IOWA DEPARTMENT OF NATURAL RESOURCES

CONSTRUCTION SPECIFICATIONS

IOWA DEPARTMENT OF NATURAL RESOURCES
ENGINEERING BUREAU
WALLACE STATE OFFICE BUILDING
DES MOINES, IA 50319-0034

PART 1 - GENERAL

1.01 SUMMARY:

A. This item shall consist of constructing one or more courses of a mixture of soil, fly ash, and water in accordance with this specification, and in conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 02200 - Earthwork

C. Measurements and Payments:

1. Measure the quantity of fly ash delivered in tons.

2. Weigh on accurate scales designed for weighing loaded trucks.

3. Load vehicles to insure against loss of material between the scales and the point of delivery.

   a. Material will not be deposited and spread until the scale weigh ticket is delivered to the inspector and the weight of material verified.

4. The yardage of fly ash treated subgrade to be paid for shall be the number of square yards completed and accepted. Depth of treatment is 12 inches, unless otherwise noted on plans.

5. The amount of fly ash to be paid for shall be the number of tons of fly ash used as authorized.

D. Basis of payment:

1. Payment shall be made at the contract unit price per square yard for the fly ash treated subgrade of the thickness specified. The price shall be full compensation for furnishing all material, except the fly ash, and for all preparation, delivering, placing and mixing these materials, and all labor, equipment, tools and incidentals necessary to complete this item.

2. Payment shall be made at the contract unit price per ton of fly ash. This price shall be full compensation for furnishing this material; for all delivery, placing

and incorporation of this material; and for all labor, equipment, tools, and incidentals necessary to complete this item.

3. The DNR Construction Inspector will:

a. Verify that all quantities are in accordance with requirements.

b. Calculate the value of deducts owed the Owner at the unit price provided in the Contractor's Price Breakdown.

1.02 REFERENCES:

A. ASTM C 618 – Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

1.03 SUBMITTALS:

A. Provide submittals as required is section 01300.

1.04 CONTROL OF MATERIALS:

A. Fly Ash:

1. Fly Ash Shall meet ASTM Specifications C-618, Section 3.3 when sampled and tested in accordance with Sections 5, 6, and 8, unless otherwise shown on the plans. Fly ash shall be of the Class "C" designation containing a minimum of 25% CaO. The source of the ash shall be identified and approved in advance of stabilization operations in order that laboratory tests can be completed prior to commencing work.

2. Fly Ash shall be stored and handled in closed weatherproof containers until immediately before distribution. Temporary storage (less than 12 hours) of fly ash in open pits may be allowed provided that wetting of the fly ash by rain or ground water is not allowed. Fly as exposed to moisture prior to mixing with soils shall be discarded.

B. Water:

1. Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Water shall be tested in accordance with and shall meet the suggested requirements of AASHTO T 26. Water known to be of potable quality may be used without test.

C. Soil:

1. The soil for this work shall consist of materials on the site or selected materials from other sources and shall be uniform in quality and gradation, and shall be

approved by the Engineer. The soil shall be free of roots, sod, weeds, and stones larger than 2-1/2 inches.

1.05 JOB CONDITIONS:

A. Survey job conditions prior to commencing work. Bring any discrepancies between existing work and the Drawings and Specifications to the attention of the Architect/DNR Construction Inspector.

B. Observe weather conditions. The fly ash treated subgrade shall not be mixed while the atmospheric temperature is below 40° F or when conditions indicate that temperatures may fall below 40° F within 24 hours, when it is foggy or rainy, or when soil or subgrade is frozen.

1.06 COMPOSITION:

A. Fly Ash:

1. Fly Ash shall be applied at the rate specified on the plans for the depth of subgrade treatment shown. The amount of fly ash to be incorporated shall be between 13% and 15% of the dry unit weight of the subgrade soils.

B. Tolerances:

1. At final compaction, the fly ash and water content for each course of subgrade treatment shall conform to the following tolerances:

Material	Tolerance
Fly Ash	+0.5%
Water	+2%, -0%

PART 2 - EXECUTION

3.01 EQUIPMENT:

A. The equipment required shall include all equipment necessary to complete this item such as: grading and scarifying equipment, a spreader for the fly ash, mixing or pulverizing equipment, sheepsfoot and pneumatic or vibrating rollers, sprinkling equipment, and trucks.

3.02 GENERAL:

A. It is the primary requirement of this specification to secure a completed subgrade containing a uniform fly ash mixture, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth, and with a smooth surface suitable for placing subsequent courses. It shall be the responsibility of the Contractor to

regulate the sequence of his/her work, to use the proper amount of fly ash, maintain the work, and rework the courses as necessary to meet the above requirements.

B. Prior to beginning any fly ash treatment the subgrade shall be constructed and brought to grade as specified and shall be shaped to conform to the typical sections, lines, and grades as shown on the plans. The material to be treated shall then be excavated to the secondary grade (proposed bottom of fly ash treatment) and removed or windrowed to expose the secondary grade. Any wet or unstable materials below the secondary grade shall be corrected, as directed by the Engineer, by scarifying, adding fly ash, and compacting until it is of uniform stability. The excavated material shall then be spread to the desired cross section.

C. If the Contractor elects to use a cutting and pulverizing machine that will remove the subgrade material accurately to the secondary grade and pulverize the material at the same time, he will not be required to expose the secondary grade nor windrow the material. However, the Contractor shall be required to roll the subgrade, as directed by the Engineer, and correct any soft areas that this rolling may reveal before using the pulverizing machine. This method will be permitted only where a machine is provided which will ensure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a smooth surface over the entire width of the cut. The machine must give visible indication at all times that it is cutting to the proper depth.

3.03 APPLICATION:

A. Fly ash shall be spread only on that area where the first mixing operations can be completed within 2 hours. The application and mixing of fly ash with the soil shall be accomplished by the methods hereinafter described as “Dry Placing.”

B. Dry Placing:

1. The fly ash shall be spread uniformly over the top of the subgrade by an approved screw-type spreader box or other approved spreading equipment. The amount of fly ash spread shall be the amount required for mixing to the specified depth which will result in the percentage determined in the job mix formula.

2. The fly ash shall be distributed in such manner that scattering by wind will be minimal. Fly ash shall not be applied when wind conditions, in the opinion of the Engineer, are detrimental to a proper application. A motor grader shall not be used to spread the fly ash.

C. Mixing:

1. The mixing procedure shall be the same for Dry Placing as hereinafter described. The full depth of the treated subgrade shall be mixed with a rotary pulvamixer that utilizes a direct hydraulic drive. Fly ash shall not be left exposed for more than 30 minutes after distribution. The mixing machine shall make two coverages. Water shall be added through use of a pulvamixer equipped with a

spray bar in the mixing drum capable of applying sufficient quantities of water to achieve the required moisture content of the soil-fly ash mixture. The system shall be capable of being regulated to the degree as to maintain moisture contents within the recommended range.

2. Required moisture contents shall be established by the Engineer based on laboratory tests with the site soils and specific fly ash to be used for the treatment. Final moisture content of the mix, immediately prior to compaction shall be determined in accordance with ASTM D 698 and shall not be below nor more than 2 percent above the optimum moisture content for maximum density for the mix. If moisture contents exceed the specified limits, additional fly ash may be added to lower the moisture content to the required limits. Lowering moisture contents by aeration following addition of fly ash will not be permitted.

3. If the soil fly ash mixture contains clods greater than 1-1/2 inch in size, they shall be reduced in size by additional pulverization.

D. Compaction:

1. Compaction of the soil-fly ash mixture shall begin immediately after mixing of the fly ash and be completed within two hours following incorporation of the fly ash. The field density of the compacted mixture shall be at least 95 percent of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested in accordance with ASTM D 698. The in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922.

2. All irregularities, depressions, or weak spots, which develop, shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and re-compacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.

3. In addition to the requirements specified for density, the full depth of the material shown on the plans shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests will be made by the Engineer. If the material fails to meet the density requirements, it shall be reworked to meet these requirements. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at the sole expense of the Contractor.

E. Finishing and Curing:

1. After the final layer or course of the fly ash treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The finished surface shall not vary more than 3/8 inch when tested with a 16-foot straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor, at his/her own expense, in a manner satisfactory to the Engineer.

2. After the fly ash treated course has been finished as specified herein, the surface shall be protected against rapid drying by either of the following methods for a period of not less than three days or until the pavement section is placed.

a. Maintain in a thorough and continuously moist condition by sprinkling.

b. Apply a 2 inch layer of earth of the completed course and maintain in a moist condition.

F. Thickness:

1. The thickness of the fly ash treated subgrade shall be determined by depth tests of cores taken at intervals so that each test shall represent no more than 300 square yards. When the base deficiency is more than ½ inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. The Contractor shall replace, at his/her own expense, the base material where borings are taken for test purposes.

G. Maintenance:

1. The Contractor shall maintain, at his/her own expense, the entire fly ash treated subgrade in good condition from the start of work until all the work has been completed, cured, and accepted by the Engineer.

END OF SECTION 02507

Iowa Department of Transportation Specification

GS-01016

General Supplemental Specification for Bridge and Highway Construction

THE STANDARD SPECIFICATIONS, SERIES OF 2001, ARE AMENDED BY THE FOLLOWING MODIFICATIONS, ADDITIONS, AND DELETIONS. THESE ARE GENERAL SUPPLEMENTAL SPECIFICATIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

NOTES: Changes made since the previous General Supplemental Specification issue are indicated by shading in the Table of Contents, in the instruction line, and in the text. Previous changes have been incorporated and are no longer called out by shading or strikeout.

Sections 4109 to 4133 have been rewritten in the imperative mood, active voice. The imperative mood is used to indicate a command to the Contractor. Sentences will be of the form:

Meet the requirements of Gradation No. 32.
Process RAP to pass the 2 inch (50 mm) sieve.

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Division 11. General Requirements and Covenants.

Section 1101

1101.02, Definitions of Abbreviations.

Add the following abbreviations:
ASA - American Standards Association
IMSA - International Municipal Signal Association
NSF - National Sanitation Foundation
OSHA - Occupational Safety and Health Administration
SUDAS - Statewide Urban Design and Specifications

Replace “ACT” with “ACI” in the list of abbreviations.

Replace “HMA - Hot Mix Asphalt” with “HMA - Hot Mix Asphalt”.

1101.03, Definition of Terms.

Add definitions:

Approved Equal (Equivalent).
A product or material that, upon review of the Engineer, is determined to meet or exceed the requirements called for by the specifications. Upon approval, the item will be allowed in lieu of the specified material or product.

Bid Amount.
The aggregate sum obtained by totaling the amounts arrived at by multiplying the number of units of each class of work, as shown in the proposal form, by the unit price specified in the proposal form for that class of work.

Bid Bond.
See Proposal Guaranty.

Bid Item.
See Contract Item (Pay Item).

Completion Date.
The date on which all work specified in the contract is completed.

Contract Unit Price.
The price bid by the Contractor for one unit of work, as defined by the specifications.

Developmental Specifications.
Additions and revisions to the standard, general supplemental, and supplemental specifications covering the development of new construction items or changes to a process. They only apply to a project when noted in the proposal form.

General Supplemental Specifications.
Specifications adopted by the Department’s Specification Committee subsequent to the publication of this book. They involve changes in the Standard Specifications and apply to all contracts. Published in April and October of each year.

Jurisdiction.
Political subdivision acting through its governing body, or through the authorized representatives of such governing body when so authorized.

Jurisdictional Engineer.
See Engineer.

Liquidated Damages.
The dollar amount, estimated by the Engineer, and set forth in the contract documents, as the damage to the Contracting Authority or the public for delay in completion of the work.

Manhole.
See Utility Access.

Mobilization.
Preparatory work and operations for all items under the contract documents, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, buildings, and other facilities necessary for work on the projects; and for all other work or operations which must be performed or costs incurred prior to beginning work on the various items on the project site. Mobilization may include bonding, permit, and demobilization costs.

Optionally Combined Proposal.
The projects from two or more proposals combined by the Contracting Authority to allow the Contractor to bid all the projects as one contract.

Responsive Bid.
A bid submitted by a Contractor which is determined not to be an irregular proposal as defined by Article 1102.10 and fulfills the good faith effort recruitment requirements in Article 1102.17.

SUDAS Standard Specifications.
Refers to specifications developed by the Iowa Statewide Urban ~~Standard~~ Design and Specifications Program ~~for Public Improvements~~.

Specifications.
The general term comprising all the written directions, provisions, and requirements to which may be added or adopted Supplemental Specifications, Special Provisions, or Developmental Specifications, all of which are necessary for the proper performance of the contract documents.

Speed Limit.
Refers to the legally established speed limit before construction and not the advisory speed during construction.

Street.
See Road.

Unit Price.
See Contract Unit Price.

Utility.
Includes all privately, publicly, municipally, or co-operatively owned structures and systems for supplying water, sewer, electric lights, street lights and traffic lights, gas, power, telegraph, telephone, communications, transit, pipelines, and the like.

Utility Access.
An inline structure to allow personnel access and maintenance of underground utilities.

Utility Agency.
Means and includes (1) all franchised utilities having utility system facilities within State or local jurisdiction right-of-way, including but not limited to gas, electric, telephone, cable television, and communications; (2) communications systems allowed by the State or local jurisdiction; and (3) all governmental agencies owning or operating governmental utility systems, including but not limited to water, sewer, traffic control, and communications.

Waters of the United States.
All waters, impoundments of waters, or tributaries of waters, including but not limited to lakes, rivers, streams, intermittent streams, mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, or natural ponds.

Work Area.
That portion of the project area in which construction activity is ongoing.

Replace definitions:

Contract (Also Contract Documents).
The written agreement between the Contracting Authority and the Contractor setting forth the obligations of the parties thereunder, including but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment.

The contract includes the following: addendum, contract bond, contract form, Materials Instructional Memorandums, Notice to Bidders, Notice to Proceed, plans, proposal, Special Provisions, Standard Specifications, Developmental Specifications, and Supplemental Specifications; also any change orders and agreements which are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

Contract Item (Pay Item).
A specifically described unit of work for which a price (either unit or lump sum) is provided in the contract.

Culvert.
Any structure not classified as a bridge or storm sewer which provides an opening under any roadway or embankment, except that such term shall not include tiles crossing the road, or intakes thereto, where such tiles are part of a tile line or system designed to aid subsurface drainage.

Engineer.
For the Department, the Engineer is the Chief Engineer. For publicly owned projects, the Engineer is a Professional Engineer licensed in the State of Iowa and the authorized representative of the Contracting Authority. For privately contracted projects, with improvements that are to become publicly owned, the Engineer is the authorized representative of the public entity ultimately accepting ownership of the improvements. For all other projects, the Engineer is the owner's authorized representative.

The Engineer may act directly, or through duly authorized representatives, acting within the scope of the particular duties assigned to the Engineer, or of the authority given the Engineer.

Interstate Project.
A Primary project on the Federal System of Interstate and Defense Highways. Includes projects on county and city road bridges over the Interstate.

Laboratory.
The testing laboratory of the Contracting Authority, or any other testing laboratory which may be designated in the contract documents.

Lump Sum.
The contract amount is complete payment for all work described in the contract documents and necessary to complete the work for that item. Changes in payment will be made for obvious errors or authorized additional work that was not included in the work to be bid by lump sum.

Primary Project.
A project on the Primary road System of Iowa and extensions thereof in cities and towns. Includes projects on county and city road bridges within an interchange of a Primary road with a county road or city road.

Project Area.
The right-of-way between the project limits shown in the contact documents, and additional area which is necessary for the Contractor to place traffic control devices required by the contract documents or necessary to protect the work.

Proposal Form.
The approved form which includes Special ProvisionsText listing applicable Supplemental Specifications, Developmental Specifications, Special Provisions, and other requirements of the project(s) on which the Contracting Authority requires formal bids to be prepared and submitted for the work.

Roadway.
The portion of the right-or-way designed or ordinarily used for vehicular travel.

Special Provisions.
Additions and revisions to the Standard, General Supplemental, Developmental, and Supplemental Specifications covering conditions peculiar to an individual project. They only apply to a project when noted in the proposal form.

Standard Specifications.
The requirements contained herein applying to all contracts, and pertaining to the method and manner of performing the work, or to the quantity and quality of the materials to be furnished under the contract.

Structures.
All objects constructed of materials other than earth, required by the contract documents to be built, or to be removed, but not including pavement, surfacings, base courses, and subbases. Includes bridges, culverts, intakes, drop inlets, retaining walls, cribbing, manholes, handholes, end walls, buildings, sewers, service pipes, subdrains, foundation drains, and other features which require engineering analysis.

Supplemental Specifications.
Specifications adopted subsequent to the publication of this book. They involve new construction items or changes in the Standard Specifications. They only apply to a project when noted in the proposal form. Generally published in April and October of each year.

Delete the following definitions:

~~**Invitation for Bids.**~~
~~See Notice to Bidders.~~

~~**Work Order.**~~
~~A written order, signed by the Engineer, of a contractual status requiring performance by the Contractor without negotiation of any sort, and which may involve starting, resuming, or the suspension of work. (Not to be confused with change order.)~~

Section 1102

1102.01, Competency and Qualification of Bidders.

Replace “16” with “18” in the second sentence of the second paragraph.

Replace the definition of CURRENT in the third paragraph with:
CURRENT = current assets ~~minimum~~ minus current liabilities.

Replace the first sentence of the fourth paragraph:
The Contracting Authority will qualify Contractors into three categories~~: which are further explained in Article 1102.04~~.

1102.01, A, Individually Prepared Statement.

Replace “and” with “an” in the first sentence of the second paragraph.

1102.01, C, CPA Audit Statement.

Replace the third sentence of the second paragraph:
However, a prospective bidder shall be considered to have an “Unlimited” bidding capacity with the Department if they were awarded over $50 million of work (including that from other Contracting Authorities) during their past fiscal year and have a prequalification limit, by the formula, over $100 million.

1102.04, Contents of Proposal Forms.

Replace the second paragraph:

The statement, "By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa where applicable," which is on the bidding document shall not be applicable to contracts involving Federal-aid participation in construction.

1102.07, Estimate of Quantities.

Replace the entire article:

The proposal form will contain a Schedule of Prices that lists the items of work on the project(s). The Schedule of Prices, which shall be completed and submitted by each bidder, will be used for comparing bids for award of the contract.

Contract items listed in the Schedule of Prices will be either Unit Price or Lump Sum.

The contract documents may also include a list of items that are noted as incidental. Incidental work is normally minor in scope and is clearly described in the contract documents. The cost to complete incidental items shall be included in the contract unit price bid for the item to which they are listed as incidental. Additional payment will not be made for incidental items unless there are obvious errors or changes to the quantity of the incidental item. An item of work, normally paid for separately, but not listed in the contract documents as incidental, will be paid for in accordance with Article 1109.03, B.

1102.08, Examination of Plans, Proposal Form, Specifications, Supplemental Specifications, Developmental Specifications, Special Provisions, and of Site Work.

Replace the title and the first sentence:

1102.08, EXAMINATION OF PLANS, PROPOSAL FORM, SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, AND SITE OF WORK. It is the responsibility of the bidder to examine the plans, proposal form, Standard Specifications, Supplemental Specifications, Developmental Specifications, Special Provisions, the site of the work, and the state of the work of other contractors on the project to assure that all requirements of the proposal form and the plans are fully understood.

1102.09, Preparation of Proposals.

Replace the second sentence of the first paragraph:

For bids submitted to the Department that exceed $600,000, the Contractor shall use subparagraph B or subparagraph C below. The Department may waive this requirement for unique or isolated situations.

1102.09, B, (following the first paragraph)

Delete the word “Expedite”.

1102.09, C, (following the first paragraph)

Replace the entire paragraph:

Submit an electronic bid with digital signature using the bidding software furnished by the Department and the electronic bid submittal procedures of the Department.

1102.11, Proposal Guaranty.

Replace the first sentence of the first paragraph:

Each proposal shall be supported by a proposal guaranty in the form and amount prescribed in the proposal.

Replace the last sentence of the second paragraph:

Certified checks and credit union share drafts shall be certified, or the cashier’s check shall be drawn and endorsed, in an amount not less than prescribed in the proposal.

Replace the last sentence and list of the third paragraph:

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 Signature of Contractor: In case of joint venture bid, all contractors must sign.
Name of the Surety Company
Original Signature of Surety (if Surety's limitation is less than the amount of the bid bond, a certificate of reinsurance must be attached).

Replace the fourth paragraph:

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
Original signature of the Contractor
Date of signature
Name of the Surety Company
Original signature of the Surety

1102.12, Filing of Proposal.

Add second paragraph:

The Contracting Authority may take bids on the same project as an individual proposal or part of an Optionally Combined Proposal. When an Optionally Combined Proposal is designated, the consideration for award of contracts will be based on which of the following gives the lowest total cost:

1. The sum of the lowest responsible bid on each of the individual proposals.

2. The lowest responsible bid on the Optionally Combined Proposal.

1102.13, Withdrawal of Proposal.

