of the adjacent pavement surface.

- 3) For Class A patching materials, perform this work according to the patching manufacturer's recommendations and limitations, subject to approval of the Engineer. Furnish these recommendations to the Engineer. After 1 hour, remove the joint board in a manner that does not damage the patch. The area may then be returned to public traffic.
 - 4) Mix Class B and Class C patching material and place in the patch area. Consolidate it by vibration in a manner that will provide good bonding. Level the patch to provide a smooth riding surface. Texture patches longer than 1 foot in the manner of the adjacent pavement surface.
- c. Protecting and Curing.**
- 1) **Class A patching material.**
Cure according to the manufacturer's recommendations. If manufacturer's strength data at anticipated curing temperatures is not available, use only when mix and substrate temperature are 50°F or greater and cure for a minimum of 4 hours.
 - 2) **Class B patching material.**
 - a) Cure as specified in Article 2529.03, G.
 - b) Cure these patches for the minimum time specified in Article 2529.02 for the mixture used.
 - 3) **Class C patching material.**
 - a) Cure according to Article 2529.03, G. Patches may be covered immediately with white pigmented curing compound. In this case, the specified cure may be delayed as much as 2 hours. Cure patches with an approved white pigmented curing compound meeting the requirements of Section 4105. Apply curing compound within 30 minutes after placement of patching material.
 - b) Cure patches with Class M concrete a minimum of 36 hours or as directed by the Engineer.
 - c) After the required curing period, the insulation blanket and the joint forming board may be removed in a manner that does not damage the patch, or removal may be delayed until the sealing is to be done provided no damage results from the delay. Cure according to Article 2529.03, H, when overnight low temperatures are forecast to be below 35°F.
- d. Surface Finish.**
Prior to final acceptance, level finish partial depth finish patches with the adjacent pavement. Trowel toward edge of the repair when finishing. Ensure they have a smooth riding surface.
- e. Joint and Crack Sealing.**
Where joints and cracks cross areas of partial depth PCC patches, saw, seal, and clean the patch according to Article 2301.03, P. Complete sealing within 5 working days after the patch is placed. When joint and crack sealing is included in the contract, perform sealing as part of that work.
- f. Failure Repair.**
Repair failed patches that appear within 30 calendar days of original construction or subsequent repair at no cost to Contracting Authority. Failures may include, but are not limited to, loss of bond between patch and underlying pavement or random cracking.

C. Limitations of Operations.

1. Unless the road is closed, maintain traffic during construction operations. Conduct all operations with minimum inconvenience to traffic. On two-lane roads, limit operations to one traffic lane at a time, except for minor encroachment in the adjacent lane for sawing and installing forms when traffic is maintained. For multiple lane roadways, the work area may include one lane in each direction.
2. An adjacent lane shall be opened to traffic prior to the old pavement being removed from a patch area.
3. When approved by the Engineer, patch areas may extend up to 2 feet into an adjacent lane as allowed by the contract documents.
4. Adjust the work schedule so all work for each patch, including removal of barricades and equipment (except the cure period for PCC Class C concrete), will be completed on the same day it is started between the hours of 30 minutes after sunrise to 30 minutes before sunset. If unforeseen conditions result in excavated areas being left overnight, assign a sufficient number of flaggers to warn and direct traffic until the patches are placed. Extra payment will not be made for the necessary flaggers.
5. Place PCC patching material only when the ambient air and pavement temperatures are 45°F or above.
6. The Engineer may limit advance sawing.

7. If an emergency makes a DW joint necessary, temporarily fill the excavated area following the joint with a suitable hot or cold paving mixture or stable granular material, as directed by the Engineer. The Engineer may direct that the lane remain closed to traffic overnight. Provide traffic control.
8. When PCC patches without calcium chloride are constructed, place two drums meeting the requirements of Article 2528.03, C, in front of each patch location where there is a possibility of turning into or returning to the closed lane. Additional drums need not be placed for patches spaced closer than 150 feet.
9. Apply Articles 1107.08, 1107.09, and 1108.03.

D. Area Restoration.

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

2530.04 METHOD OF MEASUREMENT.

The Engineer will determine the quantities involved in satisfactory construction of partial depth finish patches for the areas specified as follows:

A. Partial Depth PCC Finish Patches.

1. The Engineer will calculate the area of each patch in square feet from surface measurements. The area of each patch less than 1 square foot will be counted as 1 square foot for payment purposes. If the patch area is increased by the Contractor to accommodate milling equipment, only the area designated by the Engineer will be measured for payment.
2. The Engineer will also calculate the area of patches in square feet which have been directed to be constructed full depth. Removal and repair of areas up to one half existing pavement thickness will be included in this payment.

B. Partial Depth PCC Joint and Crack Repair Patches.

1. Measurement for Partial Depth PCC Joint and Crack Repair Patches will be to the nearest 0.1 linear foot on the basis of 12 inch width of repair. Areas designated for repair outside the 12 inch repair width will be measured as Partial Depth PCC Finish Patches per Article 2530.04, A, 1.
2. Removal and repair of areas up to one half existing pavement thickness will be included in this payment.

C. Overdepth Patches.

Engineer will calculate area of each Overdepth Patch in square feet at the mid-depth of the pavement. Area of each patch less than 1 square foot will be counted as 1 square foot for payment purposes.

D. Partial Depth HMA Finish Patches.

1. The Engineer will measure the area for each patch and the weight of HMA placed in partial depth patches according to Article 2303.04. Regular patches and irregular patches will be calculated and totaled separately. If the patch area is increased to accommodate milling equipment, only the quantities for the area designated by the Engineer will be measured for payment.
2. Asphalt binder and tack coat will not be measured separately for payment.
3. The Engineer will also calculate the area and weight of patch material placed in HMA patches which have been directed to be constructed full depth. The Engineer will deduct quantities not used.

2530.05 BASIS OF PAYMENT.

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

A. Partial Depth PCC Finish Patches.

1. Per square foot.
2. Payment is full compensation for removal of all pavement, preparing the patch area, furnishing and placing all material, construction of joints, sawing, finishing, curing, and restoration of the area.
3. ~~When parts of PCC partial depth finish patches are constructed to full depth at the direction of the Engineer, payment will be for the areas of those parts at two times the contract price per square foot for partial depth PCC patches.~~

B. Partial Depth PCC Joint and Crack Repair Patches.

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

C. Overdepth Patches.

1. Per square foot. Payment for Overdepth Patches will be in addition to Partial Depth PCC Finish Patch or Partial Depth PCC Joint and Crack Repair Patch quantities for the same area.
2. Payment is full compensation for repairs designated in lower half of existing pavement and includes removal of pavement, preparing the patch area, and furnishing and placing material.

D. Partial Depth HMA Finish Patches.

1. Payment will be for both the patch area and the quantity of HMA placed in the patch.
 - a. **Regular Partial Depth HMA Finish Patches, by Area.**
Per square yard.
 - b. **Irregular Partial Depth HMA Finish Patches, by Area.**
Per square yard.
 - c. **Hot Mix Asphalt Mixture.**
Per ton. Includes mixture designated for full depth patches.
2. When parts of regular or irregular partial depth HMA finish patches are constructed to full depth at the direction of the Engineer, payment will be for the areas of those parts at two times the contract price per square yard for regular or irregular partial depth HMA finish patches.
3. Payments are full compensation for:
 - Removal of the old pavement,
 - Preparing the patch area,
 - Furnishing and placing the HMA patching material, including asphalt binder in the mixture and necessary tack coat bitumen,
 - Sawing and sealing,
 - Sealing the patch edges, and
 - Restoration of the area.
4. When joint and crack sealing is included in the contract, it will be paid for as a part of that work.

Section 2532**2532.03, B, 3, a.**

Add as the second sentence:

No areas greater than 2 feet in length shall be left without texture. Total depth of concrete surface ground shall not exceed 1/4 inch.

Section 2535**2535.03, A, 2.**

Replace the last sentence of the Article:

When not included in contracts for grading, all excavation in connection with this construction is Class 23 Excavation according to Article 2402.03, J K.

Section 2540**2540.02, Materials.**

Replace the Article:

A. Use the following materials for filling the longitudinal joint in the PCC base:

1. For a 0 to 3/4 inch opening, fill the existing joint with either PG 58-xxS or CRS-2 emulsion.
2. For an opening greater than 3/4 inch, fill the existing joint with a 3/8 inch to 1/2 inch commercial HMA mixture with PG 58-xxS or other suitable hot or cold bituminous mixture approved by the Engineer.

B. For completing the joint repair (filling the milled trench above the PCC base), use a ~~300,000~~ ESAL Standard Traffic (ST) HMA or similar mixture approved by the Engineer.

Section 2543**2543.02, A.**

Replace the Article:

Unless stated elsewhere in the contract documents, use HMA meeting or exceeding Section 2303 requirements for a ~~300,000 ESAL~~ Standard Traffic (ST) surface mixture.

Section 2548**2548.03, Construction.**

Add to the end of the first paragraph:

Allow PCC to cure for a minimum of 14 days prior to placing milled rumble strips.

Section 2550**2550.04, Traffic Control.**

Replace the Article:

~~**A.** Ensure all vehicles and equipment (except for hand-operated equipment) operating or parked within 15 feet of an open lane of traffic and all vehicles and equipment entering or exiting the work area display amber high intensity rotating, flashing, or oscillating lights.~~

A. Place and remove all traffic control devices during daytime hours, when possible, unless specified otherwise in the contract documents.

B. Continually review all traffic control devices, including monitoring of lights, to ensure proper installation and working order.

Section 2552**2552.02, B, Bedding (Class I) Material.**

Renumber and Retitle the Article:

B C. Bedding (Class I) Material (Non-Primary Roadways Projects).

2552.02, C, Backfill Material (Under Interstate and Primary Roadways).**Renumber, Retitle, and Replace the Article:****C B. Pipe Bedding and Backfill Material (Under Interstate and Primary Roadways Projects).**

Meet requirements of Article 2102.02, A, and Section 4119.

2552.02, D, Backfill Material (Other Areas).**Retitle the Article:****Backfill Material (Other Areas Non-Primary Roadways Projects)****2552.02, F, Stabilization (Foundation) Material.****Replace the Article:**~~1. Clean 2 1/2 inch crushed stone with the following gradation:~~

Sieve	Percent Passing
2 1/2 inch	100
2 inch	90 to 100
1 1/2 inch	35 to 70
1 inch	0 to 20
1/2 inch	0 to 5

~~2. The Engineer may authorize a change in gradation subject to materials available locally at time of construction.~~~~3. Crushed concrete may be used, if approved by the Engineer, if it is within \pm 5% of the gradation for each size of material.~~

Meet the requirements of Section 4128.

2552.03, E, Pipe Bedding and Backfill Material.**Add to Article 1:**

f. Refer to Standard Road Plan SW-101 for bedding and backfill zones.

Replace Articles 2 and 3:**2 3. Pipe Bedding (Non-Primary Roadways Projects).****a. Granular Material.**

- 1) Class I granular material is required for all gravity mains. Use when specified for pressure pipes.
- 2) Place bedding material in the bottom of the trench in lifts no greater than 6 inches thick. Consolidate and moderately compact bedding material.
- 3) Shape bedding material to evenly support pipe at the proper line and grade, with full contact under the bottom of the pipe. Excavate for pipe bells.
- 4) Install pipe and system components.
- 5) Place, consolidate, and moderately compact additional bedding material adjacent to the pipe to a depth equal to 1/6 the outside diameter of the pipe.

b. Suitable Backfill Material.

- 1) Only use with pressure pipe.
- 2) Use suitable backfill material to shape trench bottom to evenly support pipe at the proper line and grade, with full contact under the bottom of the pipe. Excavate for pipe bells.

c. Special Pipe Embedment and Encasement Materials.

- 1) If required in the contract documents, use concrete, flowable mortar, or CLSM in lieu of other bedding materials.
- 2) Secure pipe against displacement or flotation prior to placing concrete, flowable mortar, or CLSM.

3 2. Bedding and Backfill Under (Interstate and Primary Roads Projects).~~a. Place in lifts no greater than 6 inches thick. Thoroughly tamp or vibrate each layer to ensure compaction.~~~~b. Thoroughly tamp or vibrate each layer to insure compaction.~~**a. Pipe Bedding.**

- 1) Use material meeting requirements of Section 4119. Shape bedding material to evenly support pipe at proper line and grade, with full contact under bottom of pipe. Excavate for pipe bells.
 - 2) Install pipe and system components.
 - 3) Place, consolidate, and moderately compact additional bedding material adjacent to pipe to a depth equal to 1/6 the outside diameter of pipe.
- b. Backfill.**
- ~~c.~~ Place backfill material after recording locations of connections and appurtenances or at the Engineer's direction. ~~Terminate backfill material at subgrade elevation.~~
- ~~d.~~ ~~Terminate backfill material at subgrade elevation.~~
- 1) **Under Interstate and Primary Roadway.**
 - a) Use material meeting requirements of Section 4119 for haunch support, primary backfill, and secondary backfill, ~~and final trench backfill.~~
 - b) For trench installations through the subgrade, terminate final trench backfill material at subgrade elevation. Use final backfill material meeting requirements of Section 4119.
 - c) For fill or partial trench installations, terminate final trench backfill material at the top of the trench. Use final backfill material meeting the requirements of Section 4119. For fill above the trench, use Class 10 material meeting the requirements of Article 2102.02, A.
 - 2) **Outside of Interstate and Primary Roadway.**
Use material meeting requirements of Section 4119 for haunch support, primary backfill, and secondary backfill. Use Class 10 material meeting requirements of Article 2102.02, A, for final trench backfill.

Retitle Articles 4, 5, and 6:

4. **Haunch Support (~~Other Areas Non-Primary Roadways Projects~~).**
5. **Primary and Secondary Backfill (~~Other Areas Non-Primary Roadways Projects~~).**
6. **Final Trench Backfill (~~Other Areas Non-Primary Roadways Projects~~).**

Section 2554

2554.04, A, Pipe and Fittings.

Replace Article 4 title:

Water Service Stubs by Each.

Add the Article:

5. **Water Service Stubs by Length.**
 - a. **Water Service Pipe.**
Each type and size of water service pipe will be measured in linear feet along the centerline of the pipe.
 - b. **Water Service Corporation.**
Each type and size of water service corporation will be counted.
 - c. **Water Service Curb Stop and Box.**
Each type and size of water service curb stop and box will be counted.

2554.04, B, Valves, Fire Hydrants, and Appurtenances.

Add the Articles:

10. **Fire Hydrant Assembly Removal.**
Each fire hydrant assembly removed will be counted.
11. **Valve Removal.**
Each size of valve removed will be counted.
12. **Valve Box Removal.**
Each valve box removed will be counted.

2554.05, A, Pipe and Fittings.

Replace Article 4 title:

Water Service Stubs by Each.

Add the Article:

5. Water Service Stubs by Length.**a. Water Service Pipe.**

Payment will be the contract unit price per linear foot for each type and size of water service stub.

b. Water Service Corporation.

Payment will be made at the contract unit price for each type and size of water service corporation.

c. Water Service Curb Stop and Box.

Payment will be made at the contract unit price for each type and size of water service curb stop and box.

2554.05, B, Valves, Fire Hydrants, and Appurtenances.

Add the Articles:

10. Fire Hydrant Assembly Removal.

a. Payment will be at the contract unit price for each fire hydrant assembly removed.

b. Payment is full compensation for:

- Excavation,
- Removal of the fire hydrant, hydrant valve, and thrust block,
- Capping of the pipe,
- Delivery of the fire hydrant to the Contracting Authority (if specified),
- Backfill,
- Compaction, and
- Surface restoration to match the surrounding area.