Add after the first paragraph:

The bidder will be permitted to withdraw their proposal under the following three conditions:

A. The bidder may withdraw a proposal unopened if such a request is made in writing and received at the Department prior to the time specified in the advertisement for receiving bids. A proposal so withdrawn may be resubmitted as long as it is resubmitted prior to the deadline for receipt of bids.

B. If, after bids are open, the low bidder should claim a serious error in the preparation of the bid, and can support such a claim with evidence satisfactory to the Department, the bidder may be permitted to withdraw the bid and the bid guarantee may be returned. In such an event, action on the remaining bids will be considered as if the withdrawn bid had not been received. Under no circumstances will the bidder be permitted to alter the bid after the bids have been opened.

The Department will keep the bidder's proposal guarantee unless the bidder satisfies all four of the following conditions:

1. The mistake must be a clerical mistake as opposed to a mistake involving poor judgment concerning a construction process. The bidder must be able to produce bid preparation documentation to show how the clerical error occurred.

2. The bidder must immediately notify the Department as soon as the error is observed.

3. The scope of the mistake must be significant. The size of the mistake when compared to the overall project must be significant enough to cause major financial difficulties if the bidder is forced to complete the project at the price quoted.

4. The Department should not be placed in a worse position than if the bid had never been submitted.

C. The bidder may withdraw their bid from consideration if a contract has not been offered them within 30 calendar days after the letting and the bidder has not requested approval for award be deferred.

1102.17, Disadvantaged Business Enterprises.

Replace the first paragraph:

All contractors shall pursue affirmative action requirements to encourage and increase participation of disadvantaged individuals in business enterprises in all Federal-aid projects let by the Department, ~~is~~ as set forth in this specification which is imposed pursuant to 49 CFR Part 26 Subpart A through F and Public Law 105-178, 112 Stat. 107 which supersedes all existing minority business enterprise regulations, orders, circulars, and administrative requirements concerning financial assistance programs that the United States Department of Transportation has issued.

1102.17, C, 7, Transportation or Hauling of Materials.

Replace the first sentence:

If a DBE trucking company picks up a product from a manufacturer or regular dealer and delivers the product to the Contractor, the commercially useful function performed is not that of a supplier, but that of a transporter of goods.~~,~~ ~~u~~Unless the DBE company is itself the manufacturer or a regular dealer in the product, credit only will be allowed for the cost of the transportation service.

1102.17, D, Contract Award Procedures.

Add a new third sentence:

The bidder may only use work on the federal aid projects on the proposal to achieve the DBE goal.

Replace the fourth sentence:

The proposal may also designate the items of the federal aid project that are over utilized by DBE firms and cannot be used for DBE commitments.

Indent the two paragraphs following Article 1102.17, D, 2. These paragraphs apply to Article 1102.17, D, 2.

1102.17, D, 2, Proposals With Established Project DBE Goals.

Change the third paragraph to be item “h” in the second paragraph.

h. The “DBE Commitment” of each DBE firm which will be counted towards the total DBE commitment of the contract.

1102.17, D, 3, c, Contractors with History of Utilizing DBEs.

Replace the first two paragraphs:

A bidder who has demonstrated their ability to utilize DBE firms on both Federal-aid and non-Federal-aid projects let by the Department in the 24 months prior to the letting will be assumed to have made a Good Faith Effort to achieve the project goal.

The Department’s objective evaluation of prior usage of DBE firms will include all contracts let by the Department that were awarded to the Contractor during the 24 months prior to the letting. The calculation will include the sum of the following:

1102.17, D, 3, c, 1).

Replace the first paragraph:

1) One point for each percentage of average DBE subcontracted dollars for the 24 months prior to the letting (e.g. an average 7.5% dollars subcontracted to DBE equals 7.5 points)

1102.17, D, 3, c, 3) and 4).

Delete Sub-Articles 3) and 4):

~~**3)** A range of minus 2.0 points to plus 2.0 points for usage of multiple DBE firms using the following formula:~~

~~X = No. DBE firms used / No. DBE subcontracts~~
~~No. Subcontractors used / No. Subcontracts~~

~~X~~	~~Points~~
~~<.80~~	~~-2.0~~
~~.80 – .84~~	~~-1.5~~
~~.85 – .89~~	~~-1.0~~
~~.90 – .94~~	~~-0.5~~
~~.95 – 1.05~~	~~0.0~~
~~1.06 – 1.10~~	~~0.5~~
~~1.11 – 1.15~~	~~1.0~~
~~1.16 – 1.20~~	~~1.5~~
~~>1.20~~	~~2.0~~

~~**4)** Up to 4.0 points for participating in DBE assistance programs (e.g. formal mentor protégé programs, big brother/sister programs, or other programs to assist DBEs) in which the Contractor is currently involved. Participation in a formal mentor protégé program would be required to earn more than 2.0 points.~~

Replace the third paragraph (follows the sub-articles):
A contractor under consideration for having a history of utilizing DBE firms must have been awarded at least two contracts during the period being reviewed. Contractors who have used the same DBE firm for over 50% of their subcontract dollars with DBE firms will not be considered as having a history of utilizing DBEs.

1102.17, E, 1.

Replace the second sentence:
After adequate notice by the Contractor, if any DBE is unable to perform, the Contractor shall inform the Engineer of the reasons why a DBE will be unable to complete the work for which they were committed.

1102.17, E, 2.

Delete the entire Article:

~~**2.** Each month all certified DBE firms shall submit to the Contracts Engineer a list of projects and the dollar amounts they have been paid on each during the prior month. This information is necessary to compute the volume of Federal-aid contract dollars being paid to DBE firms.~~

1102.17, E, 3 and 4.

Re-number Article 1102.17, E, 3 and 4, to Article 1102.17, E, 2 and 3, respectively.

1102.17, E, 2.

Replace the last sentence:
Before offering the assistance, the Contractor shall notify the Engineer and obtain the written approval of the Contracts Engineer.

1102.17, F, Post Construction Requirements.

Replace the second sentence of the first paragraph:

This certificate shall be submitted on all Federal-aid contracts, where a DBE performed work and shall list the dollar amounts paid to all DBE firms on the contract.

Replace "penalty" with "price adjustment" in the second and third sentences of the second paragraph.

Replace the last paragraph:

Failure to meet the specified DBE commitment to each DBE firm will result in a price adjustment of an amount equal to the difference between the actual DBE dollars paid and the Contractor's adjusted DBE commitment to that DBE firm.

1102.17, H, Sanctions for Failing to Comply with the Intent of the DBE Regulations.

Add a new article:

H. Sanctions for Failing to Comply with the Intent of the DBE Regulations.

1. DBE Firms.

The ability to be eligible to receive DBE goal work is a privilege made available to a select group of firms. Firms that abuse this privilege may have their ability to be counted towards the DBE goal restricted if the firm fails to perform their work consistent with common industry practices. Examples of not performing work consistent with common industry practice include, but are not limited to:

a. Patterns of failing to perform a commercially useful function for work quoted to meet a DBE goal.
b. Patterns of failing to complete the work with their own organization for work quoted to meet a DBE goal.
c. Patterns of failing to pay for all labor and materials for the work they have subcontracted to meet a DBE goal.
d. Patterns of failing to perform the work they have subcontracted.
e. Patterns of failing to notify the prime contractor in a timely manner when their work schedule makes it impossible for them to begin subcontract work at the requested time.
f. Patterns of failure to furnish documents (e.g. certified payrolls, material test reports, etc.) within the timeframes allowed by the specifications.

The Department will provide written notice to the DBE firm, informing them of any proposed sanction. The DBE firm will have 14 calendar days, from the receipt of the certified notification, to make a written request for a hearing. The appeal hearing will be held with a three-person committee consisting of representatives from the Office of Contracts, Office of Construction, and a district office. If the Department does not receive a written request for a hearing, or if the DBE firm does not provide sufficient evidence at the hearing to refute the violations, the Department may suspend the DBE firm from the ability to be counted towards the commitment on projects with DBE goals. The duration of the suspension will be determined based on the severity of the violation and the number of prior suspensions of the DBE firm.

2. Prime Contractors.

Contractors who show a pattern of non-compliance with the DBE requirements of the contract may be suspended from bidding on contracts that have DBE goals. Examples that would indicate a lack of good faith effort to comply with the DBE requirements include, but are not limited, to:

a. Patterns of performing work with their own organization, or having another company perform work, which was committed to a DBE firm to meet a DBE goal.
b. Patterns of not keeping the DBE firms posted on the status of their projects, and not providing advance notification to the DBE when their subcontract work will be available to the DBE firm.
c. Patterns of not promptly paying DBE firms for completed work in accord with Article 1109.05.
d. Not treating DBE firms as they would any other subcontractor on the project.

The Department will provide written notice to the Contractor, informing them of any proposed sanction for failure to comply in good faith with the intent of the DBE regulations. The Contractor will have 14 calendar days, from the receipt of the certified notification, to make a written request for a hearing. The appeal

hearing will be held with a three-person committee consisting of representatives from the Office of Contracts, Office of Construction, and a district office. If the Department does not receive a written request for a hearing, or if the Contractor does not provide sufficient evidence at the hearing to refute the violations, the Department may suspend the Contractor from bidding on projects that have DBE goals. The duration of the suspension will be determined based on the severity of the violation and the number of prior suspensions of the Contractor for DBE sanctions. The sanctions may be extended beyond contracts with DBE goals if the Contractor's treatment of DBE firms has extended beyond contracts assigned DBE goals.

1102.18, C, Positive TSB Effort Documentation.

Add as the second paragraph:

On proposals where a specific TSB goal has been established, the contractor will be required to submit the TSB form with their bid. The TSB form will be provided by the Contracting Authority and used to document the TSB participation that shall be attained. The Contracting Authority will determine if the bidder has made adequate Good Faith Effort to meet the established goal. Bidders who fail to make such Good Faith Effort may have their bid rejected on the basis of being non-responsive to meeting the established TSB goal.

1102.19, C, 4, Payment to Trainees.

Replace the title and entire article:

Payment of Trainees.

On contracts with a predetermined wage rate, trainees must be paid at least the journeyman's wage unless the trainee is enrolled in an approved U.S. Department of Labor (DOL) training program. Trainees in approved U.S. DOL training programs shall be paid the appropriate rates approved by the U.S. DOL or Iowa DOT.

1102.19, D, 5, Placement of EEO/AA Notices and Posters.

Replace entire article:

5. Placement of EEO/AA Notices and Posters.

The Contractor shall place the following notices and posters on a bulletin board at the project site in areas readily accessible to employees and potential employees:

a. Notice provided by the Iowa DOT listing the names, addresses, and phone numbers of the Contractor and all approved subcontractors.

b. Form EEOC-P/E-1, stating "Equal Employment Opportunity is THE LAW".

c. Form FHWA-1022, regarding any false statement, false representation, false report, or false claim made in connection with any Federal or Federal-aid highway or related project.

d. Form FHWA-1495, regarding wage rate information for a Federal-aid highway project, required only if Davis/Bacon predetermined wage rates apply to the project.

e. Current Iowa Predetermined Wage Rate Decision, identifying Davis/Bacon predetermined wage rates for the State of Iowa. The wage rate decision shall be arranged on a bulletin board so that all wage rate and classification information is visible.

f. IOSH 30 Safety and Health Protection on the Job.

g. WH-1420 Your Rights Under the FMLA Act of 1993.

h. WH-1462 Notice: Employee Polygraph Protection Act.

i. Form FHWA-1495A (Spanish version of form FHWA-1495), stating "Informacion Sobre Escalas De Salarios Proyecto De Carretera Con Ayuda Federal", required only if Davis/Bacon predetermined wage rates apply to the project.*

j. Form EEOC-P/S-1 (Spanish version of form EEOC-P/E-1), stating "La Igualdad de Oportunidades De Empleo Es LA LEY".*

* These forms are not required, but it is strongly recommended that these two Spanish notices be posted whenever the company employs and/or anticipates receiving applications from those who speak Spanish.

All required postings shall be in place when work commences on a project and shall remain in place through completion of the project.

Progress payments to the Contractor will not be made until these notices and posters are displayed at the required site.

1102.19, F, 1, c, 3

Replace “Article 1102.19/F, 2, b” with “Article 1102.19, F, 2, b”.

Section 1103

1103.05, Requirement of Contract Bond.

Replace the first sentence:

On all contracts, the Contractor shall file an acceptable bond in an amount not less than 100% of the contract sum with the Contracting Authority; however, the amount of the contract bond does not need to include the predetermined costs for incentives or bonuses shown on the contract.

Section 1104

1104.09, Right-of-Way.

Add as last sentence of article:

Permission of the property owner may be necessary to access some parcels prior to the letting.

1104.11, Public Utilities.

Delete the entire article.

Section 1105

1105.03, Working Drawings

Add as the second, third, fourth, and fifth paragraphs:

For non-Primary projects, working drawings shall be submitted to the Engineer unless noted otherwise in the contract documents.

For Primary and Interstate projects, all submittals shall be processed by the Contractor and sent to the Review Office identified in the table below with a copy of the cover letter sent to the Resident Construction 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).

Unless otherwise specified in the contract documents, Contractor submittal time shall be subject to the specified review time and the Contractor's need based on their schedule for the work.

When the contract documents specify submittals to be sent to the Design Consultant, copies of the cover letter shall be sent to the specified Review Office, Resident Construction Engineer, and District Materials Engineer.

DESCRIPTION	REVIEW OFFICE	NUMBER OF COPIES	REVIEW TIME (calendar days)
Falsework for slab bridges	Bridges and Structures	2	30
Cofferdam design (when required)	Bridges and Structures	2	30
Reconstruction of substructure (detailed plans for supporting the superstructure)	Bridges and Structures	2	30
Steel Structures	Bridges and Structures	7	30
Detail plans for falsework or centering support of steel structures (i.e. erection plans)	Bridges and Structures	2	30
Steel and aluminum pedestrian hand rails	Bridges and Structures	2	30
Highway sign support structures (i.e. trusses, cantilevers, & bridge mounts)	Bridges and Structures	2	30
Precast concrete (i.e. deck panels, RCB culverts, noise wall panels, arch sections, etc.)	Bridges and Structures	2	30
Tower lighting	Bridges and Structures	2	30
Highway lighting	Traffic & Safety	2	30
Highway signing steel breakaway posts	Traffic and Safety	2	30
Traffic signalization*	Traffic and Safety	2	30
Highway signing - Type A & B signs	Traffic and Safety	2	30
Bridge components	Bridges and Structures	2	30
Pre-engineered steel truss recreational trail bridge	Bridges and Structures	2	30
MSE, segmental, & modular block retaining walls	Design (Soils Design Section)	Preliminary submittal: 3 design calculations, 3 shop drawings, & 3 field construction drawings Final submittal: 3 design calculations, 3 shop drawings, & 3 field construction drawings	30 14
Soil nail & tie-back retaining walls	Design (Soils Design Section)	6 final design plans	60
Intermediate foundation improvement (IFI) (i.e. stone columns, geopiers, etc.)	Design (Soils Design Section)	4 design calculations & 8 field construction drawings	30
Removal of box girder bridges	Bridges and Structures	2	30
Structural erection manual	Bridges and Structures	2	30
Temporary shoring	Bridges and Structures	2	30
Temporary sheet pile retaining wall	Bridges and Structures	2	30
Safety grates for RCB culverts	Bridges and Structures	2	30
* Submittal time shall be within 45 calendar days from the date of award of contract.			

1105.04, Conformity with and Coordination of the Contract Documents.

Replace the list:

1. Addendum
2. Proposal Form
3. Special Provision
4. Plans

5. Standard Bridge Plans, Standard Culvert Plans, and Standard Road Plans
6. Developmental Specifications
7. Supplemental Specifications
8. General Supplemental Specifications
9. Standard Specifications
10. Materials I.M.

1105.06, Construction Stakes.

Add as first sentence of first paragraph:
Minimum standards for Construction Survey provided by the Engineer will meet the requirements of Section 2526.

1105.13, Temporary Primary Road Haul Roads.

Replace the second sentence of the third indented paragraph following the second unindented paragraph:
Haul route requests shall be submitted to the Engineer.

Replace the seventh sentence of the third indented paragraph following the second unindented paragraph:
If the Contractor fails to provide haul road information within the time allowed, the Department will have the right to establish a route without increased compensation to the Contractor.

1105.14, Placement of Fill Material in Streams and Water Bodies.

Replace the title and the entire article:

1105.14 Protection of Water Quality and Wetlands.
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 may be required.

When required, the Contracting Authority will obtain a Section 404 permit 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 Iowa 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.

1105.15, Value Engineering Incentive Proposal.

Replace the second sentence of the third paragraph:
Proposed changes that involve the basic design of a bridge or pavement type, or involve the use of mechanical dowel bar inserters will not be considered an acceptable incentive proposal.

Section 1106

1106.01, Source of Supply and Quality Requirements.

Replace “Materials I.M.s 209 and 210” with “Materials I.M.s 209 and 213” in the fourth paragraph.

Section 1107

1107.07, Safety, Health, Pollution, and Sanitation.

Delete the second paragraph:

~~A safety inspection will be required at the beginning of each major phase of the operation. Repeated inspections may be necessary for phases of long duration. All safety inspections shall be made and reported by the Contractor's safety officer, even though that phase of the operation may be subcontracted. The times of these inspections should be identified at the preconstruction conference or before work is started. The Engineer shall be given reasonable notice with an opportunity to witness the inspection, and the Engineer shall receive a copy of a written report.~~

1107.08, Public Convenience and Safety.

Add as the sixth, seventh, and eighth paragraph:

On two-lane two-way roadways, a work area shall be established only on one side of the roadway and there shall be no parking of vehicles or equipment on the opposite shoulder within 500 feet (150 m) of the work area.

The location for storage of equipment by the Contractor during nonworking hours shall be as reviewed and approved by the Engineer prior to use.

Parking of private vehicles on Interstate right-of-way will not be allowed. Parking of unattended equipment within the median or storage of equipment within 50 feet (15 m) of the edge of pavement will not be allowed.

Add as the eleventh paragraph:

Shoulder construction in conjunction with PCC overlay or HMA resurfacing shall meet the following:

A. Paved Shoulders (Partial or Full Width).

Construction shall be staged so no drop-offs exist at the pavement or shoulder edge when the adjacent lane is to be opened to traffic. The pavement edge drop-off requirement shall be satisfied with an HMA shoulder fillet. This fillet shall extend into the shoulder area a minimum of six times the thickness of the drop-off and shall be placed prior to the adjacent lane being opened to traffic. Compaction of the HMA fillet shall be a minimum of one coverage with a pneumatic tired roller per 1 inch (25 mm) of thickness. The fillet shall be removed prior to start of shoulder paving. The shoulder edge drop-off requirement shall be satisfied with a granular fillet, meeting the requirements of the following paragraph.

B. Granular Shoulders.

Construction shall be staged so no drop-offs exist at the pavement edge when the adjacent lane is to be opened to traffic. The drop-off requirements shall be satisfied with a shoulder fillet or full shoulder width of granular material according to Article 2121.07. The fillet shall extend into the shoulder area a minimum of six times the thickness of the drop-off and shall be placed prior to the adjacent lane being opened to traffic. Compaction of the fillet shall be a minimum of one coverage with a pneumatic tired roller per 1 inch (25 mm) of thickness.

Replace the twelfth paragraph:

When the Contractor works on a bridge spanning a roadway or passageway, the Contractor shall take all necessary steps to protect the public using the facility below the bridge from falling debris, material, or construction equipment. The Contractor shall submit a safety procedure written plan to the Engineer prior to starting work. The plan shall include the following:

- Design of the means and methods used to provide protection.
- All assumptions used in the design.

Add as the thirteenth paragraph:

Evaluation of the plan and design may require its preparation by a Professional Engineer licensed in the State of Iowa. If so, the costs will be paid for in accordance with Article 1109.03, B.

1107.09, B, Responsibilities of the Contractor.

Replace “Article 2528.12” with “Article 2528.13” in the last sentence of the first paragraph.

Change the last three paragraphs following the second paragraph of Article 1107.09, B, 12, to be un-indented as they are applicable to the entire Article 1107.09, B.

Add as the second sentence of the fourth unindented paragraph:

Individual intersections that must be closed for the paving train (tack application through final rolling) to pass shall have a flagger stationed at each approach to control side road traffic.

1107.09, B, 1, Intersecting Local Public Roads.

Replace “Article 2528.12” with “Article 2528.13” in the last sentence of the first paragraph.

1107.09, B, 2, Entrance from Local Public Roads.

Replace “Article 2528.12” with “Article 2528.13” in the last sentence.

1107.09, B, 3, Shoulder Drop-Offs.

Replace the entire article:

Drop-offs at paved and granular shoulders shall be treated as provided in Article 1107.08. All other drop-offs shall be handled in accordance with project plan requirements.

1107.09, B, 9, Cleaning.

Replace the entire article:

The reflective surfaces of signs and traffic control devices shall be washed, as described in Article 2528.11, and shall be clean at the time of initial installation on a project.

1107.09, B, 11, Lane Drop-off or Rise.