11. Valve Removal.

a. Payment will be at the contract unit price for each size of valve removed.

b. Payment is full compensation for:

- Excavation,
- Removal of the valve,
- Replacing the removed valve with pipe and connections (if required) or capping the former valve connection,
- Delivery of the valve to the Contracting Authority (if specified),
- Backfill,
- Compaction, and
- Surface restoration to match the surrounding area.

12. Valve Box Removal.

a. Payment will be at the contract unit price for each valve box removed.

b. Payment is full compensation for:

- Excavation,
- Removal of the valve box,
- Delivery of the valve box to the Contracting Authority (if specified),
- Backfill,
- Compaction, and
- Surface restoration to match the surrounding area.

Section 2556**2556, Dowel Bar Retrofit.**

Add the Section:

2556.01 DESCRIPTION.

Install epoxy coated dowel bars on transverse joints and transverse cracks as shown in the plans. Place dowels after concrete repair operations and prior to diamond grinding operation. Areas with random cracks passing through dowel

bar retrofit locations will be reviewed by the Engineer prior to construction.

2556.02 MATERIALS.

A. Epoxy Coated Dowel Bars.

1. Ensure epoxy coated dowel bars, 1.5 inches by 15 inches, conform to requirements of Section 4151. Uniformly coat dowel bars with approved bond breaker according to Article 4151.02, B.
2. Dowel bars shall have tight fitting end caps made of nonmetallic material that allow for at least 0.25 inch bar movement at each end of the bar.
3. Chair devices for supporting dowel bars shall be either epoxy coated or made of a nonmetallic material. Chair devices shall provide a minimum clearance of 0.5 inch between the bottom of the bar and the surface upon which the bar is placed, and between the bar and the walls of the slot. Chairs shall be designed to prevent movement of the bar during placement of the grout. Submit samples of end caps and chairs to Engineer for approval before installation.

B. Caulking Filler.

Acceptable caulking filler used for sealing the existing transverse joint or crack at the bottom and sides of the slot includes any commercial caulk designed as a concrete sealant that is compatible with the patch material being used.

C. Foam Core Inserts.

Foam core board filler material shall be a closed cell foam faced with plastic film, foil, or poster board material on each side. Foam core board filler shall be 3/8 inch \pm 1/8 inch thick. Foam core board filler shall be approved by the Engineer before installation.

D. Grout.

1. Grout material placed around bars shall be a shrinkage compensated rapid set patch material listed in Materials I.M. 491.20, Appendix B.
2. Extend grout according to the manufacturer's recommendations. Aggregate for extending grout shall be pea gravel meeting Section 4112 of the Standard Specifications, with a minimum durability of Class 2 and the following gradation:

Sieve Size	Percent Passing
1/2 inch	100
3/8 inch	85-100
No. 8	0-8

3. The rapid set cement used to produce any of the rapid set patch materials in Materials I.M. 491.20, Appendix B may be approved to produce a concrete patch mix utilizing sand meeting Section 4110 and pea gravel meeting Section 4112, at maximum aggregate extension. Concrete patch mix shall meet the following strength requirements:
 - 3 hour minimum compressive strength of 3000 psi, ASTM C 39
 - 24 hour minimum compressive strength of 5000 psi, ASTM C 39
 - 24 hour bond to dry PCC, 1000 psi, ASTM C 882
4. Furnish a list of materials for use in making the grout, and the mix design, to the Engineer at least 30 calendar days prior to installation. The District Materials Engineer may waive mix design testing based on previous testing with the patching materials.
5. Testing of the grout by the Engineer may be done anytime during production.

2556.03 CONSTRUCTION.

A. Process Control Plan.

Provide the Engineer a process control plan at least one week prior to the beginning of retrofit work. This plan shall include:

- Description of materials and process to be used to achieve required dowel bar alignment.
- Description of materials and processes to be used to prevent grout from entering existing joints.
- Description of materials and processes to be used to place and align foam core inserts.
- Mix design and proportion control for grout mixture

B. Preparing Slots for Dowel Bars.

1. Cut slots in pavement with gang saw capable of cutting at least three slots in each wheel path simultaneously. Cut slots to required depth to place center of dowels at mid-depth of concrete slab. Multiple saw cuts parallel to centerline may be required to remove material from slot.
2. Use jackhammers not larger than 30 pound class to remove concrete from slots. Prevent damage to pavement or vehicles traveling in the adjoining lane.
3. Sandblast and clean exposed surfaces and cracks in slots before bar installation. Fill transverse contraction joint on bottom and sides with non-sag caulking filler.

C. Placing Dowel Bars.

1. Use chair devices to support dowel bars at depth shown on the plans.
2. Place dowel bars parallel to centerline of pavement and parallel to pavement surface.
3. Place dowel bars within $\pm 1/4$ inch of desired alignment.
4. Center dowel bars over transverse joints or cracks so a minimum of 7 inches of dowel bar extends into adjacent panel.
5. Cut a piece foam core board material (angled if joints are skewed) to fit tightly around dowel bar. Place foam core board at center of dowel bar flush with surface of concrete pavement, or slightly recessed. Maintain foam core board in vertical position, tight to edges, during grout placement operations.

D. Grouting Dowel Bars.

1. Produce grout with a portable mixer approved by the Engineer. Place grout immediately after mixing and before grout has attained initial set. Do not re-temper grout with water.
2. Thoroughly moisten all surfaces of the sawed slot immediately prior to filling with grout. Remove all excess water with compressed air.
3. Place grout according to the manufacturer's recommendations. Thoroughly consolidate grout with a hand held vibrator so the grout completely surrounds dowel bars and support chairs. Place grout so that the material is at least 1/8 inch higher than the pavement if the pavement is to be diamond ground. If the pavement is not to be ground, finish the grout flush with the surface.
4. Immediately after placement, thoroughly coat grout with white pigmented curing compound.

E. Re-establishing Joints or Cracks.

Re-establish joint or crack above foam board insert within 8 hours of grout placement by means of sawing when grout has attained sufficient strength. If foam board is visible, sawing of joint or crack will not be required.

F. Replacing Deficient Work.

Replace dowel bars that are to be removed due to poor quality work or material failure with new bars. Provide additional traffic control needed due to required retrofit repairs at no additional cost to the Contracting Authority.

2556.04 METHOD OF MEASUREMENT.

Dowel Bar Retrofit will be measured by each bar satisfactorily placed.

2556.05 BASIS OF PAYMENT.

Payment for Dowel Bar Retrofit will be paid at the contract unit price per each bar. Payment shall be considered full compensation for furnishing all labor, equipment, and materials necessary to perform the work prescribed in this specification.

Division 26. Roadside Development.**Section 2601****2601.01, Description.**

Replace the tenth bullet:

~~Outlet or channel scour protection (†Transition mat), and~~

2601.03, A, 7, a.

Replace the first sentence:

Use hydraulic seeding equipment with a pump rated at no less than 100 gallons per minute and is capable of continuous agitation action to uniformly distribute seed over the area.

2601.03, A, 14, Straw Mulching Machine.

Replace the second sentence:

~~Engineer may consider e~~Excessive pulverization as is the general absence of straw longer than 6 inches after distribution.

2601.03, A, 15, a.

Delete the second bullet:

~~• Have a nominal minimum diameter of 20 inches, and~~

2601.03, A, 15, b.

Delete the second and third sentences:

~~Use equipment that weighs approximately 1000 pounds. When directed by the Engineer, increase the weight (mass) of the equipment by the addition of ballast.~~

2601.03, A, Equipment.

Add the Articles:

18. Slit Seeder.

Use a gas, diesel, or electric powered mechanical slit seeder that:

- Is capable of cutting vertical grooves a maximum of 1/4 inch deep into the soil with a maximum horizontal blade spacing of 3 inches,
- Deposits metered seed directly behind the vertical grooves, and
- Contains packer wheels that press and firmly pack seed into the soil.

19. Drop Seeder.

One piece of equipment containing the following:

- Pulverizer rollers in front of the seed tubes.
- Ground driven seed meters.
- Max seed tube spacing of 3 inches delivering seed between the pulverizer rollers and packer wheels.
- Packer wheels pressing and firmly packing seed into the soil.

2601.03, B, 4, b, 1.

Add to the end of the Article:

A fertilizer will be considered equivalent when it meets the minimum total pounds per acre of nitrogen (N), available phosphoric acid (P₂O₅), and water soluble potassium (K₂O).

2601.03, B, 4, c, 1.

Replace the Article:

~~Except when a hydraulic seeder is used, thoroughly mix all seed specified for the contract prior to placing seed in seed hopper. For Seed mixing, shall meet comply with the requirements of Materials I.M. 469.02. Use Ppermanent rural, permanent urban, urban stabilizing, salt tolerant seeding, Native Grass, Wetland Grass, and Wildflower seeding mixtures shall be mixed off-site by a seed conditioner approved by the Iowa Crop Improvement Association or other state’s Crop Improvement Association.~~

2601.03, B, 4, d, 2, Seeding and Fertilizing with Hydraulic Seeder.

Replace the Title and Article:

Seeding and Fertilizing with Hydraulic Seeder Seeding.

- ~~a) A hydraulic seeder may be used when seedbed has been prepared according to Article 2601.03, B, 4, a. When a hydraulic seeder is used, apply seed or fertilizer, or both, at the rates specified in approximately 400 gallons of water slurry per acre. Add 50 pounds of Wood Cellulose Fiber complying with Article 4169.07, B, 1, as a tracer for each 500 gallons of water in hydraulic seeder tank.~~
- ~~b) Apply mixture within 1 hour after fertilizer and seed are placed in hydraulic seeder. Use continuous agitation. Seed remaining in the fertilizer solution for more than 1 hour will be unacceptable. Additional seed at the specified rate will be required. Use flood type nozzles and manufacture’s recommended water volume to apply mixture.~~
- ~~c) Once seed has been added to tank mixture, a 1 hour time limit is set for spreading mixture on soil. Once 1 hour time limit has expired, discard remaining mixture.~~
- ~~d) Perform hydraulic seeding separate from placing hydraulic mulch.~~

2601.03, C, 2, b, Seed Mixture.

Replace Table 2601.03-2:

Table 2601.03-2: Urban Stabilizing Crop Seeding Rates

Bluegrass, Kentucky ¹	422 126 lbs. per acre
Ryegrass, Perennial (fineleaf turf-type variety) ²	35 40 lbs. per acre
Fescue, Creeping Red	18 lbs. per acre
1. Choose three different cultivars of Kentucky bluegrass, at 42 lbs. per acre each.	
2. Choose two different cultivars of turf-type perennial ryegrass, at 20 lbs. per acre each.	

2601.03, C, 2, d, Application Dates.

Replace the Article:

~~Normal seed application dates are March 1 through May 31, and August 10 through September 30. Seed may be applied throughout the year unless ground conditions are unsuitable for seeding due to moisture or frost.~~

2601.03, C, 3, a, Preparation and Application.

Replace the Article:

- ~~1) Prepare seedbed according to Article 2601.03, B, 4, a c.~~
- ~~2) Prepare seed according to Article 2601.03, B, 4, c. In areas without existing stabilized crop seeding residue, pPrepare seedbed according to Article 2601.03, B, 4, a, and apply seed according to Article 2601.03, B, 4, d, using only a drop seeder complying with Article 2601.03, A, 19.~~
- ~~3) Apply seed according to Article 2601.03, B, 4, d. In areas with existing stabilized crop residue, apply seed with a native grass seed drill with a no till attachment through the small seed box slit seeder. Seedbed preparation will not be required, except for areas with rills and gullies.~~

2601.03, C, 4, a, Preparation and Application.

Renumber Articles 2, 3, 4 and **Add** the Article:

- 2) In areas with existing urban crop stabilizing of 50% or greater density, full seedbed preparation and rolling will not be required. Apply seed using a slit seeder as defined in Article 2601.03, A, 18.
- ~~2 3)~~
- ~~3 4)~~

4 5)

2601.03, C, 4, b, Seed Mixture.

Replace Table 2601.03-4:

Table 2601.03-4: Permanent Seed Rates, Urban Area

Bluegrass, Kentucky ¹	122 126 lbs. per acre
Ryegrass, Perennial (fineleaf turf-type variety) ²	35 40 lbs. per acre
Fescue, Creeping Red	18 lbs. per acre
1. Choose three different cultivars of Kentucky bluegrass, at 42 lbs. per acre each. 2. Choose two different cultivars of turf-type perennial ryegrass, at 20 lbs. per acre each.	

2601.03, C, 5, a, Preparation and Application.

Replace the Article:

- ~~1) In areas without existing stabilized crop seeding residue, prepare seedbed according to Article 2601.03, B, 4, a. Seed areas accessible to field equipment with native grass seed drill, gravity, or broadcast equipment. Cultipack as specified in Article 2601.03, B, 4, d. Broadcast seed other areas and follow with a light dragging or hand raking. Apply seed with native grass seed drill with a no till attachment. Seedbed preparation and cultipacking will not be required. Mowing according to Article 2601.03, B, 4, a, 3, may be required. In areas where rills and gullies are present, prepare seedbed according to Article 2601.03, B, 4, a, and then apply seed with a native grass seed drill with a no till attachment.~~
- ~~2) In areas with existing stabilized crop residue, apply seed with a native grass seed drill with a no till attachment. Seedbed preparation and cultipacking will not be required. Seedbed preparation is required for areas with rills and gullies.~~
- 2) Prepare seed according to Article 2601.03, B, 4, c.**
- 3) Calibrate native grass seed drill to specified seeding rate for project prior to operation on project.**
- 4) Plant seed at a maximum 1/8 inch depth. Do not perform seeding when wet soil conditions would cause seed to be placed deeper than specified.**
- 5) Fill seed boxes loosely without packing seed to allow agitator wheels to run freely and seed flows freely through drill.**
- 6) Set no-till coulters to penetrate between 1/4 and 1/2 inch below soil surface.**
- 7) Operate drill so drive wheel maintains ground contact. Perform two passes with drill, with second pass being offset from first pass.**
- 8) Operate tractor between 3 and 5 mph to prevent drill from bouncing.**
- 9) Remove seed remaining in drill at end of each day. At completion of seeding, remove remaining seed from drill by vacuum or other means. Hand broadcast remaining seed on project.**

2601.03, C, 5, b, Seed Mixture.

Add row to Table 2601.03-5:

Butterfly weed (Asclepias tuberosa)	3 oz. per acre
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2601.03, C, 7, d, Application Dates.

Replace the Article:

~~Normal seed application dates are April 15 through June 30. Normal seed application dates are April 1 through May 31 and November 1 until ground conditions are unsuitable for seeding due to moisture or frost.~~

2601.03, C, Types of Seeding.

Add the Article:

9. Salt Tolerant Seeding.

a. Preparation and Application.

- 1) Prepare seed according to Article 2601.03, B, 4, c.
- 2) Prepare seedbed according to Article 2601.03, B, 4, a, and apply seed according to Article 2601.03, B, 4, d using only a drop seeder according to Article 2601.03, A, 19.

b. Seed Mixture.

Use seeding rates in Table 2601.03-7 for permanent seeding of rural areas, unless otherwise specified in the contract documents:

Table 2601.03-7: Salt Tolerant Seed Rates

Alkali grass	109 lbs. per acre
Turf-type Tall Fescue ¹	109 lbs. per acre
Perennial ryegrass	66 lbs. per acre
Crested wheatgrass	66 lbs. per acre
Hard fine fescue	44 lbs. per acre
Sheep fine fescue	44 lbs. per acre
¹ Turf-type Tall Fescue shall contain a minimum 36 lbs. of each cultivar Inferno and Quest.	

c. Fertilizing.

- 1) Spread over the areas at the rate of 300 pounds per acre of 6-24-24 (or equivalent).
- 2) Apply provisions of Article 2601.03, B, 4, b.

d. Application Dates.

Normal permanent seed application dates are March 1 through May 31, and August 10 through September 30.

2601.03, E, 2, a, Straw Mulch.