Delete the title and the entire article.

1107.09, B, 12, Two Way Traffic Signs on Four Lane Highways.

Delete the title and the entire article.

1107.12, Responsibility for Damage Claims.

Replace the entire article:

The parties agree that it is their intent that there be no third-party beneficiaries to this contract. No provision of this contract; or of any addendum, materials instructional memorandums, plan, proposal, special provision, developmental specification, supplemental specification, or general supplemental specification; shall be construed as creating any third-party beneficiaries.

The Contractor shall indemnify and save harmless the Contracting Authority and other agencies which have concurred in the award of the contract, as well as their officers and employees, from all suits, actions, or claims of any character, except as provided in the next sentence. Indemnity shall not, however, extend to acts or omissions for which the Contracting Authority is solely responsible, though it shall extend to those claims, actions, or suits in which the Contractor, Subcontractor, or either's employee or agent, and the Contracting Authority are alleged to be, or could be, jointly or concurrently liable. Any funds due said Contractor under the Contractor's contract as may be considered reasonable and necessary by the Contracting Authority for such purpose may be retained for the use of the Contracting Authority; in case no money is due, the Contractor's surety may be held until such suit or suits, action or actions, claim or claims have been settled and suitable evidence to that effect furnished to the Contracting Authority, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence of insurance covering the claim, action, or suit.

The Contractor's responsibility for providing warning devices required by Article 1107.09 to avoid damages or injuries to the traveling public on any portion of the road covered by the contract shall not cease until the work on such portion has been released by the Engineer. A "release" in this context means a written statement by the Engineer stating that the Contractor may cease to maintain barriers and lights, that the road may be opened to traffic, and that the Contractor is relieved of further maintenance of that portion of the road. This release shall not constitute an acceptance of the work.

The Contractor's responsibility for maintenance of lights on any individual structure will cease when, and only when, the Engineer has issued a written release to that effect or there has been final acceptance of the structure.

1107.15, Contractor's Responsibility for Utility Property and Services.

Replace the title and the entire article:

1107.15, Contractor's Responsibility for Utility Facility and Services.
The Contracting Authority will endeavor to have all necessary adjustments made to public or private utilities within or adjacent to the limits of construction prior to construction activities, except those requiring coordination with the Contractor. Utility facilities have been plotted from available surveys and records, and shall be considered approximate. Other utilities may exist and their location may not be presently known or identified on the plans. The Contractor shall notify Iowa One-Call at 1-800-292-8989 to identify the location of all underground utility facilities within the construction area.

The Contractor shall determine the exact location of all public and private utility facilities located within the construction area to avoid damage in accordance with Section 480.4, Code of Iowa. The Contractor shall have considered in their bid all permanent and temporary utility appurtenances in their present or adjusted positions as shown in the contract documents. For projects not developed under 761 IAC, Chapter 115.25 and not designated as POINT 25 projects in the contract documents, additional compensation will not be allowed for any delays, inconvenience, or damage sustained by the Contractor due to any interference from the utility appurtenances or their operation or relocation.

Where existing utility facilities are shown in the contract documents or encountered within the construction area, the Contractor shall notify the utility company prior to beginning construction activities. The Contractor shall be responsible for notifying utilities and conducting work near utility facilities, required by Section 480.4, Code of Iowa.

Any system for supplying water, gas, power, or communications; a storm sewer, sanitary sewer, drainage tile, or other system for transmitting liquids; a pipeline system; traffic signalization system; and lighting systems within the limits of the proposed construction, which are to be adjusted, are to be moved by the utility company at their expense, except as otherwise provided for in the contract documents.

The Contractor shall cooperate with utility companies in their adjustment operations so that these operations may progress, that duplication of adjustment work may be reduced, and that services rendered by those parties will not be interrupted.

Where the Contractor's operations are adjacent to properties of railway, communication, or power companies, or are adjacent to other utility facilities where damage might result in considerable expense, loss, or inconvenience, work shall not begin until all arrangements necessary for protection of the facilities have been made.

In the event of interruption to utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the authority in restoration of service. If a utility service is interrupted, repair work shall be continuous until service is restored.

Primary projects developed under 761 IAC, Chapter 115.25 and designated as POINT 25 projects in the contract documents, where the utility company's adjustment is dependent on work by the Contractor, the Contractor shall provide the Contracting Authority and the utility company a good faith notice 14 calendar days and a confirmation notice not less than 3 working days before the Contractor's work will be complete and ready for the utility company to begin its work. If the utility fails to complete the adjustment of its facilities and fails to submit or comply with its accepted work plan as referenced in the Utility Status Report in the contract documents, and these failures result in a delay to the Contractor or causes damages to be incurred by the Department or Contractor, the utility may be liable for costs and damages incurred as a result of its failure to perform.

Section 1108

1108.01, Subletting of Contract.

Replace 50% with 30% in the first paragraph.

Add as the second sentence of the first paragraph:
The percent of total contract subcontracted will be computed on Contract Unit Prices for work performed by the subcontractor, unless the subcontractor is only doing partial work on the contract item.

Replace the second paragraph with a new second and third paragraph:
Except for the furnishing and transportation of materials, no portion of the contract shall be sublet, assigned, or otherwise disposed of except with written consent of the Contracting Authority. Where a subcontract has been approved, the approved subcontractor shall be responsible to complete that portion of the contract with its own organization.

Where a subcontract does not exist, but a DBE firm is manufacturing, supplying, or trucking materials to the job site; terms of the agreement shall be described and documented on the Subcontract Request and Approval form (Form 830231). This will assure the Engineer that a Contractor is meeting commitments previously stated on the Statement of DBE Commitments form (Form 102115). This dollar value will not be used to determine the percent subcontracted as specified previously. Where Davis/Bacon wage requirements apply, the Contractor shall be responsible for collecting and submitting certified payrolls for all drivers. Owner/operators shall be listed on the certified payrolls as owner/operators.

Add as the second sentence of the last paragraph:
For contracts that exceed $600,000, the Contractor shall submit the Subcontract Request and Approval form electronically using the software furnished by the Department.

1108.02, D, Charging of Working Days.

Replace the first paragraph:
The Contractor will be charged working days as defined in Article 1101.03 and this article. For multiple site contracts, working day charges for each site will be charged independently based on the controlling operation for the site.

Add this indented paragraph after the numbered list in the second paragraph:
However, working days will not be charged prior to 15 calendar days after the contract has been signed by the Contracting Authority, as long as the Contractor furnished the signed contract, performance bond, and proof of insurance within the time allowed by Article 1103.07; and has not begun work on the contract.

Add as first two sentences of fourth paragraph:
The Contractor will be charged 1/2 working day when weather or other conditions beyond the control of the Contractor permit work for at least 1/2 but less than 3/4 of a working day. The Contractor will not be charged a working day when weather or other conditions beyond the control of the Contractor prevent work less than 1/2 of a working day.

Delete the third paragraph:
~~For multiple site contracts, working day charges for each site will be charged independently based on the controlling operation for the site.~~

Section 1109

1109.01, B, 1, b, 1, Section 4151 Steel Reinforcement.

Add after the last paragraph:
All hard converted * metric reinforcing steel (bar size matrix shown on plans) may be substituted with English reinforcing steel or soft converted * metric steel as follows:

*NOTE: Hard Converted metric size reinforcing steel refers to bars referenced in ASTM A 615/A 615 M - 95b using the following sizes: 10, 15, 20, 25, 30, 35, 45, and 55.

Soft Converted metric size reinforcing steel refers to bars referenced in ASTM A 615/A 615 M - 96a using the following sizes: 10, 13, 16, 19, 22, 25, 29, 32, 36, 43, and 57.

Hard Converted* Metric Size	English Size	Soft Converted* Metric Size
10	4	13
15	5	16
20	6	19
25	8	25
30	10	32
35	11	36

The spacing or pattern of bar placement shall be as shown in the contract documents, and no changes in the spacing or the pattern will be allowed with the substitution.

1109.05, A, Progress Payments.

Replace the first three sentences of the first paragraph:

For work extending over a period of more than one month, the Contractor will receive monthly progress estimate payments based on the amount of work completed in an acceptable manner. For primary and secondary projects in which the Contracting Authority is the Department or a county Board of Supervisors, these progress payments will be bi-weekly if requested by the Contractor. For late payment, the Contracting Authority will pay a penalty of 1.0% per month (or part of a month), or a minimum of $250, whichever is the greater amount, on any work completed but not processed for payment within 14 calendar days after completion of the work. Completion of the work includes physical completion of the work and submittal of all paperwork required by the contract.

Delete the first sentence of the fourth paragraph:

~~The Engineer will certify that each payment is just and unpaid.~~

1109.05, B, Prompt Payment to Subcontractors.

Replace the third sentence of the first paragraph:

A payment, excluding retainage, to a subcontractor for satisfactory performance of the subcontractor's work shall be made by the Contractor no later than one of the following, as applicable:

Add as the last paragraph:

The use of joint checks for payment to subcontractors for their materials is acceptable under the following conditions:

1. The request for a joint check from the prime contractor is made by the materials supplier.
2. The joint check issued by the prime contractor is for an amount not to exceed the cost of unpaid invoice(s) from the materials supplier to a subcontractor on that contract.
3. The joint check is given to the subcontractor and the subcontractor must release the joint check to the material supplier.
4. The use of a joint check by the prime contractor is applicable to all their subcontractors.

1109.05, C, Retainage.

Replace the first two paragraphs:

Three percent of each progress estimate will be deducted and held as retainage on the first $1,000,000 paid on a contract. Additional retainage will be withheld to a maximum of $30,000 following a retainage release if subsequent work is performed.

The Contractor may withhold up to 5% of each progress estimate on work performed by subcontractors. All retained funds due a subcontractor shall be payable by the Contractor within 30 calendar days after completion of the work by the subcontractor. Non-bonded subcontractors may be required to submit proof of payment for all material bills and wages to the Contractor before the Contractor is required to pay the retainage.

The retained funds held by the Contracting Authority for the contract will not be due and payable prior to 30 calendar days after the date of final acceptance of the entire contract or following the release or adjudication

of claims that may have been filed, or until the Contractor has filed the signed final voucher with the Contracting Authority.

1109.05, Partial Payments.

Add two new articles D and E:

D. Complaints.
Compliance with prompt payment is the responsibility of both the Contracting Authority and Contractor.

If the Contractor feels the Contracting Authority has not complied with the prompt payment provisions, the initial attempt to resolve the issue shall be with the Project Engineer. The attempt to resolve the issue shall include at least one written request to the Project Engineer, stating the project number, items of work, quantities, unit prices, dates work was performed, total amount owed, and signature of a representative of the Contractor.

If a subcontractor feels the Contractor has not complied with the prompt payment provisions, the initial attempt to resolve the issue shall occur with the Contractor. The attempt to resolve the issue shall include at least one written request to the Contractor, stating the project number, items of work, quantities, unit prices, dates work was performed, total amount owed, and signature of a representative of the subcontractor.

If the initial attempt to resolve the issue does not result in satisfactory payment for completed work, the Contractor or subcontractor shall submit a written complaint to the Office of Contracts. The written complaint shall include copies of the correspondence with the Project Engineer or Contractor that provides the details stated above. The Department will investigate and provide written response to the complainant within 15 business days of receipt of the complaint.

E. Required Records.
The Contractor shall retain records that document the date of completion of the field work of each subcontractor and the date of final payment (including retained funds) to each subcontractor. Prior to receiving final payment, the Contractor shall provide to the Engineer the “Certification of Subcontractor Payments” (Form 518002). This form shall include the names of each approved subcontractor, the date of completion of the work, the date of final payment, the number of days between completion and final payment, and explanations for any final payments made after the 30 calendar day period following completion.

1109.07, Certified Statement of Sales Tax and Use Tax Paid.

Replace the entire article:
Contractors and approved subcontractors will be provided a Sales Tax Exemption Certification to purchase building materials, supplies, or equipment in the performance of construction contracts let by the Department.

1109.13, Claims Against Contractor.

Replace the entire article:
The Contractor guarantees the payment of all just claims against the Contractor or any of the Contractor's subcontractors in connection with the work. If another contractor on the project submits a claim for alleged damages caused by delay due to the Contractor not having completed the work in a timely manner, the Contractor's bond shall remain in effect until payment of such claim is made or until litigation is concluded, at which time the bond will be released.

Claims may be filed against the Contractor as provided in Chapter 573, Code of Iowa. The claims shall be submitted on forms provided by the Contracting Authority. The amount of retainage held by the Contracting Authority is described in Article 1109.05, C.

For public improvement projects let and paid by the Department, the claims shall be submitted to the Project Accounting and Payables Section, Office of Finance, Iowa Department of Transportation. For public improvements let by the County, claims shall be filed with the county auditor. For public improvements let by the City, claims shall be filed with the officer, board, or commission authorized by law to let contracts for such improvements.

The contract bond required by Article 1103.05 stipulates that the principal and sureties agree to pay to all persons, firms, or corporations having contracts directly with the principal or with subcontractors, all just claims due them for labor performed or materials furnished, in the performance of the contract on account of which the bond is given, when the same are not satisfied out of the portion of the contract price which the public corporation is required to retain until completion of the public improvements, but the principal and sureties shall not be liable to said persons, firms, or corporations unless the claims of said claimants against said portion of the contract price shall have been established as provided by law.

Division 20. Equipment Requirements.

Section 2001

2001.07, B, Special Procedures for Asphalt Mixtures and Aggregates.

Replace the title and entire article:

B. Special Procedures for Asphalt Mixtures, Aggregates, and Binders.
Automatic or semi automatic weighing shall be used on projects with contract quantities of asphalt mixtures totaling 10,000 tons (10,000 Mg) or more; or aggregates totaling 10,000 tons (10,000 Mg) or more from a single source.

1. Automatic Weighing.
The weighing equipment shall be self balancing and shall include an automatic weight (mass) recorder. All tickets shall be printed automatically with net weight (mass) and all weights (mass) needed to determine total net weight (mass).

2. Semi Automatic Weighing.
The weighing equipment may be self balancing or manually balanced. Equipment shall include an automatic weight (mass) recorder which will not print until the equipment is balanced, and which prints the gross weight (mass) or the batch weights (mass) and number of batches. For weigh hoppers, the printout shall include the empty weight (mass) after each discharge.

For measurement of asphalt binders by tank stick or in-line flow meter, the Contractor shall meet the requirements of Materials I.M. 509 for calibration and measurement.

For asphalt mixtures, the Contractor shall furnish to the Engineer each day, a total quantity of mixture used for the project. The Contractor shall furnish daily totals to the Engineer for all mixture quantities produced and not incorporated into the project. This total shall also identify the quantity of asphalt binder used but not incorporated.

2001.20, D, Equipment for Volumetric Proportioning.

Add as the fourth sentence:
This equipment may be used on miscellaneous concrete pours, described in Materials I.M. 534, less than 50 cubic yards (50 cubic meters) per day.

Add as the fifth and sixth sentences:
Equipment used on miscellaneous pours shall be equipped with a batch ticket printer to include the cement, coarse and fine aggregate, and water count. Equipment used in accordance with Section 2413 shall be equipped with a batch ticket printer for the cement count.

Division 21. Earthwork, Subgrades, and Subbases.

Section 2102

2102.01, Description.

Add as the fourth paragraph:

Preparation of the site and construction of the embankment shall be done according to Section 2107.

2102.04, B, Backfill Materials.

Delete the first three sentences of the third paragraph.

Delete the first three sentences of the fourth paragraph.

2102.05, Rock Cuts.

Add new paragraph:

The contract documents may require that part or all of the Class12 Excavation be crushed. When crushing is required, the contract documents will specify the size and/or gradation the rock shall be crushed to, and specify where the crushed material is to be stockpiled or used in the contract.

2102.06, A, 3, Unsuitable Soils.

Change the second row of the table:

Type C placement placed 3 feet (1 m) below top of subgrade in fills:	1. All soils other than A-7-5 or ~~below subgrade~~ A-5 having a density of 95 pcf (1500 kg/m^3) or less (AASHTO T 99 Proctor Density). 2. All soils other than A-7-5 or A-5 containing 3.0% or more carbon.

Change the fifth row of the table:

(Alternate layers shall be suitable ~~Class 10~~ soils or Type C placement soils.)	1. A-7-5 or A-5 soils having a density greater than 86 pcf (1351 kg/m^3) but less than 95 pcf (1500 kg/m^3) (AASHTO T 99 Proctor Density).

2102.11, Finishing.

Replace “Section 2525” with “Section 2602” in the seventh paragraph.

2102.12, Grading for Paving.

Replace the second sentence of the first paragraph:

The roadbed shall be constructed so that the surface elevation shall not be lower at any point than the elevation shown on the project plans and shall not be above this elevation by more than 3 inches (75 mm), except at structures or when required by the contract documents.

2102.13, G, Crushing of Class 12 Excavation.

Add entire new article:

G. Crushing of Class 12 Excavation.

The quantity in cubic yards (cubic meters) shown in the contract documents for Crushing of Class 12 Excavation will be the volume paid. Prior to the start of this work, if either the Engineer or the Contractor desires actual measurement the Engineer will determine in cubic yards (cubic meters) the quantity of Class 12 Excavation that will be crushed computed from the cross section measurements by the average end area method based on soil borings.

2102.14, D, Special Backfill Material.

Add a second paragraph:

The contract will have a separate item for Special Backfill, Place Only, in tons (Mg) or cubic yards (m^3), when the Contracting Authority is providing the material or if the material is available from mandatory crushing of

pavement or pavement scarification on the contract. The cost of crushing or pavement scarification should be included in the Contractor's price for special backfill if recycling is not required but the Contractor chooses to crush the pavement removed or scarify the HMA surfacing for special backfill.

2102.14, G, Crushing of Class 12 Excavation.

Add entire new article:

G. Crushing of Class 12 Excavation.
The Contractor will be paid the contract unit price per cubic yard (cubic meter) for the volume of Class 12 Excavation crushed.

Section 2103

2103, Fuel Adjustment.

Replace the entire section:

2103.01 DESCRIPTION.
A fuel adjustment factor will be applied to payments and partial payments for quantities of certain items of excavation work as the work is done, in accordance with this specification when indicated in the contract documents.

2103.02 APPLICATION.
Fuel adjustment will be applied to all Class 10, 12, and 13 Excavation, Embankment-In-Place (non-dredge material), Selected Backfill Material, and Topsoil which is work of the contract. A fuel usage factor of 0.20 gallon per cubic yard (1.0 L/m^3) will be used for all excavation items of work covered by this specification. A fuel usage factor of 0.27 gallon per cubic yard (1.3 L/m^3) will be used for Embankment-in-Place (non-dredge material).

Fuel adjustment will also be applied to Embankment-In-Place (dredge material). The fuel usage will be based on billed gallons (liters) of fuel used.

2103.03 PRICE INDEX.
A Current Price Index (CPI) in dollars per gallon (liter) will be established by the Department of Transportation for each month. The CPI will be the price of No. 2 High Sulfur Diesel, as reported by the Oil Price Information Service, using the first weekday of the month and the average of all prices reported for Des Moines. This information will be printed in the Weekly Letting Report published by the Department.

The Base Price Index (BPI) for each contract will be the CPI in effect during the month previous to the month of letting of that contract.

2103.04 METHOD OF MEASUREMENT.
The Contractor shall provide to the Engineer a monthly spreadsheet (format of the spreadsheet will be provided by the Engineer) with quantities, and the fuel adjustment for the month (even if there will be no adjustment).

If the contract quantity for an item is in tons (megagrams), the Contractor shall convert the quantity to cubic yards (cubic meters) using a conversion factor approved by the Engineer. The total quantity of cubic yards (cubic meters) for each month (Y) shall be the sum of these quantities.

If the work is not completed within the contract period or authorized extensions thereof, the CPI to be used for work done after the contract period shall be the CPI that applied during the last working day within the contract period, including authorized extensions.

A. The Contractor shall compute the Gross Fuel Adjustment (GFA) for all items of work covered in this specification other than Embankment-In-Place (dredge material) using the following formula:

(English) $GFA = 0.20(CPI-BPI)Y$

(Metric) GFA = 1.0(CPI-BPI)Y

Note: The GFA may be positive or negative.

The Contractor shall compute the first $0.15 per gallon ($0.04 per liter) of adjustment (FFA) for all items of work covered by this specification other than Embankment-In-Place (dredge material) using the following formula:

(English) FFA = 0.20($0.15)Y

(Metric) FFA = 1.0($0.04)Y

B. The Contractor shall compute the Gross Fuel Adjustment for Embankment-In-Place (dredge material) (GFA_{Dredge}) using the following formula:

English GFA_{Dredge} = $0.15 (Billed gallons of fuel used per month)

Metric GFA_{Dredge} = $0.04 (Billed liters of fuel used per month)

Note: The GFA_{Dredge} may be positive or negative.

The Contractor shall compute the first $0.15 per gallon ($0.04 per liter) of adjustment for Embankment In Place (dredge material) (FFA_{Dredge}) using the following formula:

English FFA_{Dredge} = $0.15 (Billed gallons of fuel used per month)

Metric FFA_{Dredge} = $0.04 (Billed liters of fuel used per month)

If the FFA is equal to or greater than the GFA, the Net Fuel Adjustment will be zero, and no fuel adjustment payment will be made. The same applies to FFA_{Dredge} and GFA_{Dredge}.

If the GFA is greater than the FFA, the Net Fuel Adjustment will be determined as GFA-FFA. If the GFA is less than 0.0, the Net Fuel Adjustment will be determined as GFA+FFA. The same applies to GFA_{Dredge} and FFA_{Dredge}.

2103.05 BASIS OF PAYMENT.
The Contractor will be paid the Net Fuel Adjustment for each month, subject to the deduction for partial payments described in Article 1109.05. Should the Net Fuel Adjustment be negative, an equal amount will be deducted on payments made to the Contractor from sums otherwise due. This payment or deduction will be made by change order.

On completion of the work of the contract, for all items covered in this specification other than Embankment-In-Place (dredge material) the sum of the total quantities (Y) for each monthly period will be adjusted, if necessary, to agree with the final quantities to be paid. On completion of the work of the contract for Embankment-In-Place (dredge material), the sum of the total quantities for billed gallons (liters) of fuel used for each monthly period will be adjusted, if necessary, to agree with the final quantities to be paid. This adjustment will be made by either subtracting the proper quantity from the last adjustment made; or adding the proper quantity and computing the adjustment on the basis of the CPI in effect on the last working day any of this work was done.

On completion of the work of the contract, the monthly fuel adjustment will be revised by pro-rating any variance from the plan quantity.

This payment or deduction shall be full compensation for all fluctuations in fuel prices during the time the contract work is being done.

Section 2106

2106, Settlement Plates.

Add as new Section 2106:

Section 2106. Settlement Plates

2106.01 DESCRIPTION.
This work consists of furnishing and installing settlement plates consisting of a base plate, steel bar, steel riser pipe sections, PVC casing, inspection cover, and any additional hardware and couplers which may be required as shown in the contract documents.

This work also consists of monitoring settlement plate installations and reporting settlement results.

The number of settlement plates will be shown in the contract documents.

2106.02 MATERIALS.
Materials shall meet the requirements of Division 41.

A. Base Plate and Steel Bar.
Section 4153 shall apply.

B. PVC Casing.
Article 4146.04 shall apply.

2106.03 CONSTRUCTION.
Settlement plates shall be furnished and installed by the Contractor at locations specified in the contract documents. Benchmarks shall be established in the adjacent area before settlement plates are installed. The method of determining alignments and elevations and the method of preserving control points shall be subject to the review and approval by the Engineer. This approval shall not act to relieve the Contractor of the responsibility for the correctness of the survey work. Plan cross-sections shall not be used for vertical or horizontal control. Settlement plates shall be approved by the Engineer before beginning embankment construction.

A. Initial Installation.
The base plate shall be installed at least 6 inches (150 mm) below natural ground, firmly seated on a level surface. The PVC casing shall be placed on the base plate, centered on the steel bar attached to the base plate. The void between the casing and bar shall be filled with commercial grade oakum, tightly packed, in order to keep the casing centered on the bar.

An inspection cover shall be constructed as shown in the contract documents and placed over the top of the casing. The cover shall remain in place at all times, except when inspection or monitoring of the riser pipe is being performed.

B. Adding Extensions.
Riser pipe extensions and couplers shall be added, as necessary, in 3 foot (1 m) increments as construction of the embankment progresses. The Contractor shall install extensions in a plumb line.

Sections of PVC casing and couplers shall also be added, as necessary, in order to prevent fill material from coming into contact with the steel pipe extensions.

C. Final Cleanup.
After all embankment construction and monitoring has been completed, the tops of the riser pipe and PVC casing shall be adjusted so they terminate below the final elevation of the embankment.

The Contractor shall remove riser pipe sections protruding above the surface of the embankment. The PVC casing shall then be cut at a point below the surface of the embankment and covered with a PVC cap, solvent welded to the casing, in order to prevent the intrusion of soil and water.

D. Monitoring.
Monitoring shall consist of inspecting the riser pipe, accurately measuring the elevation of top of the riser pipe, and recording to the nearest 0.01 foot (0.3 mm) the elevation readings on a form supplied by the Engineer.

The Contractor shall record elevation readings daily during normal construction and weekly during delays and following the completion of embankment construction. During the course of embankment construction, completed forms shall be submitted to the Engineer weekly. Following the completion of embankment construction, forms shall be submitted weekly unless otherwise directed by the Engineer.

During periods of work suspension, the Engineer will record elevation readings.

E. Limitations.
All necessary precautions shall be taken to keep the alignment of the riser pipe and PVC casing in a plumb position. The Contractor shall operate equipment so that the riser pipe and PVC casing are not damaged, displaced, or tilted out of plumb. All pipes that are damaged, displaced, or tilted out of plumb shall be repaired or replaced, at the discretion of the Engineer and at no additional cost to the Contracting Authority.

2106.04 METHOD OF MEASUREMENT.
Settlement plates will not be measured directly for payment.

2106.05 BASIS OF PAYMENT.
The cost of furnishing, installing, extending, and monitoring settlement plates shall be considered incidental to embankment or excavation.

Section 2107

2107.02, A, Compaction Equipment.

Replace the second paragraph:
For compaction of sand or other granular material, the Contractor shall use a self propelled, pneumatic roller meeting the requirements of Article 2001.05, C, or a self propelled vibratory roller meeting the requirements of Article 2001.05, F.

2107.03, Preparation of the Site.

Replace “1/5” with “1.5” in the first sentence of the first paragraph.

2107.10, Rock Fills.

Replace “ow” with “below” in the third sentence of the second paragraph.

2107.12, Rebuilding Embankments.

Replace the first sentence of the third paragraph:
At locations where the width of embankment widening is less than 4 feet (1.2 m), widening material may be placed and shaped to the bottom of pavement or base elevation without compaction other than that obtained with wheels of motor graders and hauling equipment.

2107.14, Use of Unsuitable Soils.

Replace “RL-1” with “RL-1B” in the first sentence.

2107.16, A, Compaction with Moisture and Density Control.

Replace the entire article:
The quantity of Compaction with Moisture and Density Control, in cubic yards (cubic meters), will be the quantity shown on the contract documents.

2107.16, B, Compaction with Moisture Control.

Replace the entire article:
The quantity of Compaction with Moisture Control, in cubic yards (cubic meters), will be the quantity shown on the contract documents.

When moisture control is required adjacent to culverts and stockpasses, Article 2107.15, the volume will be computed using the formula in Article 2107.16, D. When moisture control is required adjacent to pipe culverts, the volume will be computed as provided in Article 2402.12.

2107.16, C, Compacting Trench Bottom.

Replace the entire article:

The quantity of Compacting Trench Bottom, in stations (meters), will be the quantity shown on the contract documents. The quantity of Compacting Trench Bottom will be determined along the centerline of the roadbed.

2107.17, Basis of Payment.

Replace the first paragraph:

The construction of the embankment will be paid for as Embankment-In-Place in accordance with Article 2102.14, with the following additions:

2107.17, A, Compaction with Moisture and Density Control.

Replace the first sentence:

The Contractor will be paid the contract unit price for Compaction with Moisture and Density Control per cubic yard (cubic meter).

2107.17, B, Compaction with Moisture Control.

Replace the first sentence:

The Contractor will be paid the contract unit price for Compaction with Moisture Control per cubic yard (cubic meter).

2107.17, C, Compacting Trench Bottom.

Replace the entire article:

The Contractor will be paid the contract unit price for Compacting Trench Bottom per station (meter). This payment shall be full compensation for the work of scarifying, drying material, furnishing and applying water, controlling moisture content of the materials, and compacting the materials, as specified.

Section 2109

2109.06, Method of Measurement.

Replace the second paragraph:

The quantity of Special Compaction of Subgrade, in stations (meters), will be the quantity shown on the contract documents. The quantity of Special Compaction of Subgrade will be determined along the centerline of the roadbed.

2109.07, Basis of Payment.

Replace the second paragraph:

The Contractor will be paid the contract unit price for Special Compaction of Subgrade per station (meter). This payment shall be full compensation for excavating, manipulating, replacing, and compacting the material; and for furnishing all water required for the work.

Section 2110

2110.07, A, Construction of Soil Aggregate Subbase.

Replace the entire article:

The quantity of Soil Aggregate Subbase, in miles (kilometers), will be the quantity shown on the contract documents. The quantity of Soil Aggregate Subbase will be determined along the centerline of the subbase,

including approaches to railroad crossings, bridges, and similar structures. At intersections, the length of subbase will not include that portion of centerline which overlaps previously determined pavement, base course, or subbase.

2110.08, A, Construction of Soil Aggregate Subbase.

Replace the first sentence:

The Contractor will be paid the contract unit price for Soil Aggregate Subbase per mile (kilometer).

Section 2111

2111.06, Construction of Granular Subbase.

Delete the fourth paragraph:

~~When recycled PCC pavement is used for granular subbase, the Contractor may replace a uniform layer of up to 2 inches (50 mm) of the bottom of the specified subbase material with screened fines resulting from production of subbase material by crushing the existing PCC concrete. The screened fines shall contain les than 15% material passing the No. 200 (75 µm) sieve. This layer of fines may be used as a working platform. The replacement of subbase material with screened fines shall not result l less than 4 inches (100 mm) thickness of granular subbase material meeting the requirements of Gradation No. 12 of Section 4109. When screened fines are placed in the bottom of a granular subbase, they shall be uniformly spread for the entire pavement width or uniformly spread on the high side of the subgrade only. Placement of screened fines shall be held back at least 2 feet (0.6 m) from all subdrain trenches. Screened fines need not be compacted separately.~~

Add as the last two sentences of the last paragraph:

The granular subbase may be placed in areas where the Engineer and the Contractor agree it is reasonable to expect pavement construction can be accomplished prior to winter shutdown. The trimming of the granular subbase shall be restricted to 1 mile (1.6 km) ahead of the paving operation when winter shutdown is eminent.

2111.09, Basis of Payment.

Add as the second and third sentences of the first paragraph:

The contract will have a separate item for Granular Subbase, Place Only, in square yards (m^2), when the Contracting Authority is providing the material or if the material is available from mandatory crushing on the contract. The cost of crushing should be included in the Contractor's price for granular subbase if recycling is not required but the Contractor chooses to crush the pavement removed for granular subbase.

Replace the third paragraph:

Excavation in excess of 3 inches (75 mm) for preparation of subgrade at locations other than structures or existing pavements will be paid for according to Article 2102.14, or, if no contract unit price is provided, Article 1109.03, B.

Add as the fourth and fifth paragraphs:

When adjustments to profile grades cannot be made, fill required for preparation of subgrade at locations other than structures or existing pavements will be paid for according to Article 2102.14, or, if no contract price is provided, Article 1109.03, B.

When grading of the subgrade is a part of the contract, additional payment will not be made for excavation or fill necessary for preparation of subgrade.

Section 2113

2113.05, Method of Measurement.

Replace the entire article:

The quantity of Subgrade Stabilization Material of the type specified, in square yards (square meters), will be the quantity shown on the contract documents to the nearest square foot (0.1 m^2).

2113.06, Basis of Payment.

Replace the first sentence:
The Contractor will be paid the contract unit price for the type of Subgrade Stabilization Material specified per square yard (square meter).

Section 2114

2114.02, B, 1.

Replace “Section 4126” with “Section 4127”.

Section 2115

2115.02, Material.

Replace the entire article:
Section 4123 shall apply.

2115.06, Basis of Payment.

Add as the third and fourth sentences of the first paragraph:
The contract will have a separate item for Modified Subbase, Place Only, in cubic yards (m^3), when the Contracting Authority is providing the material or if the material is available from mandatory crushing on the contract. The cost of crushing should be included in the Contractor’s price for modified subbase if recycling is not required but the Contractor chooses to crush the pavement removed for modified subbase.

Section 2121

2121.02, Materials.

Replace the first sentence of the first paragraph:
Shoulder material for Type A and Type B shoulders shall meet the following:

Delete the fourth and fifth sentences of the third paragraph:
~~Not more than 50% of the granular shoulder shall be RAP. RAP shall be uniformly blended with other granular shoulder material.~~

Add as the fourth paragraph:
Recycled crushed PCC, RAP, or crushed composite HMA and PCC may be uniformly blended with crushed stone. Recycled materials shall not total more than 30% of the shoulder aggregate for new construction and not more than 50% of the total for existing granular shoulders.

2121.05, A, Earth Shoulder Fill.

Replace the first sentence:
This work involves construction of a shoulder fill to such elevation below that of the pavement edge as to allow for placement of granular shoulders as shown in the contract documents.

Add as the second and third sentences:
Material shall be select treatment materials of Article 2102.06, A, 1, if available and coordinated with the Engineer, or suitable soils of Article 2102.06, A, 2. Material shall not be unsuitable soils of Article 2102.06, A, 3, or topsoil.

2121.06, A, Type A Granular Shoulders.

Replace the first sentence of the third paragraph:
Compaction shall be accomplished by six complete coverages with a pneumatic tired roller or a steel vibratory roller, followed by at least one complete finish coverage with a steel tired roller.

2121.06, B, Type B Granular Shoulders.

Replace the first sentence of the second paragraph:

The moist aggregate shall be thoroughly compacted by a minimum of four complete coverages of the entire exposed surface with the pneumatic tired roller or a steel vibratory roller, followed by at least one complete finish coverage with a steel tired roller.

2121.06, C, Paved Shoulder Fillet.

Replace the article:

C. Paved Shoulder Fillet.
The aggregate for a granular fillet at the edge of a paved shoulder shall be placed and compacted as provided in Article 1107.08.

2121.07, B, Type B Granular Shoulders.

Replace the article:

B. Type B Granular Shoulders.
When a drop-off is caused by the Contractor's operations and is adjacent to a lane open to public traffic, placement of granular shoulders shall be coordinated so they are brought up to the pavement operation before the adjacent lane is opened to traffic. A fillet of granular material shall be used to temporarily correct a drop-off created by the resurfacing. If a fillet is placed, the minimum width of the fillet shall be 6 times the thickness of HMA resurfacing completed. This material shall be bladed across the shoulder prior to placement of the final layer of granular surfacing. The Engineer may modify this requirement for narrow shoulders and other justifiable conditions.

2121.07, C, Winter Shutdown.

Add new article:

C. Winter Shutdown.
Granular shoulder material shall be brought up to the pavement edge for the full width of the shoulder, at the design cross slope, prior to winter shutdown.

2121.08, Method of Measurement.

Replace second paragraph:

The quantity of Trenching and Reshaping, in stations (meters), will be the quantity shown on the contract documents. The quantity of Trenching and Reshaping will be determined for each side of the pavement or base.

2121.09, Basis of Payment.

Delete first paragraph:

~~All work performed and measured as provided above will be paid for as follows:~~

Add as the last paragraph:

The contract will have a separate item for Granular Shoulders, Place Only, of the type specified in tons (Mg), when the Contracting Authority is providing the material or if the material is available from mandatory crushing on the contract. The cost of crushing should be included in the Contractor's price for granular shoulders if recycling is not required but the Contractor chooses to crush the pavement removal for granular shoulder material.

2121.09, A, 2, Trenching and Reshaping.

Replace the article:

The Contractor will be paid the contract unit price for Trenching and Reshaping per station (meter). This payment shall be full compensation for trenching, reshaping, and removing excess excavated material from the project.

Section 2122

2122.02, A, Type B Hot Mix Asphalt Mixture.

Replace the title and sentence:

A. Hot Mix Asphalt Mixtures.
HMA 1,000,000 ESAL base mixture shall be of materials specified in Section 2303.

2122.04, Preparation of Shoulder Area.

Replace the first paragraph:

This work may involve construction of an earth fill and a special backfill to allow placement of paved shoulders. The earth fill shall be spread and compacted in accordance with the requirements of Section 2109. Material shall be select treatment materials of Article 2102.06, A, 1, if available and coordinated with the Engineer, or suitable soils of Article 2102.06, A, 2. Material shall not be unsuitable soils of Article 2102.06, A, 3, or topsoil.

2122.04, Preparation of Shoulders Area.

Replace “Article 2303.03, C” with “Article 2303.03, D” in the second paragraph.

2122.07, Method of Measurement.

Replace the entire article:

A. Paved Shoulders.

1. Hot Mix Asphalt Paved Shoulder.
The quantity of Hot Mix Asphalt Paved Shoulder, in square yards (square meters), will be the quantity shown in the contract documents.

2. Portland Cement Concrete Paved Shoulder.
The quantity of Portland Cement Concrete Paved Shoulder, in square yards (square meters), will be the quantity shown in the contract documents. Thickness determination will be in accordance with Article 2301.34, A.

B. Special Backfill.
The quantity for payment for special backfill shall be the contract quantity.

C. Resurfacing or Overlay of Existing Paved Shoulders.

1. Hot Mix Asphalt Resurfacing.
Article 2303.05, A, 1, shall apply.

2. Asphalt Binder.
Article 2303.05, B, shall apply.

2122.08, A, Paved Shoulders.

Delete the first paragraph:

~~For the number of square yards (square meters) of paved shoulders of the type, width, and thickness specified, satisfactorily constructed, the Contractor will be paid the contract unit price per square yard (square meter), as follows:~~

2122.08, C, 1, Hot Mix Asphalt Resurfacing.

Replace “Article 2303.06” with “Article 2303.06, A”.

2122.08, C, 2, Asphalt Binder.

Replace “Article 2303.06” with “Article 2303.06, B”.

Section 2123

2123.02, Construction.

Replace the second sentence:
Material deposited above an elevation 6 inches (150 mm) below subgrade elevation shall be select treatment materials of Article 2102.06, A, 1, if available and coordinated with the Engineer, or suitable soils of Article 2102.06, A, 2.

Add as the third sentence:
Material shall not be unsuitable soils of Article 2102.06, A, 3, or topsoil.

2123.04, A, Earth Shoulder Finishing.

Replace the first paragraph:
The quantity of Earth Shoulder Finishing, in stations (meters) along each edge of the pavement, will be the quantity shown in the contract documents.

2123.04, B, Earth Shoulder Construction.

Replace the first sentence:
The quantity of Earth Shoulder Construction, in stations (meters) along each edge of the pavement, will be the quantity shown in the contract documents.

2123.05, Basis of Payment.

Delete the first paragraph:
~~For the quantity of earth shoulder finishing or earth shoulder construction, measured as provided above, the Contractor will be paid as follows:~~

2123.05, A, Earth Shoulder Finishing.

Replace the first sentence:
The Contractor will be paid the contract unit price for excavation per cubic yard (cubic meter), as provided in Article 2102.14, A; and for Earth Shoulder Finishing per station (meter).

2123.05, B, Earth Shoulder Construction.

Replace the first sentence:
The Contractor will be paid the contract unit price for Earth Shoulder Construction per station (meter).

Section 2125

2125.03, Method of Measurement.

Replace the entire article:
The quantity of Reshaping Ditches, in stations (meters), will be the quantity shown on the contract documents. The quantity of Reshaping Ditches will be determined along the bottom of the ditch.

2125.04, Basis of Payment.

Replace the entire article:

The Contractor will be paid the contract unit price for Reshaping Ditches per station (meter). This payment shall be full compensation for reshaping ditches, and for removal or placement of the excavated material.

Section 2127

2127.03, Method of Measurement.

Replace the entire article:

A. Reconstruction of Roadbed.
The quantity of Reconstruction of Roadbed, in stations (meters), will be the quantity shown on the contract documents. The quantity of Reconstruction of Roadbed will be determined along the centerline.

B. Earth Shoulder Construction.
Article 2123.04, B, shall apply.

C. Reclaiming Present Surfacing Material.
Article 2126.03 shall apply.

2127.04, Basis of Payment.

Replace the entire article:

A. Reconstruction of Roadbed.
The Contractor will be paid the contract unit price for Reconstruction of Roadbed per station (meter). This payment shall be full compensation for excavating, hauling, compaction, and recovery of excavated material. This work will not include the cost of reclaimed surfacing material or earth shoulder construction in the area of Reconstruction of Roadbed.

B. Earth Shoulder Construction.
Article 2123.05, B, shall apply.

C. Reclaiming Present Surfacing Material.
Article 2126.04 shall apply.

Division 22. Base Courses.

Section 2201

2201.03, Method of Measurement and Basis of Payment.

Replace “Article 2301.34 and Article 2301.35” with “Article 2301.34, A, and Article 2301.35, A”.

Section 2210

2210.02, Materials.

Replace “Article 4123.01” with “Section 4122” in the first paragraph.

Section 2212

2212.04, B, Base Repair.

Replace the second sentence of the sixth paragraph:

For composite patches, the surface of the repair patch shall be finished at approximately the level of the old PCC surface.

Replace the seventh paragraph:
PCC full depth and partial depth repair patches shall be cured as specified in Article 2529.09.

2212.06, D, Patches by Count.