Add the Articles:

- 3) Crimp/tuck straw to a minimum of 2 inches below ground surface.
- 4) Do not operate mulch-blowing equipment on slopes steeper than 2.5:1 or on slopes that may rut. Use blower attachments to apply mulch without traversing slopes. Hydraulic mulching, as described in Article 4169.07, B, 2, may be substituted at no additional cost to the Contracting Authority.
- 5) Do not mulch when wind velocities are greater than 15 mph.

2601.03, E, Mulching.

Add the Article:

3. Organic Fiber Matrix.

- a. Apply at no less than 4500 pounds per acre using standard hydraulic mulching equipment, unless specified otherwise in the contract documents.
- b. If using with hydraulic seeding, apply as a separate operation.

2601.03, G, 3, d, 4.

Replace the Article:

After sodding and seeding, water the sod, sodbed, and disturbed areas according to Article ~~2601.03, G, 3, e~~ 2601.03, I, 2.

2601.03, G, 3, e, Watering Sod.

Delete the Article:

e. ~~Watering Sod.~~

- ~~1) Provide watering equipment and an approved water supply before beginning any sodding operation. Six waterings will be required. Allow no more than 1 hour to elapse between laying and initial watering of sod. Perform the second, third, and fourth waterings at 4 calendar day intervals, and fifth and sixth waterings at weekly intervals. Perform waterings unless notified by the Engineer in writing at least 1 calendar day prior to the day the watering is to occur. A price adjustment will be assessed at a rate of \$200.00 per day for each calendar day that the Contractor fails to complete the watering from the day watering is to commence.~~
- ~~2) Ensure waterings are sufficient to thoroughly saturate sod, sodbed, and adjacent disturbed areas to a depth of approximately 4 inches.~~
- ~~3) Each watering may require a maximum of 100 gallons of water per square. Apply water as a spray or dispersion to prevent damage to the sod. Complete each watering within a 4 hour period. More than one application for each watering may be necessary to provide adequate saturation without runoff.~~

2601.03, G, 3, f, Urban, Island, and Safety Rest Area Sodding.

Renumber the Article:

f e. Urban, Island, and Safety Rest Area Sodding.

2601.03, H, Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Outlet or Channel Scour Protection (Transition Mat).

Replace the title of the Article and Articles 1, 6, and 7, and Delete Article 8:

Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Outlet or Channel Scour Protection (Transition Mat).

- 1. Preparation of Area to be Treated with Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Outlet or Channel Scour Protection (Transition Mat).**
- 6. Outlet or Channel Scour Protection (Transition Mat) (TM).**
- 7. Finishing Adjacent to Special Ditch Control, Turf Reinforcement Mat, Slope Protection Areas, and Outlet or Channel Scour Protection (Transition Mat).**
- 8. Watering of Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Outlet or Channel Scour Protection (Transition Mat).**
 - ~~a. Provide watering equipment and an approved water supply before starting special ditch control, TRM, slope protection, or TM work. Water the area no later than the day following placement of the materials. If Contractor fails to water by second day following placement a price adjustment will be assessed at a rate of \$200.00 per calendar day until the watering has been completed.~~
 - ~~b. Apply three additional waterings at intervals of 5 to 8 calendar days. Perform waterings unless notified by Engineer in writing at least 1 calendar day prior to the day watering is to occur. If Contractor fails to complete watering before the 8th calendar day has elapsed, a price adjustment will be assessed at a rate of \$200.00 per calendar day, beginning on the 9th day, until the watering is completed.~~
 - ~~c. Ensure waterings are sufficient to thoroughly saturate seedbed to a depth of approximately 2 inches.~~
 - ~~d. Each watering may require a maximum of 50 gallons of water per square. Apply water as a spray or dispersion to prevent damage to the seedbed. Complete each watering within a 4 hour period.~~
 - ~~e. More than one application for each watering may be necessary to provide adequate saturation without runoff.~~

2601.03, H, 5, a, 2.

Replace the Article:

~~Use mixture specified.~~ Seed slopes using seeding rates in Tables 2601.03-7 for slopes adjacent to native grass seedings and 2601.03-8 for slopes adjacent to rural seedings.

2601.03, H, 5, b, Fertilizing.

Replace the Article:

~~For slope protection, use fertilizer specified. Apply provisions of Article 2601.03, B, 4, b.~~

- 1) After area is prepared and prior to laying slope protection, fertilize at the rate specified. Apply provisions of Article 2601.03, B, 4, b. Spread with a mechanical spreader to secure a uniform rate of application. Manipulation or mixing with the soil other than that incidental to Article 2601.03, H, 7, will not be required.**
- 2) If the type of fertilizer is not specified, apply 300 pounds per acre of 6-24-24 (or equivalent) to slopes adjacent to rural seedings.**
- 3) No fertilizer will be required for slopes adjacent to native grass seedings.**

2601.03, Construction.

Add the Article and Renumber subsequent Articles:

I. Watering.

- 1. Watering of Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Transition Mat.**
 - a. Provide watering equipment and an approved water supply before starting special ditch control, turf reinforcement mat, slope protection, or transition mat work. Water the area no later than the**

day following placement of the materials. If Contractor fails to water by second day following placement, a price adjustment will be assessed at a rate of \$200.00 per calendar day until watering has been completed.

- b. Apply three additional waterings at intervals of 5 to 8 calendar days. Perform waterings unless notified by Engineer in writing at least 1 calendar day prior to the day watering is to occur. If Contractor fails to complete watering before the 8th calendar day has elapsed, a price adjustment will be assessed at a rate of \$200.00 per calendar day, beginning on the 9th day, until watering is completed.
- c. Ensure waterings are sufficient to thoroughly saturate seedbed to a depth of approximately 2 inches.
- d. Each watering may require a maximum of 50 gallons of water per square. Apply water as a spray or dispersion to prevent damage to the seedbed. Complete each watering within a 4 hour period.
- e. More than one application for each watering may be necessary to provide adequate saturation without runoff.

2. Watering Sod.

- a. Provide watering equipment and an approved water supply before beginning sodding operation. Six waterings will be required. Allow no more than 1 hour to elapse between laying and initial watering of sod. Perform second, third, and fourth waterings at 4 calendar day intervals; and fifth and sixth waterings at weekly intervals. Perform waterings unless notified by the Engineer in writing at least 1 calendar day prior to the day watering is to occur. A price adjustment will be assessed at a rate of \$200.00 per day for each calendar day that the Contractor fails to complete watering from the day watering is to commence.
- b. Ensure waterings are sufficient to thoroughly saturate sod, sodbed, and adjacent disturbed areas to a depth of approximately 4 inches.
- c. Each watering may require a maximum of 100 gallons of water per square. Apply water as a spray or dispersion to prevent damage to the sod. Complete each watering within a 4 hour period. More than one application for each watering may be necessary to provide adequate saturation without runoff.

‡ J. Mowing.

‡ K. Completion of the Work.

2601.04, A.

Add as the third bullet:

- Hydraulic Seeding,

2601.04, D.

Replace the second and third sentences:

Measurement of actual ditch area covered will be used, but will not exceed an area based on the actual measured length and design width. Materials used for anchor slots, junction slots, check slots, terminal folds, and lap joints are incidental. Seed, and fertilizer for Special Ditch Control and TRM are incidental.

2601.04, E.

Replace the Article:

~~Outlet or Channel Scour Protection (Transition Mat):~~ square feet calculated from measurements to the nearest foot.

2601.04, H.

Replace the Article:

Mowing described in Article 2601.03, ‡ J: acres to the nearest 0.1 acre of surface area.

2601.05, A, 2.

Add as the third bullet:

- Hydraulic Seeding,

2601.05, A, 6.

Replace the Article:

Mulch furnished and placed: ~~predetermined contract unit price per acre (hectare)~~ contract unit price per acre to the nearest 0.1 acre for mulching. Payment is full compensation for preparing the area and furnishing and applying mulch.

2601.05, A, 10, b.

Replace the Article:

Payment is full compensation for slope protection preparation and materials ~~in addition to the amount paid for seed and fertilizer~~. This includes seedbed preparation, seed and fertilizer, slope protection, stapling, and installation of materials.

2601.05, A, 11.

Replace the Article:

Square feet of ~~Outlet or Channel Scour Protection (Transition Mat)~~ with material as specified:

- Contract unit price per square feet.
- Payment is full compensation for ~~Outlet or Channel Scour Protection (Transition Mat)~~, TRM, preparation and materials including shaping outlets/channels, ditches, soil fill (if required), seed, fertilizer and anchors.

2601.05, A, 12.

Replace the second sentence and delete the third sentence:

For the quantity of water applied to sod, (Article ~~2601.03, G, 3, e~~ 2601.03, I, 2), and to special ditch control, TRM, slope protection, and TM, (Article 2601.03, H, 8), payment will be the predetermined contract unit price per 1000 gallons. ~~When an item for watering is not included, the cost of watering is included in the amount paid for the item to be watered.~~

2601.05, A, 14.

Replace the Article:

Mowing as described in Article 2601.03, † J: contract unit price per acre to the nearest 0.1 acres.

Section 2602

2602.01, D, 2.

Replace the first bullet:

Attend required storm water inspections with the Contracting Authority. However, when the Contractor is not mobilized onsite, the Contractor may delegate this responsibility to a subcontractor.

2602.03, A.

Replace the Article:

For projects regulated by a NPDES storm water permit, ~~P~~prior to the preconstruction conference furnish the Engineer an initial ECIP for accomplishment of temporary and permanent erosion and sediment control.

In the ECIP, include stages for erosion and sediment control work to address Contractor's timetable and sequence for major activities or stages on the contract. ~~including~~ ECIP stages shall consider as a minimum: Initial controls required prior to land disturbing activities,

- Intended timetable and sequence of major land disturbing activities,
- ~~Number of earthwork balances for the contract~~, Construction staging to limit disturbed areas,
- Sensitive areas requiring special consideration,
- Anticipated suspension of work and stabilization of disturbed areas,
- Compliance with Pollution Prevention Plan (PPP), and

- Method of erosion control on haul roads, and borrow pits, and
- ~~Removal of excess materials from project.~~

2602.03, E.**Replace** the Article:

1. ~~Stabilize disturbed areas, in which construction activity will not occur for a period of 21 calendar days, no later than the 14th calendar day after no construction activity has occurred.~~ For projects regulated by an NPDES storm water permit, initiate stabilization of disturbed areas immediately after clearing, grading, excavating, or other earth disturbing activities have:
 - Permanently ceased on any portion of site, or
 - Temporarily ceased on any portion of site and will not resume for a period exceeding 14 calendar days.
2. Stabilization measures include temporary seeding, permanent seeding, mulching, sod, or other methods the Engineer approves.

2602.03, L, 1.**Replace** the Article:

Mobilizations, Erosion Control, applies to projects not identified as erosion control or landscaping and ~~containing at least one of the following items:~~ contain a Storm Water Pollution Prevention Plan (SWPPP).

- ~~Stabilizing crop seeding and fertilizing: 1 acre (0.4 ha) or more,~~
- ~~Stabilizing crop seeding and fertilizing (urban): 1 acre (0.4 ha) or more,~~
- ~~Silt fence: 250 feet (75 m) or more, or~~
- ~~Silt fence for ditch checks: 250 feet (75 m) or more.~~

2602.03, L, 7.**Replace** the Article:

Mobilize within 72 hours of a written order with sufficient labor, equipment, and materials to perform erosion and sediment control work included in ECIP or PPP, or as ordered or approved by Engineer. Complete work within 7 calendar days of a written order. ~~Failure to mobilize when erosion control work is needed to comply with the ECIP or PPP, will result in the Engineer, by written order, direct mobilization within 72 hours of a written order.~~

2602.03, L, 8.**Replace** the Article:

Failure to mobilize and complete work within such time period, will result in a deduction of \$750.00 per calendar day from payment due under the contract, except when Engineer extends such time period.

2602.03, M, Mobilizations, Emergency Erosion Control.**Add** as the first sentence:

Mobilizations, Emergency Erosion Control, applies to projects not identified as erosion control or landscaping and containing a Storm Water Pollution Prevention Plan (SWPPP).

2602.04, K, Mobilizations, Erosion Control.**Add** to the end of the Article:

For multi-project contracts, count will be on a per project basis, except for projects where limits are overlapping or contiguous.

Division 41. Construction Materials.

Section 4100

4100.06, A.

Delete the last sentence:

~~Test Method 804 may be used when a coating is specified by uniformity.~~

Section 4108

4108.01, Fly Ash.

Replace the Article and title:

FLY ASH AND NATURAL POZZOLANS.

- A. Comply with AASHTO M 295, either Class N, Class F, or Class C; except the value of available total equivalent alkalis is are not to exceed 4.50% 3.80% as determined by Materials I.M. 491.17. ~~Sources with fly ash between 1.5% and 2.5% available alkalis may be approved based on satisfactory results of the mortar bar expansion test specified in Materials I.M. 491.17. For Class C fly ash, the pozzolanic activity test with lime will not be required.~~
- B. When Class F is required, a Class C fly ash with minimum total oxides ($\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$) of 66% and minimum SiO_2 of 38% may be used.
- C. Approval of the source of fly ash will be required. This shall be based on fly ash produced when the power plant is using specific materials, equipment, and processes. Any change in materials, equipment, and processes voids the source approval, and a new approval of the source will be required. Initial approval of Class N pozzolans will be based on meeting the additional requirements of Materials I.M. 491.17.
- E. Inspection and acceptance of fly ash and natural pozzolans will be according to Materials I.M. 491.17.
- E. Fly ash for soil stabilization shall meet ASTM C 618, Class C, except loss of ignition (LOI) requirement will not apply. Fly ash shall also contain a minimum of 22% calcium oxide (CaO).

Section 4115

4115.01, Description.

Add to the end of the first paragraph:

Unless stated otherwise on the source approval, coarse aggregate for Portland Cement Concrete shall be washed with sufficient agitation to cause material coatings to be separated and removed.

Section 4118

4118, Pipe Bedding Material.

Replace the title:

Pipe Bedding Material for Non-Primary Road Projects.

Section 4119

4119, Pipe Backfill Material Under Interstate and Primary Roadways.

Retitle the Section:

Pipe Bedding and Backfill Material Under for Interstate and Primary Roadways Projects.

Section 4126

4126, Aggregate for Polymer-Modified Microsurfacing.

Add the Section:

4126.01 DESCRIPTION.

Crushed stone. For non-Interstate mixes steel slag may also be used.

4126.02 GRADATION.

For quartzite, granite, and slag meet requirements for Gradation No. 37 of the Aggregate Gradation Table, Article 4109.02. For limestone and dolomite meet requirements for Gradation No. 38 of the Aggregate Gradation Table, Article 4109.02

4126.03 QUALITY.

Meet requirements of Table 4126.03-1 and 4126.03-2 with the exception that use of Friction Type 2 crushed stone requires a maximum abrasion loss of 30% and sand equivalence of not less than 60. Testing is based on aggregate crushed to 3/4 inch nominal size.

Table 4126.03-1: Aggregate Quality

Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion	40	AASHTO T 96
A Freeze	10	Office of Materials Test Method No. Iowa 211, Method A
Alumina ^(a)	0.7	Office of Materials Test Method No. Iowa 222
Sand Equivalence	45 (Minimum)	AASHTO T 176
Organic Materials	0.01	Office of Materials Test Method No. Iowa 215
(a) If the Alumina value fails, determine the A Freeze value for specification compliance. Office of Materials Test Method No. Iowa 222 does not apply to gravel or quartzite.		

Table 4126.03-02: Maximum Permissible Amounts of Objectionable Material

Objectionable Materials	Maximum Percent Allowed	Test Method
Unsound chert particles retained on No. 4 sieve	0.5	Materials I.M. 372
Total of all unsound chert, shale, coal, and iron combined	1.0	Materials I.M. 372
Clay Lumps/Friable Particles	0.5	Materials I.M. 368
Organic Materials, except coal	0.1	Iowa DOT Materials Laboratory Test Method No. 215

Section 4127

4127.01, Description.

Replace the Article:

A. Crushed stone, gravel, slag, sand, and filler from an approved source. Crushed gravel may be used to satisfy crushed particle and friction requirements for HMA mixtures. Produce crushed gravel as a separate operation by crushing the portion of a gravel aggregate retained on a screen at least 1/4 inch larger than the sieve size that 100% of the gravel will pass after crushing.

B. If a gravel aggregate has 100% passing the 3/8 inch sieve, the Engineer may replace the requirements of Table 4127.02-1 with the requirements of Article 4127.03.

4127.02, Coarse Aggregate.

Replace Table 4127.02-1:

Table 4127.02-1: Coarse Aggregate Quality (Flexible Paving Mixtures)

Coarse Aggregate Quality	Type A Maximum %	Type B Maximum %		Test Method
		Primary	Other	
Abrasion	45	45	45	AASHTO T 96
Absorption ^(a)	6.0	6.0	6.0	Iowa DOT Materials Laboratory Test Method No. 201
Alumina ^(b)	0.7 1.0	1.5	2.5	Iowa DOT Materials Laboratory Test Method No. 222
A Freeze	10 15	25	45	Iowa DOT Materials Laboratory Test Method No. 211, Method A
C Freeze	N/A	10	10	Iowa DOT Materials Laboratory Test Method No. 211, Method C
Clay Lumps/Friable Particles	0.5 2.0	N/A	N/A	Materials I.M. 368
Organic Material	0.01	0.01	0.01	Iowa DOT Materials Laboratory Test Method No. 215
<p>(a) When a coarse aggregate for use in asphalt fails absorption using Iowa DOT Materials Laboratory Test Method No. 201; absorption determined by Materials I.M. 380 (Vacuum-saturated specific gravity & absorption) will be used.</p> <p>(b) If the Alumina value fails, determine the A Freeze value for specification compliance. Iowa DOT Materials Laboratory Test Method No. 222 does not apply to gravel.</p>				

4127.03, A.

Replace the second sentence:

A gradation for wearing course mixture of no more than 50% retained between two consecutive standard sieves below the No. 4 sieve or gravel aggregate with 100% passing the 3/8 inch sieve meeting these requirements.

Section 4128**4128, Stabilization (Foundation) Material**

Add the Section:

4128.01 DESCRIPTION.

Aggregate of the following types:

- Crushed stone, or
- Crushed PCC, if approved by the Engineer.

4128.02 GRADATION.

Meet the requirements of Gradation No. 13 of the Aggregate Gradation Table, Article 4109.02.

4128.03 QUALITY.

The requirements of Table 4128.03-1 apply to individual virgin aggregates when crushed to a 3/4 inch or 1 inch nominal size for testing:

Table 4128.03-1: Stabilization Material Quality

Macadam Quality	Maximum Percent Allowed	Test Method
Abrasion	50	AASHTO T 96
C Freeze	20	Office of Materials Test Method No. Iowa 211, Method C

Section 4134**4134.02, Gradation.**

Replace the Article:

~~A. For natural sand and gravel use Gradation No. 35 of the Aggregate Gradation Table, Article 4109.02.~~

~~B. For natural sand use Gradation No. 1 or Gradation No. 36 of the Aggregate Gradation Table, Article 4109.02.~~

Meet requirements for Gradation No. 1, Gradation No. 35, or Gradation No. 36 of the Aggregate Gradation Table, Article 4109.02.

Section 4136**4136.03, Expansion Joint Fillers and Seals.**

Add the Article:

E. Preformed, Pre-Compressed, Self-Expanding, Sealant System with Silicone Pre-Coated Surface.

1. Furnish an expansion joint system comprised of the following three components:
 - a. Cellular polyurethane foam impregnated with a hydrophobic polymer and factory coated with highway-grade, low modulus, fuel resistant silicone.
 - b. Field-applied epoxy adhesive.
 - c. Field-applied silicone sealant edging.
2. Use an impregnation agent having proven non-migratory characteristics. The highway grade, low modulus, fuel resistant silicone facing shall be factory applied to the impregnated foam when the foam is at a width greater than the maximum working joint opening and once cured and compressed will form a bellows. The self-expanding foam sealant system shall have a depth as recommended by the manufacturer.
3. Furnish material capable of movements of +/-50% (100% total) of nominal material size.
4. Approved sources of sealant systems are listed in Materials I.M. 436.07, Appendix A.

Section 4137**4137, Asphalt Binder.**

Replace the Section:

- A. Meet the requirements for the type and grade specified in the contract documents and comply with the Combined States Binder Group.
- B. Determine performance grade according to AASHTO R29.
- C. ~~Do not add acids to modify asphalt binders.~~ Polyphosphoric Acid may be used as a co-modifier up to 0.4% by weight of binder. The Engineer may verify with laboratory testing.
- D. ~~For asphalt binder grades with a temperature spread of 92° or greater¹, meet the requirements of the Combined State Binder Group as follows:~~ Except for Standard Traffic grades, meet CSBG requirements for Minimum Percent Recovery when tested per AASHTO T 350 at the high temperature identified by the PG grade.

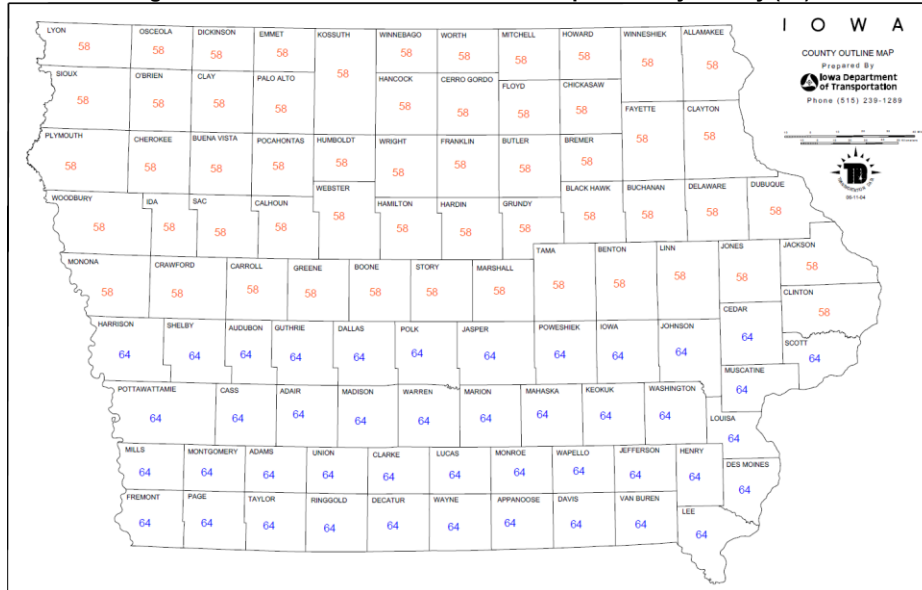
Table 4137.01-1: PG+ Requirements

AASHTO R 29 Grade	AASHTO T 350 Minimum Percent Recovery (R _{3.2})		DSR Phase Angle; degrees (original binder)
	Test Temperature ²		
	58°C	64°C	
58-34P	30	25	77
64-28P	30	25	77
64-34P	55	45	75
70-22P	55	45	77

70-28P	55	45	75
70-34P	75	75	73
76-28P	75	75	73
76-34P	75	75	73
82-22P	75	75	73

1— Temperature spread is determined by subtracting low temperature from high temperature; for example PG 64-28: 64 - (-28) = 92.
 2— See Figure 4137.01-01 for test temperatures.

Figure 4137.01-01: AASHTO T 350 Test Temperature by County (°C)



(Delete figure)

E. Waive stress sensitivity limits (J_{nr} Diff) for AASHTO M 332 when J_{nr} at 3.2 kPa is below 0.5 kPa⁻¹.

Section 4143

4143.01, B, 4.

Delete the Article:

~~4. Cover outlet with a rodent guard meeting the requirements of Materials I.M. 443.01. Attach as shown in the contract documents. Engineer will inspect and accept according to Materials I.M. 443.01.~~

Section 4149

4149.02, A, Sanitary Sewer (Gravity Mains).

Add the Articles:

9. **Double Walled Polypropylene Pipe 12 inch to 30 inch.**
 - a. Comply with ASTM F 2736
 - b. Minimum pipe stiffness per ASTM D 2412, 46 psi.
 - c. Integral bell and spigot joint complying with ASTM D 3212 and ASTM F 477.
10. **Triple Walled Polypropylene Pipe 30 inch to 36 inch.**
 - a. Comply with ASTM F 2764
 - b. Minimum pipe stiffness per ASTM D 2412, 46 psi.
 - c. Integral bell and spigot joint complying with ASTM D 3212 and ASTM F 477.

4149.02, B, 3, Sewage Air Release Valve.

Replace Articles a and b:

- a. **General.**

Consists of an elongated tapered or conical body ~~with outward-slanting walls~~ and a float to operate (open and close) under pressure without spillage. Provide valves suitable for pressures up to 150 psi. Use a float with a flexible linkage connection to the seal plug assembly to prevent irregular air release and protect the connecting rod. Ensure the bottom of the valve body is sloped or funnel-shaped to encourage the accumulated sewage and solids to drain from the valve. Preserve a volume of air at all times between the liquid sewage and the seal plug assembly. Provide a flushing port with attachments for backwashing.

b. Materials.

- 1) ~~Body and Cover: Stainless steel, fiberglass-reinforced nylon, or other corrosion-resistant materials.~~
 - a) Stainless steel: ASTM A 351.
 - b) Cast Iron: ASTM A 126, Grade B.
 - c) Ductile Iron: ASTM A 536, Grade 65-45-12.
 - d) Other corrosion resistant materials.
- 2) Internal Metal Components: Stainless steel.
- 3) Float: Stainless Steel, ASTM A 240/A 240M, Type 304 or Type 316, or foamed polypropylene.
- 4) Seal Plug Assembly: Stainless steel, foamed polypropylene, EPDM rubber, Nitrile (Buna-N) rubber, and reinforced nylon.

4149.03, Storm Sewer Pipe.

Replace Articles A and B:

A. Reinforced Concrete Pipe.

1. Comply with Section 2419 and ASTM C 76.
2. Minimum Class 2000D (Class III, Wall B).
3. Tongue and groove joints ~~with cold applied bituminous or rubber rope jointing materials, unless otherwise specified~~ wrapped with engineering fabric. ~~If specified, use rubber O-ring or profile gasket complying with ASTM C 443 (AASHTO M 315).~~
4. If specified, ~~wrap exterior of each joint with engineering fabric~~ use rubber O-ring or profile gasket complying with ASTM C 443.

B. Low Clearance Reinforced Concrete Pipe.

1. Comply with Section 2419 and ~~ASTM C 506~~ either AASHTO M 206 (RCAP) or M 207 (RCEP).
2. Minimum Class 2000D (A-III or HE-III).
3. ~~Use~~ Tongue and groove joints ~~with cold applied bituminous or rubber rope gasket jointing materials, unless specified otherwise~~ wrapped with engineering fabric.
4. If specified, ~~wrap exterior of each joint with engineering fabric~~ use rubber O-ring or profile gasket complying with ASTM C 443.

4149.03, E, Jointing Material for Concrete Apron.

Delete the Article:

~~**E. Jointing Material for Concrete Apron.**~~

~~1. Bituminous Jointing Material.~~

~~Use a cold-applied mastic sewer joint sealing compound recommended by the manufacturer for the intended use and approved by the Engineer. Comply with ASTM C 990.~~

~~2. Rubber Rope Gasket Jointing Material.~~

~~Comply with ASTM C 990.~~

~~3. Rubber O-Ring or Profile Gasket.~~

~~Comply with ASTM C 443 (for RCP) or ASTM C 361 (for RCPP).~~

4149.04, H, 1.**Replace the Article:**

Use one of the following methods for grade adjustments of manhole or intake frame and cover assemblies:

a. Reinforced Concrete Adjustment Rings.

Comply with ASTM C 478. Provide rings free from cracks, voids, and other defects.

b. High Density Polyethylene Adjustment Rings.

Comply with ASTM D 1248 for recycled plastic.

1) Test and certify material properties by the methods in Table 4149.04-1:

Table 4149.04-1: Test Methods

Property	Test Method	Acceptable Value
Melt Flow Index	ASTM D 1238	0.3 to 30 g/10 min.
Density	ASTM D 792	0.94 to 0.98 g/cm ³
Tensile Strength	ASTM D 638	2000 to 5000 psi

2) Do not use polyethylene grade adjustment rings when they are exposed to HMA pavement or heat shrink infiltration barriers.

3) When used in a single configuration, provide tapered adjustment ring with thickness that varies from 1/2 inch to 3 inches.

4) Install adjustment rings on clean, flat surfaces according to the manufacturer's recommendations with the proper butyl rubber sealant/adhesive.

c. Expanded Polypropylene Adjustment Rings.

Comply with ASTM D 4819 for expanded polypropylene when tested according to ASTM D 2375.

1) Use adhesive meeting ASTM C 920, Type S, Grade N5, Class 25.

2) Provide finish rings with grooves on the lower surface and flat upper surface.

3) Do not use when heat shrinkable infiltration barrier is used.

4149.04, J, 1, Infiltration Barrier.**Add the Article:****d. Heat Shrink Sleeve.**

Heat-shrinkable wrap around sleeve designed for protection of buried and exposed sanitary sewer manholes. Do not use with polypropylene or polyethylene adjustment rings.

1) Primer.

Compatible with concrete, ductile and cast iron, and sleeve material.

2) Sleeve and Backing.**Table 4149.04-2: Heat Shrink Sleeve**

Property	Test Method	Acceptable Value
Water Absorption	ASTM D 570	0.05% maximum
Low Temperature Flexibility	ASTM D 2671	-40°F
Tensile Strength	ASTM D 638	2900 psi minimum
Elongation	ASTM D 638	600% minimum
Hardness	ASTM D 2240	Shore D: 46
Shrink Factor		40% minimum
Thickness		0.1 inch minimum

3) Adhesive.

Softening point of 212°F maximum meeting ASTM E 28.

4149.04, K, Invert.**Replace the title and Article:****Invert Fillet.**

1. Cast-in-place Structure.

Provide cast-in-place ~~invert fillet~~ with concrete meeting the requirements of ~~Section 2403~~ Article 4149.04, B.

2. Precast Base Section.

- a. For sanitary sewers, provide a precast ~~invert fillet~~, unless allowed otherwise by the Engineer. Apply Article ~~2435.03, A~~ 4149.04, A.
- b. For storm sewers, provide a cast-in-place ~~invert fillet~~ with concrete meeting the requirements of Article 4149.04, A B.

Section 4151**4151.03, Reinforcement for Structures.**

Replace Articles C, D, E, F, G, and H:

C. Epoxy Coated Reinforcement.

1. Ensure reinforcement (deformed and plain) required to be epoxy-coated has a protective coating of epoxy applied by electrostatic spray method according to the requirements of ASTM A 775.
2. Acceptance and handling of epoxy-coated reinforcing steel reinforcement bars at the project site are to be according to the requirements of these specifications and the requirements of Materials I.M. 451.03B.