Replace the first sentence:
In addition to the measurement described in Paragraph B, the Engineer will count the total number of patches placed full depth.

2212.06, I, Hot Mix Asphalt Mixture.

Add as a new Article:
In addition to the measurement described in Paragraph C, the Engineer will measure the weight (mass) of HMA placed in partial depth patches in accordance with Article 2303.05. 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. Asphalt binder and tack coat will not be measured separately for payment.

2212.07, B, Full Depth Repair Patches.

Add as the second paragraph:
Payment for overdepth patches will be made in accordance with Article 2529.14, A, 2.

2212.07, D, Patches by Count.

Replace the first sentence:
In addition to payment described in Paragraph B, for the number of individual full depth patches placed, the Contractor will be paid the contract unit price for each.

2212.07, E, Surface Patches.

Add as the third sentence:
Tack coat shall be incidental to Surface Patches.

2212.07, H, Hot Mix Asphalt Mixture.

Add as a new Article:
In addition to the payment described in Paragraph C, HMA for partial depth repair patches will be paid for in accordance with Article 2530.09, B, 3.

Section 2213

2213.01, Description.

Delete “and the following provisions” from the end of the last sentence of the first paragraph.

Delete the indented paragraph:
~~The contract documents may designate PCC base widening, HMA base widening, or a Contractor’s option of these types. When the option is designated, the thickness of base widening with each material will be shown, and payment will be based on square yards.~~

2213.07, Preparation of Subgrade.

Replace “Article 2303.03, A, 2” with “Article 2303.03, B, 2” in the second indented paragraph.

2213.08, A, HMA Base Widening.

Replace “Article 2303.03, D” with “Article 2303.03, E” in the third paragraph.

Replace the second sentence of the fifth paragraph:
Density samples shall be taken from the compacted material and tested in accordance with Article 2303.04.

2213.09, Limitation of Operations.

Replace “Article 2303.03, C” with “Article 2303.03, D” in the fourth paragraph.

2213.13, Samples.

Replace the sentence:
Article~~s~~ 2303.04, D, 2~~, and 2301.34~~ shall apply.

2213.14, Method of Measurement.

Replace the entire article:

A. Removal of Curb.
The quantity of curb removed, in stations (meters), to the nearest foot (meter), will be the quantity shown in the contract documents.

B. Removal of Flumes.
The quantity of flumes removed will be the quantity shown in the contract documents.

C. Excavation, Class 13, for Widening.
The quantity of trench excavation for Base Widening will be the quantity shown in the contract documents as Class 13 excavation.

D. Base Widening.

1. Hot Mix Asphalt Base Widening.

a. Measurement by Weight (Mass).
The quantity of Hot Mix Asphalt Mixture for Base Widening will be determined in accordance with Article 2303.05, A, 1.

b. Measurement by Area.
The quantity of Hot Mix Asphalt Mixture for Base Widening, of the depth specified, will be determined in accordance with Article 2303.05, A, 2.

2. Portland Cement Concrete Base Widening.
The quantity of Portland Cement Concrete for Base Widening, of the depth specified, will be the quantity shown in the contract documents.

E. Asphalt Binder.
Article 2303.05, B, shall apply.

F. Primer or Tack Coat Bitumen.
Article 2303.05, E, shall apply.

G. Samples.
Article 2303.05, H, shall apply for HMA base widening. ~~Article 2301.34, I, shall apply for PCC base widening.~~

2213.15, Basis of Payment.

Replace the entire article:

A. Removal of Curb.
The Contractor will be paid the contract unit price for Removal of Curb per station (meter).

B. Removal of Flumes.
The Contractor will be paid the contract unit price for Removal of Flumes per each unit.

C. Excavation, Class 13, for Widening.
For the number of cubic yards (cubic meters) of Class 13 excavation for trench excavation stated in the contract, the Contractor will be paid the contract unit price per cubic yard (cubic meter). This payment shall include removal of bituminous fragments, boulders, and broken concrete in accordance with Article 1104.08.

D. Base Widening.

1. **Hot Mix Asphalt Base Widening.**

   a. Measurement by Weight (Mass).
   The Contractor will be paid the contract unit price for Hot Mix Asphalt Mixture for Base Widening in accordance with Article 2303.06.

   b. Measurement by Area.
   The Contractor will be paid the contract unit price for Hot Mix Asphalt Mixture for Base Widening, of the depth specified, in accordance with Article 2303.06.

2. **Portland Cement Concrete Base Widening.**
   The Contractor will be paid the contract unit price for Portland Cement Concrete for Base Widening, of the depth specified, per square yard (square meter).

E. Asphalt Binder.
Article 2303.06, B, shall apply.

F. Intentionally left blank.

G. Samples.
HMA base widening samples will be paid for in accordance with Article 2303.06, F. ~~PCC base widening samples will be paid for in accordance with Article 2301.35, I~~.

Section 2214

2214.01, Description.

Delete the second paragraph:
~~When scarified material is suitable for recycling into HMA, the contract documents will show bid items by weight (mass), except for small quantities which may be shown by area. When the scarified material is not suitable for recycling, the contract documents will show bid items by area and removed from the project as directed in the contract documents.~~

2214.03, A, Resurfacing.

Delete the last indented paragraph:
~~Recycling of salvaged asphalt material into new mixes for work on this project will be as directed in the contract documents.~~

2214.05, Limitations.

Replace the seventh, eighth, and ninth paragraphs:
Preliminary scarifying may be done to obtain representative samples, and these areas shall be patched. Patching should be done daily, and patching necessary to bring the scarified surface to the tolerance specified shall be done within 2 working days of the scarifying operation. Additional patching may be necessary to maintain this temporary surface.

Scarification shall be performed following full-depth patching.

The Contractor shall begin HMA or PCC placement operations within 10 working days after completion of the scarification operation. Once started, placement operations shall occur on each working day until such time that the scarified surface is completely covered. Failure to comply with these requirements will result in the assessment of a price adjustment equal to the liquidated damages stated in the contract documents. The Contractor shall be responsible for repair of damage to the scarified surface occurring during a time period for which liquidated damages are being assessed.

When HMA resurfacing is part of the contract, all scarified surfaces shall be covered with at least one full lift of HMA prior to winter shutdown. The Contractor shall leave no vertical edges or fillets.

2214.06, Method of Measurement.

Replace the entire article:

A. Pavement Scarification.

1. Measurement by Weight (Mass).
When measurement is by weight (mass), the quantity of Pavement Scarification will be expressed in tons (megagrams) and determined from the quantity of scale weights (mass) of the material salvaged.

2. Measurement by Area.
When measurement is by area, the quantity of Pavement Scarification, square yards (square meters), will be the quantity shown in the contract documents.

B. Blading and Shaping Shoulder Material.
The quantity of Blading and Shaping Shoulder Material, in stations (meters), along each edge of the pavement, will be the quantity shown in the contract documents.

2214.07, A, Payment for pavement scarification will be as follows:

Replace the title and entire article:

A. Pavement Scarification.

1. Measurement by Weight (Mass).
The Contractor will be paid the contract unit price for Pavement Scarification per ton (megagram).

2. Measurement by Area.
The Contractor will be paid the contract unit price for Pavement Scarification per square yards (square meters).

2214.07, B, Blading and Shaping Shoulder Material.

Replace the entire article:
The Contractor will be paid the contract unit price for Blading and Shaping Shoulder Material per station (meter).

Section 2217

2217.05, Method of Measurement.

Replace the entire article:
The quantity of Rubblized Pavement, in square yards (square meters), will be the quantity shown in the contract documents.

2217.06, Basis of Payment.

Replace the first sentence:
The Contractor will be paid the contract unit price for Rubblized Pavement per square yard (square meter).

Division 23. Surface Courses.

Section 2301

2301.04, B, Water, Consistency, and Batch Yield.

Replace the first paragraph:

The amount of mixing water used shall be that which will produce workable concrete of uniform consistency. Except as specifically modified by the Engineer, the slump, measured in accordance with Materials I.M. 317, shall not be less than 1/2 inch (15 mm) or more than 4 inches (100 mm) Slump requirements will not apply to slip form paving.

2301.04, C, Entrained Air Content.

Replace the entire article:

Air entrainment shall be accomplished by addition of an approved air entraining agent. The target ~~A~~air content as determined by Materials I.M. 318~~, will be determined on each day of production as early and as frequently as necessary until the air content is consistently acceptable. The intended air content of finished concrete is 6.0%. Acceptance for entrained air content will be before consolidation.~~ shall be 8.0%, with a tolerance of plus or minus 2.0% when measured on the grade just prior to consolidation. The air content for non slip form paving shall be 7.0% plus or minus 1.5%. The target air content may be adjusted by the Engineer based on random tests of the consolidated concrete behind the paving 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.

~~**1. Slip form projects greater than 7500 square yards (6000 m^2).**~~
~~The target air content will be determined to account for air loss during consolidation of concrete during slip form paving. The difference between before and after the paver air contents for a given location shall be considered the air loss.~~

~~On the first day of paving, air loss and target air content will be established during placement of the first eleven loads of concrete. The procedure will be as follows:~~

~~**a.** Central Batch Plant: the air content before the paver shall be between 8.0% and 12.0% until the target air content has been established.~~

~~**b.** Ready Mixed Concrete: the air content before the paver shall be 7.5% plus 1.5% or minus 1.0%, until target air content has been established.~~

~~Thereafter, the air loss and target air content will be established once per half day paving. The target air content shall be 6.5%, plus the air loss rounded to the next higher 0.5%, with a tolerance of plus or minus 1.5%. A new target air content before the paver will be established if the air loss deviates by more than 0.5% from the last air loss.~~

~~After the first day of paving, the target air content from the previous day will be used until a new target air content is determined.~~

~~**2. Slip form projects less than 7500 square yards (6000 m^2).**~~
~~The air content before the paver shall be 7.5% plus 1.5% or minus 1.0%. At the option of the Engineer, the target air content may be established using the air loss.~~

~~The air content for non slip form paving shall be 7.0% plus 1.5% or minus 1.0%.~~

2301.04, E, Use of Fly Ash.

Replace the title and article:

E. Use of Fly Ash and GGBFS.
The maximum allowable fly ash substitution rate shall be 20%. The GGBFS substitution rate shall be not more than 35% by weight (mass). The total mineral admixture substitution rate shall not exceed 40%. When

Type IP or IS cement is used in the concrete mixture, only fly ash substitution will be permitted. Substitution of Type I/II cement with both GGBFS and fly ash will be permitted in ready mix concrete mixtures only. Between October 16 and March 15, fly ash and GGBFS substitution will be allowed only when maturity method is used to determine time of opening.

2301.04, F, Use of Ground Granulated Blast Furnace Slag.

Delete the title and the article.

2301.04, F, 1.

Add a new third sentence:
The total mineral admixture substitution rate shall not exceed 40%.

2301.04, F, 2.

Replace “50%” with “40%” in the third sentence.

2301.07, A, 6, a, 2.

Replace “contacts” with “contracts” in the first sentence of the first paragraph.

Replace “exceeding” with “exceeds” in the second sentence of the first paragraph.

Replace the first sentence of the second paragraph:
The monitoring device shall have a readout display near the operator’s controls visible to the paver operator and the Engineer.

Replace the fifth sentence of the second paragraph:
An electronic record of the data shall be provided to the Engineer daily for the first three days of paving and weekly thereafter.

2301.07, A, 6, b, Finishing Machine.

Replace the words “catch basins” with “intakes” in the second sentence of the first paragraph.

2301.08, Bridge Approach Sections.

Replace the title and the entire article:

Bridge Approach Sections, Reinforced Paved Shoulders, and Full-width Reinforcement for Pavements.
Bridge approach sections, reinforced paved shoulders, and full-width reinforcement for pavements shall be constructed as shown in the contract documents. All reinforcing shall be epoxy coated in accordance with Article 4151.03, except that cut or sheared ends need not be recoated. Clear distance from face of concrete to near reinforcing steel shall be 2 inches (50 mm), unless otherwise noted in the contract documents. Class C concrete shall be used with coarse aggregate durability in accordance with Article 4115.04.

2301.10, Subgrade Construction.

Replace the second and third sentences of the second indented paragraph:
When the contract documents do not include a bid item for Class 10 excavation, it may be assumed that the subgrade has been or will be shaped and compacted by others. Acceptable tolerance for that work is described in Article 2102.12, except that at approaches to existing improvements or structures, corrections will be based on a practical minimum cut and fill for the project.

2301.11, Fixtures in Pavement Surface.

Replace the words “catch basins” with “intakes” in the first paragraph.

2301.12, Placing Reinforcement.

Add as the seventh paragraph:

Cutting the tie wires of the load transfer assemblies shall be the option of the Contractor.

Replace the title and the first seven paragraphs:

2301.12, Placing Reinforcement and Placing Dowel and Tie Bars.

A. Placing Reinforcement.

Reinforcement shall be installed prior to vibration so as to be in the intended position in the completed pavement in accordance with Article 2404.06. Reinforcing Bars may be supported by approved chairs or may be placed in position by a machine or method subject to approval of the Engineer.

Reinforcement for bridge approach sections shall be supported by approved continuous bolsters with runners. The supports shall be placed transversely across the approach and spaced longitudinally no greater than 4 feet (1.2 m). For double reinforced approach sections the top layer of reinforcing may be chaired off the bottom layer of reinforcing using approved continuous high chairs with runners, provided they are positioned directly above the continuous bolsters with runners supporting the bottom layer of reinforcing. Epoxy coated reinforcing steel shall be held in place with epoxy or plastic coated bar supports and epoxy or plastic coated tie wires. Continuous bolsters with runners and continuous high chairs with runners, either plastic or steel, shall meet the requirements of Materials I.M. 451.01.

When welded wire fabric reinforcement is used, the concrete shall first be struck off at the elevation specified for the fabric reinforcement, and the sheets of fabric shall be placed as indicated in the contract documents. The sheets of fabric shall be flat, and care shall be used in handling and placing the fabric to ensure its installation in the proper position. The balance of the concrete shall then be deposited and vibrated in a manner to not displace or distort the fabric. Sheets that have become bent or kinked may be rejected.

Alternate methods of placing welded wire fabric reinforcement will be considered for approval.

B. Placing Load Transfer Devices.

Load transfer devices may be required in the contract documents. These assemblies shall be accurately placed as shown and shall be securely staked or fastened to the base to line and grade to prevent their movement during subsequent concrete paving operations. Assemblies may be placed in fresh PCC concrete of a Class A subbase, as provided in Article 2114.02, B, to assure a firm connection for the subsequent paving operation. Mechanical dowel bar inserters will not be allowed.

Assemblies that are damaged prior to placement shall not be used. Assemblies damaged after placement shall be replaced prior to paving. Horizontal and vertical alignment of the load transfer bars shall not exceed 1/4 inch (5 mm) from parallel to line and grade. Each assembly shall be placed so the bars are in a horizontal plane at T/2 ± 1/2 inch (15 mm).

The Contractor shall check, with a suitable template or other device approved by the Engineer, the placement of each assembly and the position of the bars within the assembly. If the assembly is found to be placed outside any one of these tolerances, the placement shall be corrected.

Cutting the tie wires of the load transfer assemblies shall be the option of the Contractor.

2301.13, C, 1, Measurement of Materials.

Replace the first sentence of the second paragraph:

On work requiring automatic cement scales, the performance of the scale will be determined near the end of the first full day of production and thereafter at a frequency not to exceed each 10,000 cubic yards (10,000 m^3) of concrete produced, by comparing the accumulated mass of cement proportioned with the corresponding accumulated mass of cement shipped to the project.

2301.13, D, Mixing of Materials.

Replace the first paragraph:

Concrete materials shall be either mixed at the site of placement or mixed in a construction or stationary mixer to be used for work on the project only, or ready mixed or transit mixed concrete. During any one individual placement; the same cement, aggregates, and admixtures shall be used throughout the placement unless otherwise approved by the Engineer. With approval of the Engineer, concrete mixtures may be furnished from multiple plants provided the same materials are used in each mixture and mix consistency can be maintained.

2301.13, D, 2, b.

Delete entire article:

~~**b.** Proportioned at a central plant, and only partially mixed in a stationary mixer for transportation and finish mixing in a transit mixer.~~

2301.13, D, 2, c.

Re-letter the article:

~~**c.**~~ **b.** Proportioned and then mixed in a transit mixer prior to or during transit.

2301.16, B, Microtexture.

Replace the first sentence of the second paragraph:

Artificial turf, coarse carpet, or burlap shall be dragged longitudinally over the finished surface to produce a tight, uniform, textured surface. Burlap may be dampened to prevent adhesion of PCC mixture.

2301.16, C, 1, Application.

Replace the first sentence of the first paragraph:

Where the speed limit is greater than 35 mph (60 km/h), all mainline pavement, turn lanes, and the traveled portion of ramps shall receive macrotexture.

2301.16, C, 2, Operation.

Replace the last sentence of the first paragraph:

The depth of groove in the plastic concrete shall be 1/8 inch (3 mm) as a target with a ± 1/16 inch (± 1.5 mm) tolerance.

2301.16, C, 2, a, Transverse Grooving.

Replace the second paragraph:

On pavement where transverse tining is to be used, a 4 inch to 6 inch (100 mm to 150 mm) wide strip of pavement surface shall not be tined for the length of each transverse joint, providing an untined surface centered over the transverse joint.

2301.16, C, 3, Limitations.

Add as the fourth sentence:

The outside 2 feet (0.6 meters) shall not be grooved if placing structural rumble strips (rumble strips placed in the outside 2 feet (0.6 meters) of PCC pavements, as shown in the Standard Road Plans, to deter traffic).

2301.16, D, Smoothness.

Replace the second unindented paragraph:

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

2301.18, End of Run.

Replace entire article:

Whenever 30 minutes or more have elapsed since the last concrete has been deposited on the subgrade or if such a delay is anticipated, an approved header shall be installed.

Header joints shall not be constructed within 5 feet (1.5 m) of an intended or previously placed contraction joint. Header joints shall not be constructed opposite a contraction joint in multiple lane construction.

When a header joint is installed, resumption of paving which abuts the header shall not commence for a minimum of 6 hours.

When the end of the day's run occurs in curb section, sufficient curb shall be omitted to accommodate equipment that must be backed out of the way. Construction of the portion of curb omitted shall be as shown in the contract documents and in accordance with Article 2301.17.

A. Headers Constructed in Plastic Concrete.

The header shall be constructed true to line and grade with the face perpendicular to the surface and at right angles to the centerline of the pavement. The tie bar reinforcement shall be level, true to line and grade, and normal to the header joint.

Concrete collected by a finishing machine during its first passage shall not be used adjacent to the header board. Concrete screeded over the header during finishing shall be promptly removed.

Concrete shall be well consolidated against the header and finished with an edging tool.

The header board and all supports shall be removed before paving is resumed.

B. Headers Constructed in Hardened Concrete.

The Contractor may pave past the location of the header. After the concrete has hardened, the pavement shall be sawed perpendicular to the centerline of the pavement, creating a vertical face. Holes for the tie bar reinforcement shall be drilled and reinforcement grouted into the holes, in accordance with Article 2301.12. The paving operations may begin adjacent to the header after a minimum of 1 hour after the placement of the reinforcement bars.

2301.19, Curing and Protection of Pavement.

Delete the second and third paragraphs:

~~When an insulation blanket is required, this cover shall consist of a layer of closed cell polystyrene foam protected by at least one layer of plastic film, rated by the manufacturer with an R-value of at least 0.5, or two layers of burlap between 4 mil (100 µm) thick sheets of plastic or an approved alternate.~~

~~Placement of the insulating cover may be delayed for up to 4 hours to accommodate initial sawing of joints. The cover may be temporarily removed to perform sawing or sealing. The cover may be permanently removed when the concrete has attained the flexural strength required for opening.~~

2301.19, A, Curing with White Pigmented Liquid Curing Compound.

Replace the first sentence of the first paragraph:

Curing compound shall be applied in a fine spray to form a continuous, uniform film on the surface and vertical edges of the pavement slab as soon as the free water has appreciably disappeared, but no later than 30 minutes after finishing.

Add a new second sentence to the first paragraph:

With approval of the Engineer, the timing of cure application may be adjusted due to varying weather conditions and concrete mix properties to ensure acceptable macrotexture is achieved.

2301.19, B, Cold Weather Protection.

Replace the table:

Night Temperature Forecast	Type of Protection[1]
35°F to 32°F (2°C to 0°C)	One layer of burlap for concrete.
31°F to 25°F (-1°C to -4°C)	Two layers of burlap or one layer of plastic on one layer of burlap.
Below 25°F (-4°C)	Four layers of burlap between layers of 4 mil (100 µm) plastic, insulation blankets meeting the requirements below, or equivalent commercial insulating material approved by the Engineer.

[1] The protection shall remain until one of the following conditions is met:
a. The pavement is 5 calendar days old.
b. Opening strength is attained.
c. Forecasted low temperatures exceed 35°F (2°C) for the next 48 hours.
d. Forecasted high temperatures exceed 55°F (13°C) for the next 24 hours and subgrade temperatures are above 40°F (4°C).