~~D. Stainless Steel Reinforcement.~~

- ~~1. Unless otherwise specified in the contract documents, stainless steel reinforcement bars shall be deformed and meet requirements of ASTM A 955 and be the grade, UNS designations, and types listed in Materials I.M. 452.~~
- ~~2. Bar sizes will be specified in the contract documents.~~
- ~~3. Bars shall be heat treated using one of the three methods listed in ASTM A 955.~~
- ~~4. If welding and/or tack welding is employed in the placement of stainless steel reinforcement, the following requirements shall be met prior to welding:

 - ~~a. Welding shall not be performed without prior approval of Engineer.~~
 - ~~b. Welding procedure suitable for the chemical composition and intended use shall be submitted for approval prior to welding.~~
 - ~~c. Welding shall be performed by a state certified welder.~~
 - ~~d. Welding and/or tack welding shall be performed in accordance with the requirements of the contract documents, and latest edition of the American Welding Society, AWS D1.6, including requirements for minimum preheat and interpass temperature.~~~~

~~E. Surface Preparation.~~

- ~~1 3.~~ Thoroughly blast (near-white) clean reinforcing steel surfaces to be coated. Remove mill scale, rust, and foreign matter. Ensure the blast media produces a suitable anchor pattern profile (a depth of 2.0 to 4.0 mils). Apply the coating within 0.5 hour after cleaning.
- ~~2 4.~~ Ensure blast media meets the requirements of ASTM A 775. A maximum of 10% steel shot may be added to blast media.

~~F. Repair to Damage Incurred During Fabrication.~~

- ~~5.~~ Ensure coating damage due to fabrication or handling at the fabricator facility is repaired using patching material meeting the requirements of Section 3.1 of ASTM D 3963. The fabricator is responsible for the repair.

~~G. Repair of Damage Incurred during Shipment and Handling at the Job Site.~~

~~Comply with the following:~~

- 4 6. Repair visible damage incurred during shipment, storage, and /or placement of epoxy-coated bars at the job site.
- 2 7. Use coating patch materials of organic composition consisting of a two-component liquid properly mixed that hardens to a solid form upon curing. Approved repair/patch compounds are listed in Materials I.M. 451.03B.
- 3 8. Repair damage to the coating caused by shipment, storage, and/or placement at the job site.
- 4 9. Ensure sheared ends/saw-cut ends of the coated bars have adequate coating, have no signs of surface rust or damage, and are repaired and/or coated with the same patching material that is used for repairing damaged coating.
- 5 10. The maximum amount of repaired, damaged areas is not to exceed 2% of the total surface area in each 1.0 linear foot of the bar. Should the amount of damage exceed the 2% in 1.0 linear foot, then remove that bar and replace with an acceptable bar. Coating the cut ends will not be included in the repair percentage.
- 6 11. Apply a minimum coating thickness of 7 mils to areas to be repaired.
- 7 12. Allow patches to cure (dry to the touch) before placing concrete over the coated bars.
- 8 13. Prepare the surface, repair it, and apply patches according to the resin manufacturer's recommendations.

H D. Storage, Handling, and Placement at the Job Site.

1. Comply with the following:
 - a. Store coated bars or bundles above ground on wooden or padded supports with padded timbers placed between bundles when stacking is necessary. Place supports to prevent sags in the bundles.
 - b. Ensure systems for handling (loading, unloading, storing) the coated bars at the job site have padded contact areas. Do not drop or drag coated bars or bundles.
 - c. Store coated and uncoated steel reinforcing bars separately.
 - d. Minimize handling and re-handling of the coated bars.
 - e. Tie coated bars using tie wire coated with epoxy, plastic, Nylon, or other non-conductive Materials that will not damage or cut the coating.
 - f. Use a non-conductive Material compatible with concrete to coat or fabricate bar supports or spacers.
2. Use a non-transparent material to cover coated bars if they will be exposed for 2 months or more. Ensure adequate ventilation is provided to minimize condensation under the cover.

E. Stainless Steel Reinforcement.

1. Stainless steel reinforcement bars shall be deformed and meet requirements of ASTM A 955 and be one of the following grade, UNS designations, and (types): listed in Materials I.M. 452:
 - S24100 (XM-28)
 - S31653 (316LN)
 - S31803
 - S32304 (2304)

UNS designations (types) listed in this specification meet the requirements of ASTM A 955. Bars shall be heat treated using one of the three methods listed in ASTM A 955.

2. Supply bars free of dirt, mill scale, oil and debris. Stainless steel reinforcing bars shall be pickled to a bright or uniform light finish. Bars supplied displaying rust/oxidation, questionable blemishes, or lack of bright uniform pickled surface may be rejected.

3. Employ lifting, handling, securing and transport equipment and processes that will prohibit contamination of stainless steel reinforcing from fragments of carbon steel or other material residues/fragments. Minimize handling and re-handling of stainless steel reinforcing bars. Do not drop or drag stainless steel reinforcing bars or bundles.
4. Store stainless steel reinforcing bars or bundles above ground on wooden supports with timbers placed between bundles when stacking is necessary. Place supports to prevent sags in the bundles. Store stainless steel reinforcing separately from coated or uncoated reinforcing bars.
5. Fabricate and bend stainless steel bars using tools and equipment that have been thoroughly cleaned or otherwise modified to prohibit contamination from fragments of carbon steel or other material residues/fragments.
6. Protect stainless steel from contamination during construction operations including cutting, grinding, or welding above or in the vicinity of the stainless steel.
7. Stainless steel reinforcing bars shall not be permitted to come in direct contact with uncoated reinforcing bars, bare metal form hardware, or other bare or galvanized metals unless specifically approved herein or otherwise approved in writing by the Engineer. When practicable, stainless steel reinforcing shall maintain a minimum 1 inch clearance from bare or galvanized metals. When 1 inch clearance is not practicable, stainless steel reinforcing shall be isolated from contact with bare or galvanized metals by a wrap of electrical tape or other approved means. Protective wrap shall encompass the full perimeter of the bar and extend at least 1 inch in each direction past the point of closest contact between the stainless bar and dissimilar metal. Stainless steel reinforcing bars may be in direct contact with undamaged epoxy coated reinforcing bars. Stainless steel reinforcing bars may be in direct contact with shear studs on steel girders.
8. **Bar Chairs.**
 - a. Bar chairs for support of stainless steel reinforcing shall comply with one of the following:
 - 1) Bar chairs fabricated from solid plastic, meeting requirements of Materials I.M. 451.01.
 - 2) Bar chairs fabricated from stainless steel. Stainless steel materials for bar chairs shall be compatible with the type of stainless steel materials used for reinforcing bars.
 - 3) Epoxy coated bar chairs meeting requirements of Materials I.M. 451.01, except where prohibited by the contract documents. Care shall be taken during installation of epoxy coated bar chairs to prevent damage to epoxy coating. Bar chairs exhibiting cracked or otherwise damaged epoxy coating shall be replaced.
 - b. Non-coated carbon steel bar chairs shall not be permitted to support or come into direct contact with stainless steel reinforcing.
9. **Tie Wire.**
 - a. Tie wire for stainless steel reinforcing shall comply with one of the following:
 - 1) Tie wire coated with epoxy, plastic, nylon, or other non-conductive materials. Care shall be taken during installation of coated wire ties to prevent damage to protective coating. Wire ties exhibiting cracked or otherwise damaged protective coating shall be discarded and replaced with undamaged ties.
 - 2) Stainless steel tie wire. Stainless steel materials for tie wire shall be compatible with the type of stainless steel materials used for reinforcing bars.
 - b. Coated wire ties or stainless steel wire ties as noted herein shall be required for bar tie locations in which a stainless steel reinforcing bar is present (includes stainless-to-stainless bar tie locations and stainless-to-epoxy coated bar tie locations.)
10. Prior to placing concrete, ensure reinforcing bars are clean and exhibit a bright finish free of contaminants, oxidation, or rust. Oxidation or rust on bar surface will not be permitted and shall be immediately brought to the attention of the Engineer.
11. At the discretion of the Engineer, isolated areas exhibiting minor oxidation or rust attributable to trace contaminants on bar surface shall be thoroughly cleaned and treated with pickling paste marketed for such application. Bars exhibiting evidence of oxidation/rust not attributable to trace contaminants on bar surface, or oxidation/rust otherwise suspected to have a negative impact on the intended performance and/or service life of the bar, may be rejected.

12. If welding and/or tack welding is employed in the placement of stainless steel reinforcement, the following requirements shall be met prior to welding:
 - a. Welding shall not be performed without prior approval of the Engineer.
 - b. Welding procedure suitable for the chemical composition and intended use shall be submitted to the Engineer for approval prior to welding.
 - c. Perform welding using a state certified welder.
 - d. Perform welding and/or tack welding in accordance with the requirements of the contract documents, and latest edition of AWS D1.6, including requirements for minimum preheat and interpass temperature.

4151.07, A, Reinforcement Couplers.

Replace Articles A, B, C, and D:

A. Strength Requirements.

1. ~~Withstand 80,000 cycles of fatigue tensile loading from 5000 psi to 30,000 psi at a maximum frequency of 5 cycles per second.~~ Ultimate Tensile Strength of splice shall be minimum 90% of ultimate tensile strength of reinforcement bars.
2. Develop in tension at least 125% of the specified yield strength of the bars being spliced ~~both before and after fatigue loading.~~
3. Maximum slip of coupler after being loaded to 30,000 psi tension and unloaded to 3000 psi tension:
 - For bar size up to No. 14 (45) - 0.01 inches
 - For No. 18 (60) Bars - 0.03 inches

~~B. Couplers shall be made of steel conforming to one of the following:~~

- ~~• ASTM A 108, Level one or Level two,~~
- ~~• ASTM A 519 Grade 1025, or~~
- ~~• ASTM A 576.~~

~~C B.~~ Epoxy coated couplers shall be coated according to ASTM A 934. Other couplers shall have similar steel properties and same coating properties as reinforcement being spliced.

~~D C.~~ Install couplers following manufacturer’s requirements.

Section 4152

4152.02, Structural Steel.

Renumber and Replace Article C and Add the Article:

C. For members designated in the contract documents as Fracture Critical, apply Charpy V-notch toughness requirements of Table 4152.02-2. Ensure members are sampled and tested according to AASHTO T 243 (ASTM A 673).

C D. The contract documents may also designate other members to which toughness requirements apply.

Table 4152.02-1: Non-Fracture Critical Impact Test Requirements

Grade	Thickness (in.)	Minimum Average Energy, ft.lbf. at °F
36T ^(a)	to 4, mechanically fastened or welded incl.	15 at 40
50T ^(a, b) , 50WT ^(a, b)	to 2, mechanically fastened or welded incl. over 2 to 4, mechanically fastened over 2 to 4, welded incl.	15 at 40 15 at 40 20 at 40
HPS 50WT ^(a, b)	to 4, incl.	20 at 10
400F HPS 70WT ^{(c), (d)}	to 4, incl.	25 at -10
HPS 100WT ^(c)	to 2 1/2, mechanically fastened or welded incl. over 2 1/2 to 4, mechanically fastened over 2 1/2 to 4, welded incl.	25 at 0 -30 25 at 0 35 at 0 -30
(a) CVN-impact testing of shall be at "H" heat frequency testing according to in accordance with ASTM A 673.		
(b) If the yield point of the material structural product exceeds 65 ksi, reduce the testing		

<p>temperature for the minimum average energy required shall be reduced by 15°F for each increment or fraction of 10 ksi above 65 ksi. The yield point is the value given on the certified "Mill Test Report".</p> <p>(c) CVN-impact testing of shall be at "P" plate frequency testing according to in accordance with ASTM A 673.</p> <p>(d) If the yield strength of the structural product exceeds 85 ksi, the testing temperature for the minimum average energy required shall be reduced by 15°F for each increment or fraction of 10 ksi above 85 ksi. The yield strength is the value given in on the certified "Mill Test Report".</p>
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Table 4152.02-2: Fracture Critical Impact Test Requirements

Grade	Thickness (in.)	Minimum Test Value Energy, ft.lbf.	Minimum Average Energy, ft.lbf. at °F
36F ^(a)	to 4, incl.	20	25 at 40
50F ^(a, b) , 50WF ^(a, b)	to 2, incl. over 2 to 4, incl.	20 24	25 at 40 30 at 40
HPS 50WF ^(a, b)	to 4, incl.	24	30 at 10
HPS 70WF ^(a, c)	to 4, incl.	28	35 at -10
HPS 100WF ^(a)	to 2 1/2, incl. over 2 1/2 to 4, incl.	28 Not Applicable	35 at -30 Not Permitted
<p>(a) CVN-impact testing shall be at "P" frequency in accordance with ASTM A 673 except for plates, for which the sampling shall be as follows:</p> <p>(1) As-rolled (including control-rolled and TMCP) plates shall be sampled at each end of each plate-as-rolled.</p> <p>(2) Normalized plates shall be sampled at one end of each plate, as heat treated.</p> <p>(3) Quenched and tempered plates shall be sampled at each end of each plate, as heat treated.</p> <p>(b) If the yield point of the structural product exceeds 65 ksi, the testing temperature for the minimum average energy and minimum test value energy required shall be reduced by 15°F for each increment or fraction of 10 ksi above 65 ksi. The yield point is the value given on the certified "Mill Test Report".</p> <p>(c) If the yield strength of the structural product exceeds 85 ksi, the testing temperature for the minimum average energy and minimum test value energy required shall be reduced by 15°F for each increment or fraction of 10 ksi above 85 ksi. The yield strength is the value given on the certified "Mill Test Report".</p>			

Section 4153

4153.06, B, 1.

Replace the Article:

1. Ensure the following:
 - a. High strength bolts, nuts, and washers meet the requirements of the appropriate ASTM Specifications as follows, fasteners are defined and listed by ASTM numbers as:
 - Bolts A 325 F 3125: type 1 black, type 1 galvanized or type 3 weathering.
A 449: type 1 black, type 1 galvanized or type 3 weathering.
A 490 are not allowed.
 - Nuts A 563: Grade DH3 black, grade DH galvanized or grade DH3 weathering.
A 194: Grade 2H black or grade 2H galvanized.
 - Washers F 436: Type 1 black, type 1 galvanized or type 3 weathering.
 - b. For galvanized high strength fasteners, the fasteners meet the requirements of ASTM B 695, Class 55 Type I or ASTM F 2329 with a zinc bath temperature not exceeding 850°F.
 - c. For weathering steel, bolts are ASTM A 325 F 3125 Type III, nuts are ASTM A 563 Grade DH3, and washers are ASTM F 436 Type III.
 - d. For quenched and tempered steel bolts and studs with diameters greater than 1 1/2 inch, but with similar mechanical properties as ASTM A 325 F 3125, refer to ASTM A 449.

4153.06, B, 4, a, 3.

Replace the Article:

Article 7.2 of ASTM A 325 Article 7.3 of ASTM F 3125 is changed to read as follows:
 "Threads shall be the Unified Coarse Thread Series as specified in ANSI/ASME B1.1 and shall have Class 2A tolerances."

4153.06, B, 4, c, Specifications for Bolts.**Replace** Articles 1 and 2:

- 1) ASTM A-325 F 3125, High Strength Bolts for Structural Steel Joints.
- 2) Proof load tests (ASTM F 606, Method 1), are required. Galvanizing if required, completed prior to proof load testing. The minimum frequency of tests according to ASTM A-325 Paragraph 9.5.1 F 3125 Paragraph 9.6.1.