Add as the second paragraph:

When insulation blankets are used, they shall consist of a layer of closed cell polystyrene foam protected by at least one layer of plastic film, rated by the manufacturer with a minimum R-value of 1.0 (0.1761 for metric units).

Replace the second, third, and fourth sentences of the third paragraph:

The cover may be temporarily removed to perform sawing or sealing.

2301.22, Sawing Joints.

Replace the fifth paragraph:

Should uncontrolled cracking or random transverse cracking occur, the pavement shall be repaired at no additional cost to the Contracting Authority. Repair methods shall be as approved by the Engineer.

Delete the eighth paragraph:

~~When random transverse cracks occur away from a CD joint, the Engineer may require the pavement to be patched and an additional CD joint installed.~~

2301.23, Expansion Joints.

Replace the first three sentences:

Preformed joint material shall be installed perpendicular to the pavement surface. The Contractor shall exercise care throughout the construction of the pavement to ensure that the joint material remains in proper position.

2301.25, Sealing Joints.

Replace the entire article:

Unless otherwise provided, joints shall be sealed as designated in the contract documents before any portion of the pavement is opened to the Contractor's forces or to general traffic. Joint openings shall be sawed or prepared to the designated dimensions, cleaned, and sealed with one of the appropriate materials described in Section 4136.

Joint sealer, as described in Article 4136.02, A, shall be used to seal sawed joints in PCC pavement, shoulders, medians, crossovers, and side road pavements unless otherwise specified in the contract documents.

Within 3 hours after a joint has been wet sawed to the finished dimension, the residue from wet sawing shall be flushed away from the sawed faces by a high pressure water blast, operating with a minimum pressure of 1000 pounds per square inch (7000 kPa). Within 3 hours after the joint has been dry sawed to the finished dimension, the residue from dry sawing shall be blown from the joint. Air compressors shall provide moisture and oil free compressed air.

Immediately prior to installation of sealant, joints shall be cleaned with an air blast. Sealing shall be done only after visual examination verifies the joint surfaces appear dry, in addition to being clear of dust and contamination. Joint sealer shall be prepared and installed in the joint and to the proper level as shown in the contract documents and as recommended by the manufacturer. Hot poured sealers shall be heated in a thermostatically controlled heating kettle. The material shall be heated to the temperature required for use, but not above that recommended by the manufacturer. After sealing, excess sealer shall be removed from the pavement surface.

Joint sealer shall be placed only when the pavement and ambient air temperatures are 40°F (4°C) or above. When near this minimum, additional air blasting or drying time, or both, may be necessary to assure a satisfactory bond to the joint faces. When this sealer cannot be properly placed due to late fall work, the Contractor shall submit a joint construction plan and sealing details to the Engineer for approval before paving can begin. The cleaning, sealing, and resawing of joints, if required, shall be delayed until the following spring. This delay shall be subject to approval of the Engineer.

When surface correction is required, seals damaged from the corrective work shall be repaired. Joint preparation, cleaning, and sealing may be delayed until after corrective work, provided the pavement is not opened to traffic before corrective work is performed.

The Engineer may limit the wheel loads and axle loads of equipment operating on the pavement during preparation, cleaning, and sealing operations, if prior to the age and strength specified in Article 2301.31. Additional tests to determine the modulus of rupture may be required.

If early pavement opening is specified, the cleaning, sealing, and, if required, resawing of joints shall be accomplished after the pavement is opened to traffic if hot pour sealing material is used.

2301.28, Concrete Header Slabs.

Replace the title and entire article:

2301.28 RESERVED.

2301.31, Time for Opening Pavement for Use.

Replace the table:

Minimum Flexural		
Strength Class of Concrete	**Minimum Age**	**psi (MPa)**
A	14 calendar days(1)	500 (3.45)
B	14 calendar days	400 (2.80)
C	7 calendar days(2)	500 (3.45)
M	48 hours	500 (3.45)
Notes: (1) 10 calendar days for concrete 8 inches (200 mm) or more in thickness. (2) 5 calendar days for concrete 9 inches (230 mm) or more in thickness.		

Replace “burnish” with “furnish” in the last sentence of the second paragraph.

Replace “with” with “when” in the first sentence of the third paragraph.

Delete the second sentence of the fifth paragraph:

~~This certified technician may supervise other persons who may then perform the temperature testing of the constructed pavement.~~

Replace “certified plant inspector” and “certified inspector” with “certified technician” in the fifth paragraph.

Replace the seventh paragraph:

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 (mass), of the cement in Class M concrete mixtures. Type IP and Type IS cements may be used in Class M concrete mixtures without fly ash substitution.

2301.34, Method of Measurement.

Delete the first paragraph:

~~The quantity of the various items of work involved in construction of concrete pavements will be measured by the Engineer in accordance with the following provisions~~:

2301.34, A, Portland Cement Concrete Pavement.

Replace the first paragraph:

The quantity of Standard or Slip-Form Portland Cement Concrete Pavement of the type specified, in square yards (square meters), will be the quantity shown in the contract documents and applies to pavement, concrete pavement widening, side street connections, crossovers, ramps, acceleration and deceleration lanes or auxiliary lanes, and concrete paved shoulders. The coring requirements for thickness do not apply to detour pavements, paved drives, and temporary pavements. The thickness of pavement constructed will be determined from core depths as follows:

Replace the second indented paragraph:

At locations determined by the Engineer, the Contractor shall cut samples from the pavement, as directed above, by drilling with a core drill of a size that will provide samples with a 4-inch (101.6 mm) outside diameter. The Contractor shall restore the surface by tamping low-slump concrete into the hole, finishing and texturing. The Engineer will witness the core drilling, identify, and measure the cores immediately. The Engineer will measure the cores and determine the thickness index in accordance with Materials I.M. 346. After measurement on the grade, the Contractor shall deliver the cores to the Engineer’s office or field laboratory. When cores are not measured on the grade, the Engineer will take immediate possession of the cores.

Replace the first sentence of the third indented paragraph:

Coring of pavement and other work for thickness determination may be waived by mutual agreement ~~the Engineer~~ for sections of the same design thickness less than 5000 square yards (4200 square meters).

2301.34, D, Incidental Concrete.

Replace the title and entire article:

D. Intentionally left blank.

2301.34, E, Concrete Median.

Replace the entire article:

The quantity of Concrete Median, in square yards (square meters), will be the quantity shown in the contract documents. This will be calculated to the nearest 0.1 foot (0.1 m) of the length along the surface and the overall width of median when no integral curb is involved, or the width from back to back of curb when integral curb is involved.

2301.34, F, Bridge Approach Sections.

Replace the entire article:

The quantity of Bridge Approach Section, in square yards (square meters), will be the quantity shown in the contract documents.

2301.34, J, Saw Cut.

Replace the title:

J. Saw Cut and Joint Sealing.

Add as last paragraph:
Joint sealing will not be measured for payment.

2301.35, Basis of Payment.

Delete the first paragraph:
~~For construction of concrete pavement and other construction in connection therewith, the Contractor will be paid the contract unit prices for the following items of work:~~

Replace the first sentence of the second paragraph:
When any of the types of additional protection described in Article 2301.19, B, is necessary, additional payment will be made as extra work at the rate of $1.00 per square yard ($1.20 per square meter) of surface protected.

2301.35, A, Portland Cement Concrete Pavement.

Replace the first sentence of the first paragraph:
The Contractor will be paid the contract unit price for Standard or Slip-Form Portland Cement Concrete Pavement of the type specified per square yard (square meter) and applies to pavement, concrete pavement widening greater than 6 feet (1.8 m), side street connections, ramps, acceleration and deceleration lanes or auxiliary lanes, and concrete paved shoulders.

Replace “-26-67” with “-26.67” in Row 10, Column 3 of the Payment Schedule Table.

2301.35, D, Incidental Concrete.

Replace the title and entire article:

D. Intentionally left blank.

2301.35, E, Concrete Median.

Replace the entire article:
The Contractor will be paid the contract unit price for Concrete Median per square yard (square meter).

2301.35, F, Bridge Approach Sections.

Replace the entire article:
The Contractor will be paid the contract unit price for bridge approach pavement per square yard (square meter). This payment shall be full compensation for excavation for modified subbase and subdrain; furnishing and installing subdrain; furnishing and installing subdrain outlet; furnishing and installing polymer grid; furnishing and placing porous backfill; furnishing and backfilling modified subbase; saw cutting; furnishing and installing reinforcing steel, tie bars, and dowel assemblies; placing, finishing, texturing, grooving, curing, all joint construction; and all other materials and labor to construct the Bridge Approach Section as shown in the contract documents.

Section 2302

2302.13, Method of Measurement.

Delete the first paragraph:
~~The various items involved in construction of PCC pavement widening will be measured as follows:~~

2302.13, C, Pavement Widening.

Replace the entire article:

The quantity of PCC Pavement Widening, in square yards (square meters), will be the quantity shown in the contract documents. The thickness of the pavement will be determined as provided in Article 2301.34.

2302.13, D, Shoulders.

Replace the first sentence:

The quantity of Type A, B, and C Shoulders, in stations (meters), will be the quantity shown in the contract documents.

2302.14, Basis of Payment.

Delete the first paragraph:

~~For the quantity of the various items involved in construction of PCC pavement widening, measured as provided above, the Contractor will be paid as follows:~~

2302.14, C, Pavement Widening.

Replace the entire article:

The Contractor will be paid the contract unit price for PCC Pavement Widening per square yard (square meter) as provided in Article 2301.35. This payment shall be full compensation for construction of the pavement widening and all other work not paid for under other items.

2302.14, D, Shoulders.

Replace the first sentence:

The Contractor will be paid the contract unit price for Type A, B, and C Shoulders per station (meter).

Section 2303

2303, Hot Mix Asphalt Mixtures.

Replace the entire section:

2303.01 DESCRIPTION.

This work shall consist of mixture design, production, placement, and compaction of HMA using proper quality control practices for the construction of surface, intermediate, or base course on a prepared subbase, base, or pavement, to the proper dimensions specified in the contract documents.

Supplemental Specifications for Quality Control Program for Small HMA Paving Quantities shall apply for HMA bid items with 1000 tons (1000 Mg) or less.

The Contractor shall be responsible for all aspects of the project, provide quality control management and testing, and maintain the quality characteristics specified.

Quality Management - Asphalt (QM-A) shall apply to contracts with HMA quantities of 5000 tons (5000 Mg) or greater and all Interstate contracts. The Contractor shall follow the procedures and meet the criteria established in Article 2303.02, Section 2521, and Materials I.M. 510 and 511.

For contracts with less than 5000 tons (5000 Mg) quality control will be the responsibility of the Engineer. The Contractor shall be responsible for the mix design. This does not change the mix requirements from gyratory to Marshall, unless specified in the contract documents.

2303.02 MATERIALS AND EQUIPMENT.

Materials used in these mixtures shall meet the following requirements:

A. Asphalt Binder.

The Performance Graded asphalt binder, PG XX-XX, will be specified in the contract documents to meet the climate, traffic, and pavement conditions. The asphalt binder shall meet the requirements of Section 4137.

B. Aggregates.

1. Individual Aggregates.
Virgin mineral aggregate shall meet the following requirements:

VIRGIN MINERAL AGGREGATES		
Mixture	**Aggregate Type**	**Aggregate Requirements**
Base	Type B	Section 4127
Intermediate and Surface	Type B	Section 4127
Intermediate and Surface	Type A	Section 4127

When frictional classification of the coarse aggregate is required, the contract documents will specify the friction level and location. The friction aggregate shall be furnished from sources identified in Materials I.M. T203.

For friction classification L-2, at least 80% of the combined aggregate retained on the No. 4 (4.75 mm) sieve shall be Type 4 or better friction aggregate; and at least 25% of the combined aggregate retained on the No. 4 (4.75 mm) sieve shall be Type 2 or better friction aggregate.

For friction classification L-3, at least 80% of the combined aggregate retained on the No. 4 (4.75 mm) sieve shall be Type 4 or better friction aggregate; and at least 45% of the combined aggregate retained on the No. 4 (4.75 mm) sieve shall be Type 3 or better friction aggregate. If Type 2 is used in place of Type 3, the minimum shall be ~~30~~ 25% of the combined aggregate retained on the No. 4 (4.75 mm) sieve.

For friction classification L-4, at least 50% of the combined aggregate retained on the No. 4 (4.75 mm) sieve shall be Type 4 or better friction aggregate.

2. Blended Aggregates.
The blended aggregates shall meet the combined aggregate requirements in Materials I.M. 510.

When mixtures include RAP, the blended mineral aggregate gradation shall be a mixture of extracted RAP aggregate combined with virgin aggregate.

C. Recycled Asphalt Pavement.
RAP shall be from a source designated in the contract documents, a certified stockpile, or unclassified RAP furnished by the Contractor subject to the following limitations:

1. Designated RAP.
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. The Contractor is responsible for salvaging this material unless otherwise specified in the contract documents. The RAP not used shall be incorporated into other parts of the project or placed in active stockpiles as directed in the contract documents.

The Contracting Authority will test samples of this material. For mix design purposes, the amount of asphalt binder in the RAP will be based on extraction tests. The Contractor shall designate the exact proportions of RAP material in the hot mix within the allowable range.

When the work is completed, the Contractor shall return unused material to the stockpile or other designated location, rebuild the stockpile, and restore the area, in accordance with Article 1104.08.

Test information, if known, will be included in the contract documents.

2. Certified RAP.
The RAP shall be from a known source and of the proper quality for the intended use, with no material added from other sources during the time in stockpile. The Contractor shall certify to this before use. RAP from not more than two known sources at a time will be allowed.

Certified RAP may be used in the base and intermediate course of mixes for which the RAP aggregate qualifies. RAP may also be used in surface courses when authorized by the Engineer. Not more than 30% of the asphalt binder in a final surface course mixture shall come from the RAP.

A certified RAP stockpile shall be sealed or protected in accordance with Materials I.M. 505.

3. Unclassified RAP.
Up to 10% of unclassified RAP may be incorporated into intermediate mixes for under 3,000,000 ESALs and all base mixes with the following safeguards:

a. Unclassified RAP shall not be used in surface courses.
b. Unclassified RAP shall not be used in intermediate or base mixtures containing designated or certified RAP.
c. The Engineer will inspect the unclassified RAP stockpile visually for uniformity. Unclassified RAP stockpiles containing concrete chunks, grass, dirt, wood, metal, coal tar, or other foreign or environmentally restricted materials shall not be used, unless approved by the Engineer. If foreign material is discovered in any unclassified stockpile, the Engineer may stop the continued use of the pile.
d. Representative samples will be taken by the Engineer. These samples are to be tested for gradation and asphalt content.
e. No credit will be given for crushed particles.
f. Stockpiles, when used, shall be worked in such a manner that the materials removed are representative of a cross section of the pile as approved by the Engineer.

D. Hot Mix Asphalt Mixture.
The surface course is the upper lift for a wearing surface of a designated thickness. The intermediate course is the next lower lift or lifts of a designated thickness. Leveling, strengthening, and wedge courses shall be of the intermediate course mixture. The base course is the lift or lifts placed on a prepared subgrade or subbase.

The job mix formula (JMF) is the percentage of each material, including the asphalt binder, to be used in the HMA mixture. The JMF gradation shall be within the control points specified for the particular mixture designated and shall establish a single percentage of aggregate passing each required sieve size.

If the asphalt binder demand for the combination of aggregates submitted for an acceptable mix design exceeds the basic asphalt binder content by more than 0.75%, the mix design will include an economic evaluation prepared by the Contractor. This evaluation will be based on past job mix history, possible aggregate proportion changes, and aggregate availability and haul costs for any changes or substitutions considered.

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. The following values, based on mixture size and type, shall apply.

BASIC ASPHALT BINDER CONTENT (%)					
Mixture Size	**Aggregate Type**	**1 inch (25 mm)**	**3/4 inch (19 mm)**	**1/2 inch (12.5 mm)**	**3/8 inch (9.5 mm)**
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

The HMA mixture designed shall meet gyratory design and mixture criteria corresponding to the design level specified in the contract documents. The Engineer may approve the substitution of any mixture which meets requirements for a higher mixture than specified in the contract documents at no additional cost to the Contracting Authority. Shoulders placed as a separate operation shall be HMA 1,000,000

ESAL base mixture. For outside shoulders on Interstate projects, the Contractor has the option to substitute the mainline intermediate or surface mixture for a specified base mixture at the Contractor's expense.

The Contractor shall prepare gyratory HMA mixture designs for all base, intermediate, and surface mixtures. The gyratory design procedure used shall follow the procedure outlined in Materials I.M. 510. The gyratory mixture designs submitted shall comply with Materials I.M. 510.

The gyratory compactor used for design and field control shall meet the AASHTO protocol for Superpave gyratory compactors. Compactors for which compliance with this protocol is pending may be used at the discretion of the District Materials Engineer.

E. Other Materials.

1. Tack Coat.
Tack coat may be SS-1, SS-1H, CSS-1, or CSS-1H. Mixing of CSS and SS grades will not be permitted. RC-70 and MC-70 may also be used after October 1, at the Contractor's option.

2. Anti-strip Agent.
On Primary highways designed for over 10,000,000 ESALs and all Interstate highways, ~~if 25% or more of the plus No. 4 (4.75 mm) (virgin and RAP) aggregate is gravel, quartzite, granite, trap rock, steel slag, or other siliceous aggregate (not a limestone or dolomite), anti-strip agent will be required in the affected mixture unless the minimum requirements for moisture sensitivity are met.~~ the Contractor shall perform an AASHTO T 283 moisture sensitivity evaluation of the proposed HMA mixture design.

On all other Primary highways, if 25% or more of the plus No. 4 (4.75 mm) (virgin and RAP) aggregates or more than 40% of the total (virgin and RAP) aggregates is quartzite, granite, or other siliceous aggregates (not limestone or dolomite) which is obtained by crushing from ledge rock, ~~anti-strip agent will be required in the affected mixtures requiring Type A aggregate unless the minimum requirements for moisture sensitivity are met.~~ the Contractor shall perform an AASHTO T 283 moisture sensitivity evaluation of the proposed HMA mixture design.

Anti-strip agent will not be required for base repair, patching, or temporary pavement.

When an AASHTO T 283 analysis is required:

a. If the Contractor’s results equal or exceed 90% tensile strength ratio (TSR), a mix design verification sample shall be submitted by the Contractor to the Central Materials Laboratory for testing. If Central Laboratory results verify the Contractor’s results, no anti-strip agent will be required and no further testing will be required unless substantial mix proportion changes from the original design are made.

b. If either the Contractor’s results equal or exceed 80% but are less than 90% or the Central Laboratory TSR results do not verify the Contractor’s results, the Contractor will be required to obtain an additional sample for AASHTO T 283 testing during the initial placement of the plant produced mix. The additional sample shall be obtained either from a test strip, if available, or during the initial, approximately, 500 tons (500 Mg) of mix. This sample shall be from an area without anti-strip and will be used to determine acceptability of the plant produced mixture for moisture sensitivity. Production taking place after this initial 500 tons (500 Mg) shall be made with an anti-strip added to the mixture until results are obtained from Central Laboratory. Payment for the anti-strip will be made according to Article 2303.06, D. If Central Laboratory results on mixture without anti-strip confirm acceptability, anti-strip will no longer be required from the time of notification.

c. If the Contractor’s results fall below 80% TSR, anti-strip will be required.

~~When anti-strip agent is required based on aggregate source, the Contractor may arrange for moisture sensitivity evaluation of the proposed HMA mixture design according to AASHTO T 283, "Resistance of Compacted Bituminous Mixture to Moisture-Induced Damage." When results of this~~

~~evaluation on mixtures without anti-strip agent indicate the minimum requirements for moisture sensitivity of 80% tensile strength ratio (TSR) with visual confirmation are met, anti-strip agent will not be required. Confirmation of AASHTO T 283 test results will be completed by the Central Materials Laboratory during the initial production and placement of the mix. The Contractor will be subject to the provisions of Section 1105 for mixture placed without anti-strip agent prior to completion of the AASHTO T 283 confirmation testing.~~

~~When a liquid anti-strip additive or aggregate treatment is used, confirmation of the AASHTO T 283 test results will be completed by the Central Materials Laboratory during the initial production and placement of the mix. The Contractor will be subject to the provisions of Section 1105 for mixture placed with liquid anti-strip additive or aggregate treatment prior to completion of the AASHTO T 283 confirmation testing.~~

One of the following anti-strip agents shall be used:

a. Hydrated Lime.
Hydrated lime shall meet the requirements of AASHTO M 303, Type I. Section 4193 shall not apply. Hydrated lime will not be considered part of the aggregate when determining the job mix formula and the filler/bitumen ratio.

b. Liquid Anti-strip Additives.
Liquid anti-strip additives blended into the asphalt binder shall be approved for each JMF. The approval will be based on the following conditions:

1) Asphalt binder supplier shall provide test results that the additive does not negatively impact the asphalt binder properties, including short term and long term aged properties.