Section 4154**4154, Fence Materials.****Replace** the Section:**4154.01 DESCRIPTION.**

- A. Materials covered by this section include woven wire farm field and deer fence fabric, chain link fabric, barbed wire, steel fence posts, wood fence posts, tie and brace wire, gates, and special fittings.
- B. Use material of the size and type designated in the contract documents. ~~Use new material meeting the requirements of the following provisions.~~
- C. Inspection and acceptance of fence materials will be according to Materials I.M. 454.10.
- D. ~~Ensure similar parts with different shapes or protective coatings are not intermingled within the project limits.~~

4154.02 FIELD FENCE AND DEER FENCE FABRIC.

- A. Field fence shall conform to AASHTO M 279 ~~and~~ or ASTM A 116 and shall be, unless otherwise specified:
 1. Type Z, Class 3.
 2. Design numbers 1047-6-11 or 939-6-11 for grade 60 wire or design numbers 1047-6-12 1/2 or 939-6-12 1/2 for grade 125 wire.
 3. Use galvanized (as determined by visual inspection) steel rod for splicing fence material.
- B. Deer fence shall be woven wire that meets the following requirements:
 1. 12.5 gauge wire according to ASTM A 116 (excluding wire spacing and fence height).
 2. Wires are spaced horizontally and vertically as shown in the contract documents ~~or closer.~~

4154.03 CHAIN LINK FABRIC.

- A. When chain link fence is specified in the contract documents, chain link fabric shall conform to one of the following:
 1. Zinc coated fabric meeting requirements of ASTM A 392, Class 2 (2.0 ounces per square foot) or AASHTO M 181 Type I, Class D.
 2. Aluminum coated fabric meeting the requirements of ASTM A 491 or AASHTO M 181, Type II.
 3. PVC coated fabric meeting requirements of ASTM F 668, Class 2b or AASHTO M 181, Type IV, Class B Fused.
- B. Unless otherwise specified in contract documents, use:
 1. 9 gauge coated wire with a breaking strength of 1290 pounds.
 2. Height of fabric of 72 inches.

3. Selvage knuckled at both the top and bottom.
4. Mesh size $2 \pm 1/8$ inches.

4154.04 BARBED WIRE.

Unless otherwise specified in contract documents, use barbed wire conforming to ASTM A 121 or AASHTO M 280, Design Number 12-4-5-14R, Type Z Class 3.

4154.05 BRACE WIRE, TENSION WIRE, AND TIE WIRE.

- A. Tension wire shall meet requirements of AASHTO M 181 or one of the following:
1. ASTM A 824 or A 817, Type II, Class 3.
 2. ~~ASTM A 121, Type Z, Class 3 zinc coated or aluminum coated.~~
 3. 2. ASTM A 824 or A 817, Type I.
 4. 3. ASTM F 1664, PVC (Vinyl) Coated, Class 2b.
- B. Brace and tie wire shall meet the requirements of ASTM F 626 zinc coated or aluminum coated.
1. Where specified, round metallic-coated tie wires, clips, and hog rings shall be polymer coated to match the color of the chain-link fabric as selected from ASTM F 934
 2. The coating process and metallic-coated core wire materials shall be in accordance with ASTM F 668.
- C. Unless designated otherwise, use wire sizes no smaller than the following diameters:

Table 4154.05-1: Wire Sizes

Use	Wire Size
Tension wire	No. 7
Brace wire	No. 9
Tie wires or clips for fastening field fence to steel posts	No. 12
Use tie wires for chain link fence no smaller than No. 9 diameter for post ties or No. 12 diameter for rail and brace ties. Equivalent steel clips or aluminum wires or clips may be used if the Engineer approves.	

4154.06 STAPLES.

- A. Unless otherwise specified in the contract documents, use fence staples conforming to ASTM F 1667 - 13, Table 57: F 1667 ST FN - 06 Z.
- B. Obtain Engineer's approval for the staples to be used.

4154.07 WOOD POSTS.

- A. Use pine posts of the size and length designated in the contract documents that meet the requirements of Section 4164 with pressure preservative treatment meeting the requirements of Section 4161.
- B. Unless specified otherwise, use round stock posts of the following sizes and lengths:

Table 4154.07-1: Post Sizes and Lengths

Use	Length, feet
Line posts, 4 inch top	7
End, corner, gate, pull, angle, and brace posts, 6 inch top	8

- C. If contemplating driving the line posts, the tip of the post may have a blunt point made before treatment and located near the center line of the post.

4154.08 BRACES FOR FIELD FENCE.

- A. Unless otherwise specified in the contract documents, use either of the following between wood pull posts:
 - 1. 2 3/8 inch ~~SS-40~~ ASTM F 1043 steel pipe.
 - 2. 5 inch diameter wood posts.
- B. Use diagonal trussing with a double-wrapped 9 gauge, Class 3 steel brace wire.
- C. Ensure ends are flattened to fit squarely against the posts with brace approximately horizontal.

4154.09 STEEL LINE POSTS FOR FIELD FENCE AND DEER FENCE.

- A. Use T-section steel posts, of the length specified, as line posts with wood posts, as shown in the contract documents. Do not use them for corner, brace, pull, end, or gate posts.
- B. Only one type of steel post may be used in any installation 1000 feet or less in length.
- C. Equip posts with lugs or other approved means to prevent the fence fabric from moving vertically.
- D. Use nominal 1.33 pounds per foot T-section post meeting requirements of ASTM A 702 and hot dip galvanizing requirements of ASTM A 123.
- E. Completely paint the finished post with a prime coat with no limitation on color or tip identification except as provided for 1000 foot installations. Ensure the paint is thoroughly dry before posts are bundled for shipment.

4154.10 STEEL POSTS, BRACES, AND RAILS FOR CHAIN LINK FENCE.

- A. Steel pipe length shall be designated in the contract documents and shall conform to ~~AASHTO M 181 (ASTM)~~ one of the following requirements:
 - 1. ~~AASHTO M 181 Grade 1 or (ASTM F 1083); minimum average zinc coating weight of 1.8 ounces per square foot~~ Schedule 40.
 - 2. ~~AASHTO M 181 Grade 2 or (ASTM F 1043, Group I-G IC); external zinc coating minimum of 0.9 ounces per square foot and internal zinc coating minimum 0.9 ounces per square foot. Group IC galvanized before forming product shall be minimum G-210 (ASTM A 653).~~
- B. When specified, PVC thermoplastic coating shall be fused and adhered to zinc-coated posts with a minimum coating thickness of 0.010 inch conforming to ASTM F 934 & ASTM F 1043 ~~Sections 7 and 8.~~

4154.11 FITTINGS FOR CHAIN LINK FENCE.

- A. Comply with the following:
 - 1. Attach braces to posts using fittings which will hold both the post and brace rigidly.
 - 2. Use diagonal truss rods of 3/8 inch diameter, round steel rods with an appropriate commercial means for tightening.
 - 3. Furnish a locknut or other device to hold the tightening device in place.
 - 4. Furnish a suitable sleeve or coupling device, recommended by the manufacturer, to connect sections of top rail and to provide for expansion and contraction.
 - 5. Use stretcher bars no less than 3/8 inch diameter, or equivalent cross section area, with suitable clamps for attaching fabric to corner, end, or gate posts.
- B. Ensure fittings also conform to AASHTO M 181 or ASTM F 626.

4154.12 GATES.**A. Field Fence and Chain Link Fence.**

1. Ensure gates provide the width of opening shown in the contract documents. Install a vertical stay in gates more than 6 feet wide. Where the width of opening specified is:
16 feet or less, provide a single gate frame.
More than 16 feet, provide two gate frames using a drop bar locking device allowing operation as a double gate.
2. Ensure each gate is furnished complete with necessary hinges, latch, and other special fittings recommended for the type of gate and gate post being installed.
3. For chain link fence gates, use the pipe size shown in the contract documents or approved by the Engineer. When size is not shown in the contract documents, use:
1 1/2 inch nominal diameter pipe for gates 6 feet wide or more, and
1 1/4 inch nominal diameter pipe for gates less than 6 feet wide.
4. Use gate fabric similar to that used for the fence. Attach using stretcher bars.
5. Use adjustable rods to cross truss gates 6 feet wide or more.
6. Ensure materials are galvanized with no less than 0.8 ounce per square foot of surface. Gates for field fence may be painted with a prime coat and an enamel finish coat.

B. Deer Fence.

Furnish the following, galvanized according to Article 4154.10:

1. Tines molded in one piece of steel with no welds.
2. Structural steel tubes with wall thickness of 0.1875 inches and unit weight of 4.32 pounds per foot.
3. Support plates, hinges, and top braces.

Section 4155**4155.04, B, 3.**

Replace the first sentence:

Ensure steel posts ~~and blocks~~ are galvanized according to requirements of ASTM A 123.

4155.05, C.

Delete the Article:

~~C.—Ensure galvanizing is done after fabrication and after all bolt holes have been drilled.~~

Section 4160**4160.01, General Requirements.**

Replace the Articles:

B. Pentachlorophenol.

Meet the requirements of AASHTO M 133 (AWPA ~~P4~~ P35). Ensure petroleum solvent meets the requirements of AWPA ~~P9~~ HSA for Hydrocarbon Solvent Type A.

C. Copper Naphthenate.

Meet the requirements of AASHTO M 133 (AWPA ~~P8~~ P36). Ensure petroleum solvent meets the requirements of AWPA ~~P9~~ HSA for Hydrocarbon solvent Type A.

D. Ammoniacal Copper Zinc Arsenate (ACZA).

Meet the requirements of AASHTO M 133 (AWPA P5 P22).

E. Chromated Copper Arsenate (CCA).

Meet the requirements of AASHTO M 133 (AWPA P5 P23), Type A, Type B, or Type C.

Section 4161

4161.03, A.

Replace Table 4161.03-1:

Table 4161.03-1: Minimum Preservative Retention Requirements(lb./cu. ft. of wood)

Material and Usage	Retention					AWPA UC-Section-Special Req.
	Creosote ^(a)	Pentachlorophenol ^(a)	Copper Napthenate ^(a)	ACZA ^(b)	CCA ^(b, c)	
Lumber and Timber for Structures ^(d)	AWPA U1	AWPA U1	AWPA U1	AWPA U1	AWPA U1	AWPA U1
Piles for Foundation						
Douglas Fir	17	0.85	0.14	-	-	UC4C-E
Southern Pine	12	0.60	0.10	-	-	
Guardrail Posts, and Spacer Blocks						
Sawed Four Sides	10	0.6 0.5	0.075 0.06	0.5 0.4	0.5 0.4	UC4A-A-4.3
Fence, Guide, and Sign Posts						
Round	-	0.4	0.055	0.4	0.4	UC4A-B
Sawed Four Sides	10	0.5	0.060	0.4	0.4	UC4A-A-4.3
^(a) Oil type preservatives. ^(b) Waterborne preservatives. ^(c) Do not use for the treatment of Douglas Fir. ^(d) Retentions based on AWPA Use Category and Commodity Specifications for different applications.						

4161.03, B, 6, Handling Treated Products.

Add to the end of the Article:

End cuts, drilled holes, other fabrication after treatment, and damage/injuries require field treatment and shall be treated with preservatives as specified in AWPA M4.

4161.03, B, 7, b.

Replace the first sentence:

Ensure all treated wood material that requires a grade, with the exception of 45 inch Terminal Posts¹, displays a quality grade mark of an accredited grade monitoring and inspection agency approved under the American Lumber Standards Committee (ALSC).

Section 4164

4164.01, A.

Replace the second sentence:

For sawed wood posts and wood sign posts, Ensure a straight line from the centers of the ends of a post does not deviate from the longitudinal axis of the post at any point by more than 0.5% of the length of the post.

Section 4169

4169.02, A.

Replace Table 4169.02-1:

Common Name	Scientific Name	Purity (%)	Germination (%)
DOMESTIC GRASSES			
Alkali Grass	Puccinellia Distans	90	95
Bluegrass, Kentucky	Poa pratensis	85	80
Bluegrass, Ky. RAM-1	Poa pratensis-RAM-1	95	85
Bluegrass, Ky. PARK	Poa pratensis-PARK	95	85
Brome, smooth-LINCOLN	Bromus inermis	90	85
Fescue, tall, FAWN	Festuca arundinacea-FAWN	98	85
Fescue, tall, turf-type	Festuca Arundinacea	90	95
Fescue, chewings, red	Festuca rubra var. commutata	98	90
Fescue, creeping, red	Festuca rubra	98	85
Fescue, hard fine	Festuca Ovina Spp. Duriuscula	90	95
Fescue, red-PENNLAWN	Festuca rubra PENNLAWN	98	85
Fescue, Tall, Olympic (Fineleaf)	Festuca arundinacea-Olympic	98	85
Fescue, Tall, Rebel (Fineleaf)	Festuca arundinacea	98	85
Fescue, Sheeps	Festuca ovina	98 90	85 95
Orchardgrass	Dactylis glomerata	90	90
Red top	Agrostis alba	92	85
Reed Canarygrass	Phalaris arundinacea	98	70
Wildrye, Canada	Elymus Canadensis	95	85
Wildrye, Russian	Elymus junceus	95	85
Ryegrass, Perennial	Lolium perenne	95	90
Timothy	Phleum pratense	99	85
Wheatgrass, crested	Agropyron Cristatum	90	95
LEGUMES			
Alfalfa, RANGER/VERNAL	Medicago sativa	99	90 ^(a)
Alfalfa, Travois	Medicoa spp.	99	90 ^(a)
Birdsfoot Trefoil EMPIRE	Lotus corniculatus	98	85 ^(a)
Crownvetch, Emerald	Coronilla varia	98	70 ^(a)
Hairy Vetch	Vicia villosa	96	85 ^(a)
Lespedeza, Korean	Lespedeza stipulacea	98	80 ^(a)
Red Clover, medium	Trifolium pretense	99	90 ^(a)
Alsike Clover	Trifolium hybridum	99	90 ^(a)
White Clover	Trifolium repens	98	90 ^(a)
NURSE CROP OR STABILIZING CROP			
Oats	Avena sativa	97	90
Rye	Secale cereale	97	90
Sudangrass, PIPER	Sorghum vulgare var. sudanese	98	85

(a) Includes hard seed.

4169.07, B, Hydraulic Mulches.

Add as the first sentence of the Article:

Materials used shall be safe to the applicator and adjacent workers, and nontoxic to plants, fish, and other wildlife when properly applied according to EPA and other regulatory agencies.

Replace Articles 2 and 3:

2. Bonded Fiber Matrix.

- ~~a. Long strand wood fibers held together by organic tackifiers and bonding agents that, when dry, become insoluble and non-dispersible.~~
- ~~b. Upon curing (24 to 48 hours) forms a continuous, 100% coverage, flexible, absorbent, erosion-resistant blanket that encourages seed germination.~~
- ~~c. Manufactured to be applied with standard hydraulic mulching equipment and dyed green to facilitate visual metering during application.~~
- ~~d. Contains no growth or germination inhibiting factors.~~
- ~~e. Physical Properties:~~

- ~~1) **Fibers:** Virgin wood, greater than 88% by volume.~~
 - ~~2) **Organic Material:** Greater than 96% by volume.~~
 - ~~3) **Tackifier:** 8 to 10%.~~
 - ~~4) **pH:** 4.8 minimum.~~
 - ~~5) **Moisture Content:** 12% \pm 3%.~~
 - ~~6) **Minimum Water Holding Capacity:** 1.2 gallons per pound.~~
- f b.** All components pre-packaged by manufacturer to ensure material performance and compliance. Field mixing of additives or any components will not be allowed.
- g c.** ~~Other products not meeting requirements of Article 4169.07, B, 2, e, may be approved if they mMeet~~ the following requirements:
- 1) Contain non-toxic tackifiers that upon drying become insoluble and non-dispersible to eliminate direct raindrop impact on soil according to ASTM D 7101 and EPA 2021.0-1.
 - 2) Contain no germination or growth inhibiting factors and do not form a water-resistant crust that can inhibit plant growth.
 - 3) Hydraulic mulch that is completely photo-degradable or biodegradable.
 - 4) Contain a minimum 90% organic material according to ASTM D 2974.
 - 5) Have a rainfall event (R-factor) of $140 < R$ according to ASTM D 6459.
 - 6) Have a cover factor of $C \leq 0.03$ according to ASTM D 6459.
 - 7) Vegetation Establishment of 400% minimum according to ASTM D 7322.
 - 8) Water Holding Capacity 600% minimum according to ASTM D 7367.
- 3. Mechanically-Bonded Fiber Matrix.**
- ~~a. Long strand wood fibers and crimped, interlocking synthetic fibers.~~
 - ~~b. Upon curing (2 hours) forms a continuous, 100% coverage, flexible, absorbent, porous, erosion-resistant blanket that encourages seed germination.~~
 - e a.** Manufactured to be applied with standard hydraulic mulching equipment and dyed green to facilitate visual metering during application.
 - ~~d. Contains no growth or germination inhibiting factors.~~
 - e.** Physical Properties:
 - ~~1) **Virgin Wood Fibers:** 73% minimum.~~
 - ~~2) **Crimped, Interlocking Synthetic Fibers:** 5% \pm 1%.~~
 - ~~3) **Tackifier:** 10% \pm 1%.~~
 - ~~4) **Moisture Content:** 12% \pm 3%.~~
 - ~~5) **Minimum Water Holding Capacity:** 1.2 gallons per pound.~~
 - ~~6) **pH:** 4.8 minimum.~~
 - f b.** All components pre-packaged by manufacturer to ensure material performance and compliance. Field mixing of additives or any components will not be allowed.
 - g c.** ~~Other products not meeting requirements in Article 4169.07, B, 3, e, may be approved if they mMeet~~ the following requirements:
 - 1) Contain non-toxic tackifiers that upon drying become insoluble and non-dispersible to eliminate direct raindrop impact on soil according to ASTM D 7101 and EPA 2021.0-1.
 - 2) Contain no germination or growth inhibiting factors and do not form a water-resistant crust that can inhibit plant growth.
 - 3) Hydraulic mulch that is completely photo-degradable or biodegradable.
 - 4) Contain a minimum 90% organic material according to ASTM D 2974.
 - 5) Have a rainfall event (R-factor) of $175 < R$ according to ASTM D 6459.
 - 6) Have a cover factor of $C \leq 0.01$ according to ASTM D 6459.
 - 7) Vegetation Establishment of 500% minimum according to ASTM D 7322.
 - 8) Water Holding Capacity of 700% minimum according to ASTM D 7367.

Add the Article:

4. Organic Fiber Matrix.

Provide hydraulic organic fiber matrix (OFM) meeting the following characteristics and requirements:

- a.** Premixed formulation.
- b.** Contains a minimum of 88% organic material derived from compost, peat moss, wood cellulose, straw fibers, wood bark, biochar, flax fibers, or other organic fibers.
- c.** Phyto-sanitized to eliminate potential pathogens and weed seeds.
- d.** Contains one or more of the following: humus, enzymes, vitamins, natural sugars, plant proteins, auxins, or amino acids.
- e.** Contains zero ecotoxicity as per EPA 2021.0 in 48 hours.
- f.** Passes EPA 503 Metal Limits.

- g. Passes 40 CFR 503 Class A for pathogen reduction.
- h. pH: 5.5 to 8.5 according to ASTM D 1293.
- i. Water Holding Capacity: 400% minimum according to ASTM D 7367.
- j. Vegetation Establishment: 400% minimum according to ASTM D 7322.
- k. Moisture Content: 10% minimum and 40% maximum according to ASTM D 2974.
- l. Use with a tackifier that is either applied separately within 24 hours of the organic material, or is premixed according to the manufacturer's recommendations. Tackifier shall meet the following requirements:
 - Safe to the applicator, adjacent workers, and the environment when properly applied according to EPA and other regulatory agencies.
 - Nontoxic to plants, fish and other wildlife and 100% biodegradable.

4169.10, Special Ditch Control, Turf Reinforcement Mat, Slope Protection, and Outlet or Channel Scour Protection (Transition Mat).

Replace the title:

SPECIAL DITCH CONTROL, TURF REINFORCEMENT MAT, SLOPE PROTECTION, AND OUTLET OR CHANNEL SCOUR PROTECTION (TRANSITION MAT).

4169.10, A, Wire Staples.

Replace the Article:

Meet the following requirements for wire staples ~~for holding special ditch control wood excelsior mat and special ditch control jute mesh over sod:~~

1. U-shaped wire staples.
2. Each leg a minimum of 6 inches long for special ditch control and slope protection and 10 inches long for turf reinforcement mat. In sandy soil conditions the Engineer may require the length of each leg to be a minimum of 12 inches.
3. No. 11 diameter wire.
4. Staples of sufficient hardness to facilitate installation without bending.

4169.10, F, Outlet or Channel Scour Protection (Transition Mat).

Replace the title:

Outlet or Channel Scour Protection (Transition Mat).

4169.12, Perimeter and Slope Sediment Control Device.

Replace the Article:

A. General.

Interstate and Primary highway projects shall use sediment logs only.

1. Provide wattles, sediment logs, and filter socks consisting of ~~wood products (including wood mulch), cereal grain straw, or native grass straw~~ the following materials contained in a tube of photo degradable fabric or synthetic netting:
 - a. Wattles: Cereal straw or native grass straw certified by the Iowa Crop Improvement Association or other state's Crop Improvement Associations as Certified Noxious Weed Seed Free Mulch. Wattles with observed seed heads will not be accepted.
 - b. Sediment logs: Wood excelsior fibers with 80% of the wood excelsior fibers being 6 inches long or longer.
 - c. Filter socks: Compost (from an approved source meeting Article 4169.08) wood chips, or mulch.
2. Fill wattles, sediment logs, and filter socks using a mechanical device. Hand filling of wattles, sediment logs, and filter socks will not be allowed.
3. Ensure wattles, sediment logs, and filter socks do not contain:

- A visible admixture of refuse or other physical contaminants,
 - Germination or growth inhibiting factors, or
 - Material toxic to plant growth.
4. Ensure wattles, sediment logs, and filter socks have waterproof identification tags printed using permanent ink and containing manufacturer's name and address. For wattles and sediment logs, tags shall be attached to the inside of the netting of each wattle or sediment log. For filter socks, tags shall be attached to the outside of each sock.
 5. Approved ~~perimeter and slope sediment control devices~~ sediment logs are listed in Materials I.M. 469.10, Appendix E. Wattles and filter socks will be accepted based on the manufacturer's certification.

B. Wattles and Sediment Logs.

- ~~1. Ensure cereal grain straw for wattles or sediment logs is Certified Noxious Weed Seed Free Mulch certified by the Iowa Crop Improvement Association or other state's Crop Improvement Associations.~~
- ~~2. Wattles or sediment logs with observed unharvested seed heads will not be accepted.~~
- ~~3. For wood excelsior sediment logs and straw wattles, m~~Meet the following minimum weight requirements:
 - 20 inch sediment logs and straw wattles: 3 pounds per foot with tolerance of 0.25 pounds per foot.
 - 12 inch sediment logs and straw wattles: 2 pounds per foot with tolerance of 0.25 pounds per foot.
 - 9 inch sediment logs and straw wattles: 1 pound per foot with a tolerance of 0.1 pounds per foot.
 - ~~• 6 inch sediment logs and straw wattles: 0.5 pounds per foot with a tolerance of 0.1 pounds per foot.~~

C. Filter Socks.

Provide filter socks with a maximum 3/8 inch opening ~~and filled with a compost/wood blend filter material consisting of compost from an approved source meeting Article 4169.08.~~

Section 4171

4171.04, Cast Iron Detectable Warning Panels.

Delete the second bullet:

- ~~• Wear resistance – ASTM C 501 greater than 8500.~~

4171.05, Steel Detectable Warning Panels.

Delete the second bullet:

- ~~• Wear resistance – ASTM C 501 greater than 8500.~~

Section 4185

4185.02, A, 3.

Replace the third sentence:

~~Ensure the structural design of the light pole is based on the~~ Comply with AASHTO 2013 Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

4185.02, A, 4.

Replace the first sentence:

The assembled lighting unit, consisting of the pole and all attachments including mastarms, luminaires, and breakaway base or slip base, as specified, complete and in place in the footing anchor bolts, is required to

withstand wind loading equal a wind load corresponding to a 90 mph basic wind speed (3 second gust) of 80 mph without fracture or apparent deformation of components.

4185.02, B, Anchor Bolt and Slip-Base Plate Fasteners for Lighting Poles.

Replace Articles 2 through 7:

~~2. Furnish anchor bolts that:~~

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

2. Anchor Bolts, Nuts, and Washers.

Furnish each anchor bolt with one leveling nut, one anchoring nut, and one jam nut (if required) on the exposed end and one of the following on the embedded end: nut, nut and plate, or nut and anchor bolt assembly ring plate. Use anchor bolts, nuts, and washers that comply with Materials I.M. 453.08. Meet the following requirements:

a. Anchor Bolts.

- 1) Use straight full-length galvanized bolts.
- 2) Comply with ASTM F 1554, Grade 105, S4 (-20°F).
- 3) Threads are to comply with ANSI/ASME B1.1 for UNC thread series, Class 2A tolerance.
- 4) The end of each anchor bolt intended to project from the concrete is to be color coded to identify the grade.
- 5) Do not bend or weld anchor bolts.

b. Nuts.

- 1) Comply with ASTM A 563, Grade DH or ASTM A 194, Grade 2H.
- 2) Use heavy hex.
- 3) Use ANSI/ASME B1.1 for UNC thread series, Class 2B tolerance.
- 4) Nuts may be over-tapped according to the allowance requirements of ASTM A 563.
- 5) Refer to Articles 2522.03, H, 2, b through h for tightening procedure and requirements.

c. Washers.

Comply with ASTM F 436 Type 1.

d. Galvanizing.

Galvanize entire anchor bolt assembly consisting of anchor bolts, nuts, and washers (and plates or anchor bolt assembly ring plate, if used) according to the requirements of ASTM B 695, Class 55 Type 1 or ASTM F 2329 with zinc bath temperature limited to 850°F. Galvanize entire assembly by the same zinc-coating process with no mixed processes in a lot of fastener assemblies.

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

4.3. If slip bases are furnished, furnish 1 inch by 4 1/2 inch bolts that:

- ~~• Are high-strength bolts meeting the requirements of ASTM A 325, and~~
- ~~• Are fully mechanically galvanized to ASTM B 695, Class 55, Type 1.~~

5.4. Furnish washers that: comply with ASTM F 436 Type 1.

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

6.5. Furnish nuts that meet the following requirements:

- ~~• Meet the requirements of ASTM A 563,~~
- ~~• Are grade DH,~~
- ~~• Are heavy hex, and~~
- ~~• Are galvanized according to the requirements of ASTM F 2329, or ASTM B 695, Class 55, Type 1.~~
- Comply with ASTM A 563, Grade DH or ASTM A 194, Grade 2H.
- Use heavy hex.
- Use ANSI/ASME B1.1 for UNC thread series, Class 2B tolerance.
- Nuts may be over-tapped according to the allowance requirements of ASTM A 563.
- Refer to Articles 2522.03, H, 2, b through h for tightening procedure and requirements.

6. Galvanizing.

Galvanize hardware according to the requirements of ADTM B 695, Class 55 Type 1 or ASTM F 2329 with zinc bath temperature limited to 850°F. Galvanize entire assembly by the same zinc-coating process, with no mixed processes in a lot of fastener assemblies.

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

4185.02, D, 2.

Replace the Article:

Designed according to AASHTO 2013 Standards and Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

Section 4186**4186.09, A, 4, b.**

Replace the Article:

Washers shall be 3/8 inch I.D. by ~~4-3/8~~ 1 1/2 inch O.D. by 0.125 inch.

4186.09, B, Type B Signs.

Replace the Article:

Ensure the fittings described in the paragraphs below, when combined with the aluminum sections and posts, form a complete, assembled sign unit that will meet the specified strength requirements. ~~Though aluminum hardware is specified, equivalent hardware may be furnished in stainless steel or galvanized steel as approved by the Department. Galvanizing is to meet the requirements of ASTM F 2329, or ASTM B 633, Fe/Zn 25.~~

1. Stainless Steel Bolts.

Use the minor thread diameter in determining stress area.

- a. ~~Use post clip bolts and panel bolts made from aluminum wire or rod meeting the requirements of ASTM B 211, Alloy 2024-T4. Comply with ASTM A 320 Class 1 Grade B8, Class 1A Grade B8A, or Class 2 Grade B8; or ASTM F 593 Group 1 Alloy 304 or 304L, Group 2 Alloy 316 or 316L, or Group 3 Alloy 321 or 347 meeting Condition A, CW1 or CW2.~~
 - **Post clip bolts:** 3/8 inch in diameter and 1 3/4 inches in length, square or rectangular head, manufactured according to the dimensions and details shown in the contract documents.
 - **Panel bolts:** 3/8 inch in diameter and 3/4 inch in length with hexagonal head.
- b. Thread fit is to conform with ANSI, Class 2A.

2. Stainless Steel Nuts.

~~For Type B signs, use nuts manufactured from any aluminum alloy listed in ASTM B 211 or from stainless steel and meeting the following requirements: Comply with ASTM A 194 Grade 8, 8A, 8C, 8CA, 8M, 8MA, 8T, or 8TA; or ASTM F 594 Group 1 Alloy 304 or 304L, Group 2 Alloy 316 or 316L, or Group 3 Alloy 321 or 347 meeting Condition A, CW1 or CW2 Use same alloy properties (i.e. group, alloy, class and condition) as those of the bolts specified.~~

- a. **Post clip nuts:**
 - Finished, finished thick, regular, or heavy hexagonal, self locking nuts for 3/8 inch bolts, but all nuts to be of the same type.
 - Able to withstand a proof load, at room temperature, of 4,730 pounds.
- b. **Self locking nuts:** comply with Article 4186.09, A, 3.
- c. **Panel bolt nuts:**
 - Finished hexagonal nuts for 3/8 inch bolts. Able to stand a proof load of 4,200 pounds.
 - Thread fit is to conform with ANSI, Class 2B.

3. Stainless Steel Washers.

- a. ~~Use washers made of a quality of material approved by the Engineer. Comply with ANSI B18.22.1 for the bolts specified.~~

- b. Meet requirements of ASTM A 240. Use same alloy properties (i.e. group, alloy, class and condition) as those of the bolts specified.
- ~~b~~ c. Post clip washers and panel bolt washers are to be flat 7/16 inch I.D. by 1 inch O.D. by 0.078 inch.
- ~~c~~ d. A thickness tolerance of ± 0.006 inch is allowed.

4. Post Clips.

- a. Use aluminum castings manufactured according to the contract documents.
- b. Ensure clips are able to withstand the load requirements of the bolt specified.

5. Edge Trim Molding.

Meet the following requirements:

- a. Molding is attached to the signs by means of self tapping, 300 series, stainless steel, machine screws, Size 8-32.
- b. Pan head, binding head, or truss head screw is used.
- c. A screw is installed 1/2 inch from the end of each section of molding. Intermediate screws are installed no more than 12 inches apart.

4186.09, C, Delineators, Milepost Markers, and 6 Inch by 6 Inch (150 mm by 150 mm) Route Markers.

Replace the title:

Delineators, Milepost Markers Reference Location Signs, and 6 Inch by 6 Inch (~~150 mm by 150 mm~~) Route Markers.

4186.09, C, 2.

Replace the Article:

Fasten ~~milepost markers~~ reference location signs and 6 inch by 6 inch route markers to the post as shown in the contract documents.

4186.10, C, Posts for Delineators, Milepost Markers, and 6 Inch by 6 Inch Route Markers.

Replace the title:

Posts for Delineators, ~~Milepost Markers~~ Reference Location Signs, and 6 Inch by 6 Inch Route Markers.

Section 4187

4187.01, C, 3, Anchor Bolts, Nuts, and Washers.

Replace the Article:

~~Meet the following requirements:~~ Furnish each anchor bolt with one leveling nut, one anchoring nut, and one jam nut on the exposed end and one of the following on the embedded end if the anchor bolt is straight: nut, nut and plate, or nut and anchor bolt assembly ring plate. Use anchor bolts, nuts, and washers that comply with Materials I.M. 453.08. Meet the following requirements:

a. Anchor Bolts.