2) ~~The AASHTO T 283 test is required and must satisfy 80% TSR when compared to the dry strength of specimens prepared with asphalt binder not containing the anti-strip additive.~~ The design shall establish the optimum additive rate when comparing the dry strength of specimens prepared with asphalt binder not containing the anti-strip additive to conditioned specimens prepared with asphalt binder containing the anti-strip additive. See Materials I.M. 510 for additional information.

3) A change in the source of asphalt binder, liquid anti-strip, or aggregates will require a re-evaluation of the AASHTO T 283 test. When there is a significant change in the aggregate proportions, the Engineer may require a re-evaluation of the AASHTO T 283 test.

c. Polymer-based Liquid Aggregate Treatments.
Polymer-based liquid aggregate treatments shall be approved for each JMF. The approval will be based on the following conditions:

1) ~~The AASHTO T 283 test is required and shall satisfy 80% TSR when compared to the dry strength of specimens prepared with and without the aggregate treatment.~~ The design shall establish the optimum additive rate when comparing the dry strength of specimens prepared without the anti-strip additive to conditioned specimens prepared with the anti-strip additive. See Materials I.M. 510 for additional information.

2) A change in the source of asphalt binder, liquid aggregate treatment, or aggregates will require a re-evaluation of the AASHTO T 283 test.

3. Sand for tack Coats.
Sand shall meet requirements of Section 4109, Gradation No. 1.

4. Fabric Reinforcement.
Fabric reinforcement shall meet requirements of Article 4196.01, D.

F. Equipment.
The Contractor shall provide sufficient equipment of the various types required to produce, place, and compact each layer of HMA mixture as specified.

Equipment shall meet requirements of Section 2001 with the following modifications:

1. Plant Calibration.
Each plant scale and metering system shall be calibrated before work on a contract begins. Calibration equipment shall meet the manufacturer's guidelines and Materials I.M. 508. 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. Calibration data shall be available at the plant.

Each aggregate feed shall be calibrated throughout an operating range wide enough to cover the proportion of that material required in the JMF. A new calibration shall be made each time there is a change in size or source of any aggregate being used.

For continuous and drum mixing plants, the asphalt binder metering pump shall be calibrated at the operating temperature and with the outlet under pressure equal to that occurring in normal operations.

2. Paver.
Article 2001.19 shall apply. Spreaders, as 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.
For initial and intermediate rolling, self-propelled, steel tired, pneumatic tired, or vibratory rollers meeting requirements of Article 2001.05, B, C, or F, shall be used. Their weight (mass) or tire pressure may be adjusted when justified by conditions.

For finish rolling, self propelled, steel tired rollers or vibratory rollers in the static mode meeting requirements of Article 2001.05, B or F, shall be used.

4. Scales.
Article 2001.07, B, shall apply to all paving operations regardless of the method of measurement.

2303.03 CONSTRUCTION.

A. Maintenance of the Subgrade and Subbase.
The Contractor is responsible for the maintenance of the completed subgrade and subbase to the required density, true cross section, and smooth condition, prior to and during subsequent construction activities. If rutting or any other damage occurs to the subgrade or subbase as a result of hauling operations, the Contractor shall immediately repair the subgrade and subbase, and such repair will include, if necessary, removal and replacement at the Contractor's expense.

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.

B. Preparation of Existing Surfaces.

1. Cleaning.
The existing surface shall be cleaned and prepared in accordance with Article 2212.04, A.

2. Tack Coats.
Tack coats shall be applied when the entire surface area on which the coat is to be applied is free of moisture. They shall not be applied when the temperature on the surface being covered is less than 25°F (-4°C).

The Contractor shall place a tack coat to form a continuous, uniform film on the area to be covered. Unless otherwise directed, the tack coat shall be spread at an undiluted rate of 0.02 to 0.05 gallon per

square yard (0.1 to 0.2 L/m^2). The tack coat emulsion may be diluted with water to improve application.

Tack coat shall be adequately cured prior to placement of the HMA to assure bond to the underlying surface and avoid damage of the HMA being placed. If the tack coat surface becomes dirty from weather or traffic, the surface shall be thoroughly cleaned and, if necessary, retacked. A light application of sand cover may also be required, but this is anticipated only for excessive application rates, breakdowns, and short sections remaining at the end of a day's run.

On highways being constructed under traffic, safety and convenience to the public without soiling their vehicles shall be a controlling factor. Tack coat applications shall be limited in length, to minimize inconvenience to the public. They shall be kept within the hot mixture placing work area that is controlled by flaggers at each end, and shall be planned so that they will be covered with hot mixture when the work area is opened to traffic at the end of the day's work.

The vertical face of exposed, longitudinal joints shall be tacked as a separate operation, before the adjoining lift is placed, at a rate from 0.10 to 0.15 gallon per square yard (0.5 to 0.7 L/m^2). The vertical surfaces of all fixtures, curbs, bridges, or cold mixture with which the hot mixture will come in contact shall be lightly painted or sprayed to facilitate a tight joint with the fresh mixture.

3. Fabric Reinforcement.
When fabric reinforcement is required, the locations will be designated in the contract documents. Fabric shall not be placed on a wet or damp surface or when the road surface is less than 50°F (10°C). Fiberglass fabric shall be applied only with an adhesive recommended by the manufacturer. Fabrics with an adhesive backing shall be placed in accordance with the manufacturer's recommendations.

Other fabrics shall be placed with a heavy coat of the asphalt binder grade used in the HMA applied at a rate of 0.20 to 0.25 gallons per square yard (0.9 to 1.1 L/m^2) and at a temperature between 295°F and 315°F (145°C and 160°C).

The fabric reinforcement shall be placed in accordance with the contract documents (full width or individual crack or joint treatment). The fabric shall be placed immediately following the adhesive or asphalt binder placement under the fabric. Placement may be by hand or by a mechanical method specifically designed for this purpose. Precautions shall be taken to avoid wrinkles in the fabric and to insure that air bubbles are removed without breaking the fabric. Wrinkles or folds which cannot be removed by brushing shall be cut and lapped to provide a smooth surface.

Additional adhesive or asphalt binder may be required to produce a tight, bonded surface. When applied full lane width, the minimum transverse and longitudinal lap shall be 12 inches (300 mm).

The Contractor shall avoid application of the tack coat over longitudinally placed fabric. Traffic shall not be allowed over the fabric during placement and during curing of the adhesive material to avoid damage to the fabric. A light application of HMA mix material may be hand sprinkled on the fabric to prevent damage from necessary equipment traffic.

Fabric that is damaged or soiled prior to HMA overlay shall be repaired at no additional cost, when directed by the Engineer. Sanding, at no additional cost, may also be required by the Engineer during this period.

C. Handling, Production, and Delivery.

1. Hot Mix Asphalt Plant Operation.
The plant operation shall comply with the following requirements:

a. Handling Mineral Aggregate and RAP.
The various aggregate products used shall be kept separate, and adequate provisions shall be made to prevent intermingling. Stockpiling and processing shall be handled in a manner that will ensure uniform incorporation of the aggregate into the mix.

The various aggregates shall be separately fed by feeders to the cold elevator in their proper proportions and at a rate to permit correct and uniform temperature control of heating and drying operations.

b. Handling Asphalt Binder.
The asphalt binder shall be brought to a temperature of 260°F to 330°F (125°C to 165°C) before being measured for mixing with the aggregates. The temperature between these limits may be further regulated according to the characteristics of the mixture, method of proportioning, and viscosity of the asphalt binder. Modified asphalt binder ~~should~~ shall be heated according to the suppliers recommendations.

c. Handling Anti-strip Agents.

1) Hydrated Lime.
The lime shall be accurately proportioned by a method acceptable to the Engineer.

a) Added to a Drum Mixer.
The hydrated lime shall be added at the rate of 0.75% by weight (mass) of the total aggregate (virgin and RAP) for Interstate and Primary projects. The hydrated lime shall be added to a drum mixer by one of the following methods:

(1) Added to the virgin aggregate on the primary feed belt, as a lime water slurry.
(2) Thoroughly mixed with the total combined aggregate if the aggregate contains at least 3% total moisture.
~~**(3)** Added to the Type 2 or Type 3 virgin aggregate in a moist condition, and then mixed with the total combined virgin aggregate.~~

Alternative methods for mixing must be reviewed and approved by the Engineer. Hydrated lime shall not be introduced directly into a drum mixer by blowing or auguring.

b) Added to a Batch Plant.
Hydrated lime shall be added at the rate of 0.5% by weight (mass) of total aggregate (virgin and RAP) for Interstate and Primary projects. It shall be introduced to a batch plant by one of the following methods:

(1) Placed on the recycle belt which leads directly into the weigh hopper.
(2) Added directly into the pugmill.
(3) Added directly into the hot aggregate elevator into the hot aggregate stream. In any case, the lime must be introduced prior to the start of the dry mix cycle.

In any case, the lime shall be introduced prior to the start of the dry mix cycle.

c) Added to the Aggregate Stockpile.
Hydrated lime shall be added at a rate established by the AASHTO T 283 test. The instructions for establishing the rate are discussed in Materials I.M. 510. The hydrated lime shall be added to the source aggregates defined in Article 2303.02, E, 2, thoroughly mixed with sufficient moisture to achieve aggregate coating, and then placed in the stockpile.

~~When either method b or c above for a batch plant is used, the hydrated lime will be considered part of the JMF.~~

2) Liquid.
When liquid anti-strip additives are used, the equipment used to store, measure, and blend the additive with the asphalt binder shall comply with the anti-strip supplier's recommended practice. 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 additive, the Contractor assumes the material certification responsibilities of the asphalt binder supplier. The shipping ticket shall report the type and amount of additive and the time of injection. The asphalt supplier shall provide the Contractor and Engineer with the shelf life criteria defining when the

anti-strip additive maintains its effectiveness. Binder that has exceeded the shelf life criteria shall not be used.

When polymer-based liquid aggregate treatment is used, the Contractor shall comply with the manufacturer's current recommended specifications and guidelines.

d. Production of Hot Mix Asphalt Mixtures.
The exact proportions of the various materials shall be regulated within the limits specified so as to produce a satisfactory bituminous coating and mixture. The aggregates shall first be mixed dry, then the asphalt binder shall be added. In batch plants, the asphalt binder shall be added in an evenly spread sheet over the full length of the mixer box. In continuous plants, the asphalt binder shall be sprayed evenly into the aggregate by a positive pressure spray within the first 30% of the length of the mixer box. In drum mixing plants, the asphalt binder shall be sprayed evenly into the aggregate by a positive pressure spray. Coating aids may be added, subject to approval of the Engineer.

The mixer shall be operated so that the mixture is of consistently uniform temperature and, as discharged from the mixer, will not vary more than 20°F (11°C). The temperature of the mixtures shall not exceed 330°F (165°C) unless approved by the Engineer.

The rate of production shall not exceed the manufacturer's rated capacity of the mixer and shall provide uniform coating. Dry mixing time for batch mixers shall be not less than 5 seconds. Wet mixing time for batch mixers shall be not less than 25 seconds. For continuous mixers, the mixing time shall be at least 30 seconds.

All handling and manipulation of the hot mixture from the mixer to the final spread on the road shall be controlled so that a uniform composition is maintained and segregation of coarser particles is minimized. The segregation shall be minimized to the extent that it cannot be visibly observed in the compacted surface. The Contractor shall only apply approved release agents to trucks and equipment as specified in Article 2001.01.

The mixture temperature shall be sufficient to allow for the specified compaction and density to be attained. HMA shall not be discharged into the paver hopper when its temperature is less than 245°F (120°C) for a nominal layer thickness of 1 1/2 inches (40 mm) or less and 225°F (110°C) for a nominal layer thickness of more than 1 1/2 inches (40 mm). Except for an unavoidable delay or breakdown, delivery of hot HMA to any individual spreading unit shall be continuous and uniform and at a rate sufficient to provide as continuous an operation of the spreading unit as practical. The paver hopper shall, at all times, be kept sufficiently full to prevent non-uniform flow of the mixture to the screed.

D. Placement.
The surface of each layer shall be cleaned in accordance with Article 2212.04, A, and if necessary, retacked to provide bond with the succeeding course. If bumps or other significant irregularities appear or are evident in the intermediate course or other lower course, they are to be corrected before the final lift is placed.

HMA mixtures shall not be placed on a wet or damp surface and shall not be placed when the temperature of the road surface is less than shown in the table below. The Engineer may further limit placement if, in the Engineer's judgment, other conditions are detrimental to quality work. HMA mixtures shall not be placed after November 15, except with approval of the Engineer.

ALL BASE AND INTERMEDIATE COURSE LIFTS OF HMA MIXTURES	
Nominal Thickness - inches (mm)	**Road Surface Temperature, °F (°C)**
1 1/2 (40)	40 (4)
2 - 3 (50-80)	35 (2)
Over 3 (Over 80)	25 (-4)

ALL SURFACE COURSE LIFTS OF HMA MIXTURES	
Nominal Thickness - inches (mm)	**Road Surface Temperature, °F (°C)**
1 (30)	50 (10)
1 1/2 (40)	45 (7)
2 and greater (50 and greater)	40 (4)

When placing the mixture, the forward speed of the finishing machine shall be at a rate to provide a continuous uniform operation with the least amount of stopping.

A wire or string line shall be used to guide the finishing machine and to maintain alignment. Edge alignment irregularities shall be corrected by hand methods immediately after they occur.

The contract documents will show the total thickness to be placed. Spreading of the mixture shall be at such a rate that, when compacted, the layer(s) will be substantially of the thickness and dimensions required to produce the required thickness. The minimum layer thickness shall be based on the following:

Design Mix Size - inches (mm)	Minimum Lift Thickness - inches (mm)
3/8 (9.5)	1 (25)
1/2 (12.5)	1 1/2 (40)
3/4 (19)	2 (50)
1 (25)	3 (75)

The compacted thickness of the top layer shall not be greater than 3 inches (75 mm). This restriction shall not apply to HMA shoulders. The maximum compacted thickness of lower layers may exceed 4 inches (100 mm) if it is demonstrated that the thicker layers have satisfactory density. The riding characteristics of the thicker layers shall be within reasonably close conformance to that expected from a 3 inch (75 mm) layer. Each layer shall be completed to full width before succeeding layers are placed.

While operating on the road surface, use of kerosene, distillate, other petroleum fractions, or other solvents, for cleaning hand tools or for spraying the paver hopper will not be permitted. Containers of cleaning solution shall not be carried on or near the paver. When a solvent is used, the paver shall not be used for at least 5 hours after this cleaning. The Contractor shall be responsible for collecting and removing all cleaning materials and cleaning residue from the project and plant site. The cleaning material and residue shall become the property of the Contractor.

Whenever practicable, all mixtures shall be spread by a finishing machine. Irregular areas may be spread by hand methods. The hot mixture shall be spread uniformly to the desired depth with hot shovels and rakes. Loads shall not be dumped faster than they can be spread properly. Workers shall not stand on the loose mixture while spreading. After spreading, the hot mixture shall be carefully smoothed to remove all segregated coarse aggregate and rake marks. Rakes and lutes used for hand spreading and smoothing shall be of the type designed for use on HMA mixtures.

Unless stated elsewhere in the contract documents when placing two adjacent lanes, not more than 1 day of normal plant production shall be paved in a lane before the adjacent lane(s) is paved. The adjacent lane shall be placed to match the first lane during the next day of plant production. The Contractor shall not spread more mixture than can be compacted in the specified working hours of the same working day. At the close of each working day, the roadbed shall be free of any construction equipment.

Prior to opening a lane to traffic, fillets or full width granular shoulders shall be placed in accordance with Article 2121.07, B. The material shall be placed adjacent to and equal in thickness to the resurfacing. Fillet removal shall be incidental to the HMA mixture.

E. Compaction.
Each layer shall be promptly and thoroughly compacted. Mechanical tampers shall be used for areas inaccessible to the rollers.

The overall rolling procedure and compactive effort shall produce a surface free of ridges, marks, or bumps and shall be subject to approval of the Engineer.

There are two classes of compaction, Class I and Class II. Class I compaction is intended for use on Interstate highways, and most Primary and Secondary highways. Class II compaction is intended for paved shoulders, temporary crossovers, onsite detours, and for other situations where Class I is not specified.

For Class I compaction, the roadway density (percent of laboratory density) will be based on the density obtained from the Quality Control Program for that day's mixture.

1. Class I Compaction.

a. Class IA Compaction.
Class IA compaction shall be used for intermediate and surface courses for the traffic lanes of Interstate highways, including Interstate-to-Interstate ramps, and Primary highways as specified. Compaction shall be a minimum of 96% of laboratory density. The average air void level of the roadway density specimens shall not exceed 8.0%.

b. Class IB Compaction.
Class IB compaction shall be used for all Interstate and Primary bases. Class IB will also be required on Primary travel lanes intermediate and surface courses, and ramps connecting to Interstate and Primary highways when Class IA compaction is not specified. Compaction shall be to a minimum of 95% of laboratory density. The average air void level of the roadway density specimens shall not exceed 8.0%.

c. Class IC Compaction.
Class IC compaction shall be used for HMA base widening, shoulder resurfacing when specified, traffic lanes of Secondary highways and any other traffic lanes when Class IA and IB are not specified. Compaction shall be a minimum of 94% of laboratory density. The average air void level of the roadway density specimens shall not exceed 8.0%.

d. Test Strip Construction for Class IA and IB Compaction.
For Class IA compaction at the start of intermediate course placement and for Class IA and Class IB compaction prior to the start of surface course placement, the Contractor shall construct a test strip for the purpose of evaluating properties of the HMA mixtures and for identifying an effective rolling pattern. For multiple lifts using the same mix requiring Class IA compaction, when the thickness of the second lift varies from the first lift by 1 1/2 inches (40 mm) or more, a test strip for the second lift shall be performed. When the contract documents specify both intermediate and surface courses, a surface course test strip shall be placed in lieu of intermediate mix in a section of intermediate course prior to actual surface course placement. The test strip shall be applied to each mixture which has a plan quantity of at least 3000 tons (3000 Mg).

The quantity of HMA mixture subject to Class IA compaction, produced and placed for test strip production, will be limited to 750 tons (750 Mg) for lift thicknesses of 2 inches (50 mm) or less, and 1000 tons (1000 Mg) for lift thicknesses greater than 2 inches (50 mm). After test strip placement, further mixing and laydown operations will be suspended until the laboratory test results of the plant produced mixture and core densities are available.

Only one test strip will be allowed for each mixture. At the direction of the Engineer, additional test strips may be required if a complying HMA mixture or rolling pattern was not established.

Procedures and documentation to be followed during construction of the test strip shall allow the Engineer and the Contractor to confirm mixture design properties and effectiveness of compaction procedures.

The test strip production control shall meet the requirements of Article 2303.04, B, 2. The number of density core samples obtained for the test strip will be increased by one and the low core result will not be used in the Quality Index (QI) density formula for payment for the test strip quantity.

2. Class II Compaction.
For all rollers, the initial contact with the hot mixture shall be made by the power driven wheels or roll.

The initial rolling shall be done at a temperature so the mixture will compact without excessive distortion. Except on longitudinal joints and super-elevated curves, rolling with the initial roller shall begin at the outer edges of the pavement, and each successive pass shall progress inward toward the centerline. Each reverse trip shall lap all but 4 to 6 inches (100 to 150 mm) of the previous track. When reversing direction, the initial roller shall stop at an angle with the longitudinal direction.

Following the initial rolling, the layer shall be given an intermediate rolling with a pneumatic tired roller before the temperature falls below 225°F (110°C). The intermediate roller shall cover the entire area not less than six times. A finish, steel tired roller shall be used to smooth out all marks and roughness in the surface.

Mechanical tampers or other approved compaction methods shall be used for areas inaccessible to the rollers.

F. Joints and Runouts.
Longitudinal joints for courses on resurfacing projects shall be constructed directly above the longitudinal joint in the existing pavement. The offset distance between longitudinal joints in succeeding courses of full depth HMA paving shall be not more than 3 inches (75 mm). The spreading of hot mixtures along longitudinal joints shall be adjusted to secure complete joint closure and full compression of the mixture with a smooth surface and joint after compaction.

Transverse construction joints in succeeding courses shall be separated by not less than 6 feet (1.6 m). The use of wood or metal headers to form the edge of the joint during rolling of the fresh mixture will not be permitted. The header shall be sawed to a straight line at right angles to the centerline so that a full thickness vertical edge will be provided before continuing paving. The Contractor shall provide a 10 foot (3 m) straightedge for checking transverse construction joints for smoothness. Variations in the surface at transverse construction joints, as indicated by the straightedge, shall be corrected by hand methods before compaction.

When a transverse construction joint is open to traffic, a temporary runout of 10 feet (3 m) in length per 1 inch (25 mm) of lift thickness shall be installed. Suitable paper or burlap should be used under the taper to prevent adhesion. Sand, dirt, or wood shall not be used for this purpose.