- 1) Use full-length galvanized bolts.
- 2) Comply with either ASTM F 1554, Grade 55, S1; or Grade 105, ~~S5~~ S4 (-20°F).
- 3) Grade 55 anchor bolts may be straight or include a 90 degree bend.
- 4) Grade 105 anchor bolts shall be straight.
- ~~3~~ 5) Threads are to comply with ANSI/ASME B1.1 for UNC thread series, Class 2A tolerance.
- ~~4~~ 6) The end of each anchor bolt intended to project from the concrete is to be color coded to identify the grade.
- ~~5~~ 7) Do not bend or weld anchor bolts.

b. Nuts.

- 1) Comply with ASTM A 563, Grade DH or ASTM A 194,
- 2) Use heavy hex.
- 3) Use ANSI/ASME B1.1 for UNC thread series, Class 2B tolerance.
- 4) Nuts may be over-tapped according to the allowance requirements of ASTM A 563.
- 5) Refer to Articles 2522.03, H, 2, b through h for tightening procedure and requirements.

c. Washers.

Comply with ASTM F 436 Type 1.

d. Galvanizing.

Galvanize entire anchor bolt assembly (~~anchor bolt, nuts and washers~~) consisting of anchor bolts, nuts, and washers (and plates or anchor bolt assembly ring plate, if used) according to the requirements of ASTM B 695, Class 55 Type 1 or ASTM F 2329 with zinc bath temperature limited to 850°F. Galvanize entire assembly by the same zinc-coating process, with no mixed processes in a lot of fastener assemblies.

Section 4188

4188, Traffic Control Devices.

Add the Article:

4188.08 TEMPORARY PORTABLE RUMBLE STRIPS.

Furnish temporary portable rumble strips to be used in traffic control zones. Ensure temporary portable rumble strips meet requirements of MUTCD and the following:

A. Properties.

1. Rated for posted speed limits up to 70 mph.
2. Installation without using nails or adhesive.
3. Provides auditory and tactile warnings for all vehicles.
4. Minimal lateral displacement under traffic loading.
5. Installation and removal of rumble strips in less than 5 minutes.
6. Reusable within manufacturer's recommended life of the product.

B. Acceptance.

Comply with Materials I.M. 488.07 for inspection and acceptance of temporary portable rumble strips.

Section 4189

4189.04, A, 2, c.

Replace the first sentence:

Police door with auto/flash switch, manual/stop time switch, and on/off power switch for signal heads only.

4189.05, Poles, Heads, and Signs.

Replace Article A and renumber Articles A and B:

A C. Traffic Signal Poles and Mast Arms.

1. General.

- a. Use ~~M~~mast arm length and vertical pole height as specified in the contract documents.
- b. Ensure the mast arms, poles, and supporting bases are galvanized ~~inside and out~~ on both interior and exterior surfaces according to ASTM A 123.
- c. Use ~~C~~continuously tapered, round steel poles of the transformer base type. Fabricated poles from low carbon (maximum carbon 0.30%) steel of U.S. standard gauge.
- d. When a transformer base is not specified, provide a 6 inch by 16 inch handhole in the pole shaft for cable access. Provide a cover for the handhole. Secure the cover to the base with simple tools. ~~Hardware to be~~ Use corrosion resistant hardware.
- e. Ensure minimum yield strength of 48,000 psi after manufacture. Supply base and flange plates of structural steel complying with ~~AASHTO M 183~~ ASTM A 36 and cast steel complying with ASTM A 27, Grade 65-35 or better.
- f. Where a combination street lighting/signal pole is specified in the contract documents, ensure the luminaire arm is ~~to be~~ mounted in the same vertical plane as the signal arm unless otherwise

- specified. Use a luminaire arm of the single member tapered type ~~arm for the luminaire arm type.~~
~~Equip~~ Fabricate the pole with a minimum 4 inch by 6 inch handhole and cover located opposite the signal mast arm.
- g.** If allowed by the Engineer, poles and mast arms may be fabricated by shop welding two sections together, resulting in a smooth joint and ~~factory weld~~ as follows:
- 1) Ensure a minimum of 60% penetration for longitudinal butt welds in plates 3/8 inch and less in thickness ~~for longitudinal butt welds~~, except within 1 foot of a transverse butt-welded joint. Ensure a minimum of 80% penetration for longitudinal butt welds in plates over 3/8 inch in thickness.
 - 2) Ensure 100% penetration for longitudinal butt welds ~~on~~ in poles and arms within 1 foot of a transverse butt-welded joint.
 - 3) Ensure 100% penetration, ~~achieved by~~ for transverse butt welds by using a back-up ring or bar, ~~for transverse butt welds for connecting~~ to connect the sections.
 - 4) Examine ~~100%~~ the full length of all transverse butt welds and 100% penetration longitudinal butt welds by ultrasonic inspection according to the requirements of ANSI/AWS D1.1-80-AH.
 - 5) Comply with ~~Structural Welding Code AWS D1-180, as modified by AASHTO 1981 Standard Specifications for Welding of Structural Steel Highway Bridges and by Supplemental Specifications No. 969~~ ANSI/AWS D1.1 except as modified by Article 2408.03, B.
- h.** Provide non-shrink grout (complying with Materials I.M. 491.13) or a rodent guard (complying with Materials I.M. 443.01) for placement between the pole base and the foundation.
- 2. Pole Design.**
- a.** Comply with AASHTO ~~1994~~ 2013 Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. Use a 90 mph basic wind speed (3 second gust) with a 50 year mean recurrence interval for strength design. Use Category II for fatigue design. Apply only natural wind gust loads (i.e., do not apply galloping loads, vortex shedding loads, or truck-induced gust loads) for fatigue design. Install vibration mitigation devices on all traffic signal pole mast arms over 60 feet in length as shown in the standard details.
- ~~**b.** Designed to support the loading necessary for all traffic control equipment. Capable of withstanding winds up to 80 mph with a 1.3 gust factor without failure.~~
- 3. Hardware.**
- a.** Equipped poles and mast arms with all necessary hardware and anchor bolts to provide for a complete installation without additional parts.
- ~~**b.** Use Anchor bolts complying with ASTM F 1554 Grade 105 S5 Class 2A,; hot dip galvanized, and threaded to a minimum of 6 inches at one end; and having a 4 inch long, 90 degree bend at the other end.~~
- ~~**c.** Use Washers complying with ASTM F 436 Type 1.~~
- ~~**d.** Use Heavy hex nuts complying with ASTM A 563 Grade DH Class 2B.~~
- ~~**e.** Ensure All hardware is made of steel, and is hot dipped galvanized complying with according to ASTM F 2329, with a zinc bath temperature limited to 850°F or mechanically galvanized according to ASTM B 695, Class 50 55, Type 1, or electrodeposited coated of the same coating thickness and designed for this purpose.~~
- 4. Anchor Bolts, Nuts, and Washers.**
- Furnish each anchor bolt with one leveling nut, one anchoring nut, and one jam nut (if required) on the exposed end and one of the following on the embedded end: nut, nut and plate, or nut and anchor bolt assembly ring plate. Use anchor bolts, nuts, and washers that comply with Materials I.M. 453.08. Meet the following requirements:
- a. Anchor Bolts.**
- 1) Use straight full-length galvanized bolts.
 - 2) Comply with ASTM F 1554, Grade 105, S4 (-20°F).
 - 3) Threads are to comply with ANSI/ASME B1.1 for UNC thread series, Class 2A tolerance.
 - 4) The end of each anchor bolt intended to project from the concrete is to be color coded to identify the grade.
 - 5) Do not bend or weld anchor bolts.
- b. Nuts.**
- 1) Comply with ASTM A 563, Grade DH or ASTM A 194, Grade 2H.
 - 2) Use heavy hex.
 - 3) Use ANSI/ASME B1.1 for UNC thread series, Class 2B tolerance.

- 4) Nuts may be over-tapped according to the allowance requirements of ASTM A 563.
- 5) Refer to Articles 2522.03, H, 2, b through h for tightening procedure and requirements.
- c. **Washers.**
Comply with ASTM F 436 Type 1.
- d. **Galvanizing.**

Galvanize entire anchor bolt assembly consisting of anchor bolts, nuts, and washers (and plates or anchor bolt assembly ring plate, if used) according to the requirements of ASTM B 695, Class 55 Type 1 or ASTM F 2329 with zinc bath temperature limited to 850°F. Galvanize entire assembly by the same zinc-coating process, with no mixed processes in a lot of fastener assemblies.

B D. Traffic Signal Pedestal Poles.

4189.05, D, 2.

Replace the Article:

Anchor Bolts: Four 3/4 inch by 15 inch steel, hot dip galvanized anchor bolts complying with ASTM F 1554, Grade 36, with right angle bend at the bottom end, complete with all hardware required for installation.

Section 4196

4196.01, B, 2, Subsurface Drainage.

Replace Table 4196.01-2:

Table 4196.01-2: Fabric for use in Subsurface Drains

Property	Value	Test Method
Grab strength, dry, minimum average value in either principal direction	90 lbs.	ASTM D 4632
Elongation, dry, minimum average value in either principal direction	20%	ASTM D 4632
Permittivity, minimum	0.02–0.30 0.1 sec ⁻¹	ASTM D 4491
Apparent Opening Size, maximum	US Sieve No. 40	ASTM D 4751

4196.01, B, 3, Embankment Erosion Control.

Replace Table 4196.01-3:

Table 4196.01-3: Fabric for use as Embankment Erosion Control

Property	Value	Test Method
Grab strength, dry, minimum average value in either principal direction	150 lbs.	ASTM D 4632
Elongation, dry, minimum average value in either principal direction	20%	ASTM D 4632
Permittivity, minimum	0.02–0.30 0.1 sec ⁻¹	ASTM D 4491
Apparent Opening Size, maximum	US Sieve No. 40	ASTM D 4751

4196.01, B, 5, a.

Replace the second bullet:

Has the properties listed in Table 4196.01-5 for the type specified for use in the contract documents.

4196.01, B, 6, Bridge Abutment Backfill Fabric.

Replace Table 4196.01-6:

Table 4196.01-6: Fabric for use in bridge abutment backfill

Property	Value	Test Method
Tensile Strength (at 5% Strain), minimum	1356 lbs/ft	ASTM D 4595
Apparent opening size (AOS), maximum	US Sieve #40	ASTM D 4751
UV resistance (at 500 hours)	70% retained strength	ASTM D 4355
Flow Rate, maximum minimum	18 20 10 gal./min./ft ²	ASTM D 4491

Appendix.

Appendix.

Replace the Aggregate Gradation Table:

Grad. No.	Section No.	Std. Sieve Sz. Intended Use	AGGREGATE GRADATION TABLE												Notes
			1 1/2"	1.00"	3/4"	1/2"	3/8"	4	8	30	50	100	200		
1	4110, 4125, 4133, 4134	PCC FA, Cover Agg.					100	90-100	70-100	10-60				0-1.5	1
2	4112	PCC Intermediate				95-100			0-10						
3	4115 (57, 2-8), 4118	PCC CA	100	95-100		25-60		0-10	0-5					0-1.5	2, 10
4	4115 (2-8)	PCC CA	100	50-100	30-100	20-75		5-55	0-10	0-5				0-1.5	10
5	4115 (67, 2-8)	PCC CA		100	90-100			20-55	0-10	0-5				0-1.5	10
6	4115.06 (Repair & Overlay)	PCC CA			100	90-100		40-90	0-30					0-1.5	10
7	4117 (Class V)	PCC FA & CA	100					80-92	60-75	20-40					
8	4117.03 (Class V)	Fine Limestone						100	90-100					0-30	
10	4119, 4120.02, 4120.03 (C gravel)	Granular Surface			100			50-80	25-60						3, 11
11	4119, 4120.02, 4120.04, 4120.05, 4120.07, (A, B Cr. St.)	Granular Surface & Shoulder		100	95-100	70-90			30-55	15-40				6-16	4, 5, 11
12a	4121 (Cr. St.)	Granular Subbase	100			40-80				5-25				0-6	6, 11
12b	4121 (Cr. Gravel)	Granular Subbase	100			50-80				10-30		5-15		3-7	7, 11
13	4122.02 (Cr. St.)	Macadam St. Base	3" nominal maximum size screened over 3/4" or 1.00" screen.												
14	4123	Modified Subbase	100		70-90					10-40				3-10	5, 7, 11
19	4125 (1/2") Cr. or Cr. St.)	Cover Aggregate			100	97-100		40-90	0-30	0-15				0-1.5	11
20	4125 (1/2" Scr. Gr.)	Cover Aggregate			100	95-100		40-80	0-15	0-7				0-1.5	11
21	4125 (3/8")	Cover Aggregate				100		90-100	10-55	0-20	0-7			0-1.5	11
22	4124	Fine Slurry Mixture						100	85-100	40-95	20-60	14-35	10-25	5-25	9, 11
23	4124 (Gr. St.)	Coarse Slurry Mixture						100	70-90	40-70	19-42			5-15	11
29	4131	Porous Backfill			100	95-100		50-100	0-50	0-8					11
30	4132.02 (Cr. St.)	Special Backfill	100							10-40				0-10	5, 11
31	4132.03 (Gravel)	Special Backfill		100	90-100	75-100				30-55				3-7	11
32	4133 (Sand/Gr./Cr. St.)	Granular Backfill	100% passing the 3" screen												
35	4134 (Natural Sand/Gr.)	Floodable Backfill	100							20-90				0-4	11
36	4134 (Natural Sand)	Floodable Backfill							100					0-2	11
37	2320 (Quartzite/Granite/Slag)	Polymer-Modified Microsurfacing						100	90-100	65-90	30-50	18-30	10-21	5-15	12, 13
38	2320 (limestone/Dolomite)	Polymer-Modified Microsurfacing						100	70-90	45-70	15-35	10-25	5-20	5-15	12, 13

Notes: (Gradations No. 9, 15, 16, 17, 18, 24, 25, 26, 27, 28, 33, and 34 have been deleted)

1. For Section 4110, when the fine aggregate is sieved through the following numbered sieves - 4, 8, 16, 30, 50, and 100 - no more than 40% shall pass one sieve and be retained on the sieve with the next higher number.
2. When used in precast and prestressed concrete bridge beams, 100% shall pass the 1.00" sieve. When used for pipe bedding the No. 200 restriction does not apply.
3. When compaction of material is a specification requirement, the minimum percent passing the No. 200 sieve is 6%.
4. See specifications for combination of gravel and limestone.
5. Unwashed air dried samples of crushed composite material shall be tested for gradation compliance except that no gradation determination will be made for material passing the No. 200 sieve.
6. The gradation requirement for the No. 8 sieve shall be 5% to 20% when recycled material is supplied.
7. For Section 4121 gravel, one fractured face on 30% or more of the particles retained on the 3/8 inch sieve. For Section 4123 gravel, one fractured face on 75% or more of the particles retained on the 3/8 inch sieve.
8. Crushed stone shall have 100% passing the 1½" sieve.
9. Gradation limitations for the 30, 50, and 100 sieves shall not apply when slurry mixture is applied by hand lutes, such as for slurry leveling.
10. Maximum of 2.5% passing the No. 200 sieve allowed if for crushed limestone or dolomite when documented production is 1% or less.
11. When Producer gradation test results are used for acceptance, test results representing at least 90% of the material being produced shall be within the gradation limits and the average of all gradation results shall be within the gradations limits. Stockpiled material not meeting the criteria may, at the District Materials Engineer's discretion, be resampled using Materials I.M. 301 procedures. One hundred percent of the stockpile quality control and verification test results shall be within the gradation limits.
12. For Quartzite/Granite/Slag: 45% to 70% passing No. 16 Sieve; for Dolomite/Limestone: 25% to 50% passing No. 16 Sieve.
13. Percent passing shall not go from the high end to the low end of the range for any two consecutive screen.