When required to end paving for winter shutdown, runouts shall be located adjacent to each other. A winter shutdown runout of 25 feet (8 m) in length per 1 inch (25 mm) of lift thickness shall be installed.

For temporary runouts open to traffic for periods greater than 4 weeks and winter shutdown runouts, the Contractor may reduce the amount of top size aggregate in the transition taper. The temporary runouts and winter shutdown runouts shall be removed before commencement of paving. Runout removal shall be incidental to the HMA mixture.

G. Miscellaneous Operations.

1. Leveling and Strengthening Courses.
The contract documents will show the thickness of the courses to be placed. Strengthening and leveling courses will be placed as indicated in the contract documents. These courses shall be of the same mixture specified for the base or intermediate course.

When the width of any strengthening or leveling layer is 8 feet (2.4 m) or more, the layer shall be spread by a finishing machine.

Leveling courses shall be compacted using Class II compaction procedures, except all passes shall be made with a pneumatic roller.

2. Wedge Courses.
Wedge courses used to secure desired super-elevation of curves shall be constructed of the base or intermediate mixture, and when possible, shall be spread by a finishing machine. In placing wedge course, the maximum thickness of individual layers, when compacted, shall not exceed 3 inches (75

mm), and care shall be used to avoid crushing the coarse aggregate. Wedge courses shall be placed to the full width of pavement.

On curves which require the placement of wedge courses, the Contractor will be required to stage the shoulder construction on the super elevated curves. After completion of each day's wedge placement operations and prior to suspending construction activities for that day, a full width shoulder shall be constructed on the high side up to the elevation of the completed wedge course. All necessary staging of shoulder construction will be considered incidental to shoulder construction.

3. Fixtures in the Pavement Surface.
All utility accesses, intakes, or other fixtures encountered within the area to be covered by HMA shall be adjusted to conform to the final adjacent finished surface. Unless otherwise indicated in the plans, the Contractor shall have the option of adjusting fixtures between placement of the surface course and the layer preceding the surface course, or adjusting the fixture after placement of the surface course using a composite patch or PCC patch.

PCC and HMA patch material shall conform to the requirements of Section 2529. Patches shall be of sufficient size to accommodate the structure being adjusted.

Patches shall be square in shape and oriented diagonally to the direction of traffic flow. Elevation of the adjusted fixture and patch shall not be higher than or more than 1/4 inch (6 mm) below that of the surrounding pavement surface.

4. Fillets for Intersecting Roads and Driveways.
When fillets are designated in the contract documents for driveways to homesteads and commercial establishments and at intersecting roads, the surface adjacent to the pavement being surfaced shall be shaped, cleaned of loose material, and tack coated. On this coated surface, the hot mixture shall be placed and compacted in layers equal to the adjacent layer and extended from the edge of pavement as shown in the plans. Fillets at intersecting roads shall be placed and compacted at the same time as the adjacent layer. Entrance fillets that are 8 feet (2.4 m) or wider may be placed as a separate operation. Paving of fillets 8 feet (2.4 m) or more in width shall be with a self propelled finishing machine described in Article 2001.19. The Engineer may approve other equipment for placement of fillets, based on a demonstration of satisfactory results.

5. Stop Sign Rumble Strips.
If the plans include the bid item Rumble Strip Panel (In Full Depth Patch), Section 2529 shall apply. 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.

6. Paved HMA Shoulders.
Compaction of paved HMA shoulders shall be accomplished using one of the following methods:

a. Class II compaction (Article 2303.03, E, 2),
b. Rolling pattern established during the first day of shoulder placement to achieve Class 1C compaction (Article 2303.03, E, 1), or
c. Same rolling pattern established for mainline lanes, as determined by density coring.

Shoulder area will not be included in calculations for density price adjustment on mainline. Shoulder area may be subject to price adjustment for failure to adhere to the established roller pattern.

2303.04 QUALITY ASSURANCE PROGRAM.

A. Mix Design - Job Mix Formula.
The JMF for each mixture shall be the responsibility of the Contractor.

The Contractor shall submit completed JMF using the computer format of Form 956 to the materials laboratory designated by the Contracting Authority for approval. The Contractor shall submit supporting documentation demonstrating the design process was followed and how the recommended JMF was determined, including an economic evaluation when required. Documentation shall include trial and final

proposed aggregate proportions (Form 955) and corresponding gyratory data. The Contractor shall also submit sufficient loose mixture and individual material samples for approval of the design.

The JMF shall be prepared by personnel who are Iowa DOT certified in bituminous mix design.

If the JMF is not satisfactory, the Contractor shall submit another JMF for review. An approved JMF will be required prior to beginning plant production. The Contractor will be charged $1000 for each JMF approval requested and performed which exceeds two per mix size, type, and proposal item on any individual project or group of tied projects.

B. Plant Production.
The Contractor shall perform the sampling and testing to provide the quality control of the mixture during plant production. Certified Plant Inspection as described in Section 2521 will be required on all HMA plant production. All personnel performing production quality control testing shall be certified by the Department.

Easy and safe access shall be provided to the location in the plant where samples are to be taken.

A “significant mix change" is defined as a single occurrence of an aggregate interchange of greater than 5%, a single occurrence of an asphalt content change greater than 0.2%, or any deletion or introduction of a new material into the mix.

1. Sampling and Testing.
Asphalt binder shall be sampled and tested to verify the quality of the binder grade. Asphalt binder samples shall be taken, at random times, as directed and witnessed by the Engineer in accordance with Materials I.M. 204.

Aggregate gradation control shall be based on cold feed gradation.

Aggregate samples shall be taken, at random times, as directed and witnessed by the Engineer in accordance with Materials I.M. 204 and secured in accordance with Materials I.M. 511 to determine that materials are being proportioned in accordance with the specifications.

The hot HMA mixture shall be sampled, at random locations, as directed and witnessed by the Engineer, in accordance with Materials I.M. 322 and secured in accordance with Materials I.M. 511.

The Contractor shall provide the Engineer assistance with material sampling for verification testing. When the Engineer notifies the Contractor that a sample shall be taken, the Contractor shall obtain the sample within 15 minutes.

Each day's production of a mix design shall be considered a lot. When the anticipated quantity for the day is 2000 tons (2000 Mg) or more, that day's production shall be divided into four sublots, the first sublot of each day shall be the first 500 tons (500 Mg) produced. The remaining anticipated quantity for the day shall be divided into three sublots of equal size.

When the anticipated mix design quantity for the day is less than 2000 tons (2000 Mg), the first daily sublot shall be the first 500 tons (500 Mg) produced. Additional daily sublots of 750 tons (750 Mg) each will be established for mix production exceeding the first 500 tons (500 Mg).

The maximum number of paired hot HMA mixture samples required for acceptance of a lot will not exceed four.

Paired samples shall not be taken from the first 100 tons (100 Mg) of mix produced each day or the first 100 tons (100 Mg) of mix following a significant mix change.

The Contractor shall test the quality control sample of each production paired sample as follows:

Two gyratory specimens shall be prepared and compacted in accordance with Materials I.M. 325G and the results averaged to determine sample results.

Density shall be determined for each specimen in accordance with Materials I.M. 321.

The Contractor's field quality control laboratory compaction shall be used for field density control. The laboratory density for field control will be the bulk specific gravity of compacted mixture (G_{mb}) at N_{design}. Bulk specific gravity at N_{design} will be determined by compacting specimens to N_{max} and back calculating the bulk specific gravity at N_{design}.

The Theoretical Maximum Specific Gravity of the uncompacted mixture shall be determined in accordance with Materials I.M. 350 or other test methods recognized by AASHTO or ASTM.

The laboratory air voids shall be determined in accordance with Materials I.M. 501.

When liquid anti-strip additives are used, the Contractor shall satisfy one of the following methods to regulate the quantity of additive.

a. The Contractor shall present Certification that the equipment used to measure and blend the liquid anti-strip additive meets the anti-strip supplier's recommended practice, that the equipment is directly tied to the asphalt binder supply system, and that the equipment has been calibrated to the equipment manufacturer's guidelines.

b. The Contractor shall test the binder to measure the quantity of liquid anti-strip additive in the binder every 5000 tons (5000 Mg) of HMA production. The supplier's test method shall be approved by the Engineer prior to use of the test.

c. The Contractor shall run AASHTO T 283 during production. If the Contractor is unable to certify or test for the presence and quality, the Contractor shall run AASHTO T 283 each 10,000 tons (10,000 Mg) of production to measure the effectiveness of the additive. The test results shall satisfy 80% TSR when compared to the dry strength of specimens prepared with asphalt binder containing the anti-strip additive.

2. Production Control.

After the JMF is established, the combined aggregate furnished for the project, the quantity of asphalt binder and laboratory air voids should consistently conform to the JMF, as target values, and shall be controlled within the production tolerances given in Table 2. Plant production must be controlled such that the plant produced HMA mixture will meet mixture design criteria for Air Voids and VMA at N_{design} gyrations of the gyratory compactor within the test tolerances given in the table. The slope of the gyratory compaction curve of plant produced material shall be monitored and variations in excess of ±0.40 of the mixture design gyratory compaction curve slope may indicate potential problems with uniformity of the mixture.

The gyratory mix design gradation control points for the size mixture designated in the project plans will not apply to plant production control.

Table 2 - Production Tolerances		
MEASURED CHARACTERISTIC	**TARGET VALUE (%)**	**SPECIFICATION TOLERANCE (%)[1]**
Cold feed gradation No. 4 (4.75 mm) and larger sieves	by JMF	± 7.0
Cold feed gradation No. 8 (2.36 mm)	by JMF	± 5.0
Cold feed gradation No. 30 (600 µm)	by JMF	± 4.0
Cold feed gradation No. 200 (75 µm)	by JMF	± 2.0 [2]
Daily asphalt binder content	by JMF	± 0.3
Field laboratory air voids	4.0 [3]	-0.5/+1.0 [4]
VMA [5]	by JMF	± 1.0 [6]
[1]- Based on single test unless otherwise noted.		
[2]- The filler/bitumen ratio of the plant produced mixture will be maintained between 0.6 and 1.4.		
[3]- Unless otherwise specified.		
[4]- Based on the moving average of four test values.		
[5]- Restricted to an asphalt film thickness as specified for the level of HMA mixture.		
[6]- Based on the daily lot average.		

The Contractor shall strive for the target value of the percent air void and asphalt binder by adjusting gradation and asphalt binder content.

The Contractor shall produce a mixture of uniform composition conforming to the JMF. If, during production, the Contractor determines from quality control testing that adjustments are necessary to the JMF to achieve the specified properties, adjustments to the JMF target gradation and asphalt binder content values may be made.

Adjustments to the JMF aggregate proportions and asphalt binder content shall be made as a result of the interactive process between the Contractor and the Engineer. The Contractor's adjustment recommendations shall prevail, provided all specifications and established mix design criteria are being met for plant production.

The voids in the mineral aggregate (VMA) and estimated film thickness shall be measured for specification compliance every day of HMA production.

Quality control charts in accordance with Materials I.M. 511 shall be available and kept current showing both individual test results and moving average values. Moving averages shall be based on four consecutive test results. Moving averages may only restart in the event of a mandatory plant shutdown for failure to maintain the average within the production tolerance. Control charts shall include a target value and specification tolerances.

Laboratory voids for individual tests shall be calculated according to Materials I.M. 501, using the individual density and individual maximum specific gravity determined for each sample. The moving average of laboratory voids shall be the average of the last four individual laboratory voids.

The Contractor shall monitor the test results and to make mix adjustments, when appropriate, to keep the mixture near the target values. The Contractor shall notify the Engineer whenever the process approaches a specification tolerance limit. One moving average point for laboratory air voids outside the specification tolerance limit shall be cause to cease operations. The Contractor shall assume the responsibility to cease operations, including not incorporating produced material which has not been placed. The process shall not be started again until the Contractor notifies the Engineer of the corrective action proposed.

C. Construction.

1. Density.

Density samples shall be taken from the compacted mixture and tested not later than the next working day following placement and compaction.

A lot shall be considered as one layer of one mixture 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.

The Engineer may waive sampling for density provided compaction has been thorough and effective in the following situations:

1. When the day's operation is not more than 2500 square yards (2500 m^2),
2. When the day's operation is not more than 500 tons (500 Mg),
3. When the mixture is being placed in irregular areas, or
4. When placing wedge or strengthening courses.

Density samples shall be taken and will be tested for each lot in accordance with Materials I.M. 204. The length laid in each lot will be divided into approximately equal sublots and one sample shall be obtained at a random location, as directed and witnessed by the Engineer in each sublot.

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. Samples shall not be taken less than 1 foot (300 mm) from the edge of a given pass of the placing equipment, from run-outs, or from day's work joints or structures.

The quality index for density of each lot shall be determined by the following formula:

$$QI_{Density} = \frac{(\text{Average } G_{mb})_{\text{Field Lot}} - ((\%\ \text{Density})_{\text{Specified}} \times (\text{Average } G_{mb})_{\text{Lab Lot}})}{(\text{Standard Deviation } G_{mb})_{\text{Field Lot}}}$$

where $QI_{Density}$ = Quality Index for density
G_{mb} = bulk Specific Gravity of the mixture

When the quality index falls below 0.00, the Engineer may declare the lot or parts of the lot defective.

If one of the density test values from a lot is an outlier, identified in accordance with the procedure described in Materials I.M. 501, the outlier value shall not be used to determine the quality index. The quality index shall be determined using the remaining density test values.

If only one laboratory density value is obtained that day, combine that value with the next day's test results to evaluate both days' production. If two or more laboratory density values are obtained that day, then the average of those tests alone shall be used. If a significant mix change has been made, only the appropriate laboratory density values should be used with the corresponding density cores.

2. Thickness.
The thickness of the completed course will be measured to the nearest 1/8 inch (3 mm), exclusive of seal coat, by measurement of cores. All areas of uniform and similar thickness and width for the project will be divided into lots.

The frequency specified for taking density samples from the surface lift will be used when measuring for completed thickness. However, samples that may not be tested for density because they are less than 70% of the intended thickness shall be used for thickness, and in these particular instances, the additional samples of sufficient thickness that are used for density tests shall not be measured for thickness. Thickness samples will be taken full depth of the completed course and after measurement, the density samples for the top layer shall be removed by the Contractor from the core. If any of the measurements for a lot is less than the designated thickness, the quality index for thickness of that lot will be determined by the following formula:

(English)

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

(Metric)

$$QI_{Thickness} = \frac{\text{Average Thickness}_{\text{Measured}} - (\text{Thickness}_{\text{Plan}} - 12.7)}{\text{Maximum Thickness}_{\text{Measured}} - \text{Minimum Thickness}_{\text{Measured}}}$$

When the day's operation is 2500 square yards (2500 m^2) or less, or the mixture is being placed in irregular areas or next to structures, the Engineer may waive sampling for thickness provided there is reasonable assurance that the pavement conforms to the required thickness. When the quality index falls below 0.00, the Engineer may declare the lot or parts of the lot defective.

3. Smoothness
Section 2317 shall apply to all HMA surface mixture bid items of a Primary project if any individual HMA mixture bid item is 1000 tons (1000 Mg) or greater or 5000 square yards (4200 m^2) or greater. Section 2316 shall apply to all other Primary projects with a surface course and when specifically required for other projects.

D. Sampling and Testing.
The Contractor shall maintain and calibrate the quality control testing equipment with prescribed procedures. Sampling and testing shall conform to 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 lab shall be qualified.

All quality control samples and field lab gyratory specimens used for acceptance shall be identified, stored, and retained by the Contractor until the lot is accepted. The Contracting Authority will prescribe the method of securing the identity and integrity of the verification samples in accordance with Materials I.M. 511. All verification samples shall be stored by the Contractor for the Contracting Authority until delivery to the Contracting Authority's lab.

All samples shall be identified by a system approved by the Engineer.

1. Individual Materials and Loose Mixture.
All samples of asphalt binder, aggregate, and tack coat material, shall be identified, secured, and promptly delivered to the appropriate laboratory, as designated by the Engineer.

Paired samples of loose HMA mixture shall be taken in accordance with Materials I.M. 322, each box of the pair weighing at least 30 pounds (14 kg). The Contractor's quality control tests for mixture properties shall be conducted on representative portions of the mix, from the quality control sample of each sublot.

Samples shall be split for specimen preparation in accordance with Materials I.M. 357.

Paired sampling may also be accomplished by taking a bulk sample and immediately splitting the sample in accordance with Materials I.M. 322 on the grade.

All test results and calculations shall be recorded and documented on data sheets approved by the Contracting Authority. Specific test results shall be recorded on the Daily Plant Report provided by the Contracting Authority. The Daily Plant Report shall also include a description of quality control actions taken (adjustment of cold feed percentages, changes in JMF, etc.). The Contractor shall FAX, or deliver by other method approved by the Engineer, the Daily Plant Report to the Engineer and designated laboratory daily. A copy of the electronic file containing project information generated during the progress of the work shall be furnished to the Engineer at project completion.

When sampling for AASHTO T 283, the Contractor shall obtain a 50 pound (25 kg) sample in accordance with Materials I.M. 322. The Engineer will select, at random, the sample location. The Contractor shall split the sample and deliver half to the Central Materials Laboratory.

2. Compacted Pavement Cores.
The Contractor shall cut and trim samples under the direction of and witnessed by the Engineer for tests of density, thickness, or composition, by sawing with a power driven masonry saw or by drilling a minimum 4 inch nominal diameter core. The surfaces shall be restored by the Contractor the same day. The core holes shall be dried, filled with the same type of material, and the material properly compacted. Pavement core samples will be identified, taken possession of by the Engineer, and delivered to the Contractor's quality control field laboratory.

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.

The compacted HMA pavement will be tested in a timely manner by the Engineer's personnel who are Iowa DOT Certified to perform the test.

The minimum number of cores taken shall be in accordance with Materials I.M. 204, Appendix F.

The core locations will be determined by the Engineer.

The cores shall be prepared and tested in accordance with Materials I.M. 320, 321, and 337.

3. Verification and Independent Assurance Testing.
The Contractor's quality control test results from paired samples 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.

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 in accordance with Materials I.M. 511.

The Engineer will select, at random, one or more of the daily hot mix 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.

The Engineer will test each lot of cores. These will be tested at the Contractor's field quality control laboratory. Cores may also be tested by the Contractor, but the Contractor's test results will not be used for material acceptance.

All personnel and laboratories performing tests used in the acceptance of material shall participate in the statewide Independent Assurance Program in accordance with Materials I.M. 208.

2303.05 METHOD OF MEASUREMENT.

A. Hot Mix Asphalt Mixture.

1. Measurement by Weight (Mass).
When measurement is by weight (mass), the quantity of Hot Mix Asphalt Mixture of the type specified will be expressed in tons (megagrams) and determined from the weight (mass) of individual loads, including fillets, measured to the nearest 0.01 tons (0.01 Mg).

Loads may be weighed in trucks, weigh hoppers, or from the weight (mass) from batch plants computed by count of batches in each truck and batch weight (mass). Article 2001.07 applies. The weights (mass) of various loads shall be segregated into the quantities for each pay item.

2. Measurement by Area.
When payment is based on square yards (square meters), the quantity of Hot Mix Asphalt Mixture of the type specified, will be the quantity shown in the contract documents to the nearest 0.1 square yard (0.1 m^2).

When constructing shoulders on a basis of payment of square yards (square meters), inspection of the profile and elevation will be based on the completed work relative to the pavement edge; the Contractor shall be responsible for the profile and elevation of the subgrade and for thickness.

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, or when placed as a separate operation, from scale tickets. If the substitute mixture placed on the shoulder is for an

intermediate course fillet only, the quantity in the fillet shall be included for payment in the quantity placed in the adjacent intermediate course.

Removal of fillets shall be incidental to the contract unit price for the mixture.

B. Asphalt Binder.
The amount of asphalt binder used from batch plants, continuous plants, or drum mixing plants, shall be by stick measurement in the Contractor's storage tank or by in-line flow meter reading, in accordance with Article 2001.07, B. The asphalt binder quantity added to the storage tank shall be computed from a supplier certified transport ticket accompanying each load. The quantity of asphalt binder not used in the work will be deducted.

When the quantity of asphalt binder in a batch is measured by weight (mass) and is separately identified by automatic or semi-automatic printout, the Engineer may compute from this printout the quantity of asphalt binder used.

By mutual agreement, this method may be modified when small quantities or intermittent operations are involved.

The Engineer will calculate and exclude the quantity of asphalt binder used in mixtures in excess of the tolerance specified in Article 2303.04, B, 2.

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.
The quantity of asphalt binder in RAP, which is incorporated into the mix, will be calculated in tons (megagrams) of asphalt binder in the RAP, based on an assumed asphalt binder content of 5% of the dry RAP weight (mass).

The quantity of asphalt binder in RAP, which is incorporated into the mix, will be included in the quantity of asphalt binder used.

The quantity of asphalt binder in unclassified RAP will not be measured for payment.

D. Anti-strip Agent.
Anti-strip agent incorporated in HMA mixtures will not be measured separately. The quantity will be based on tons (megagrams) of HMA mixture with anti-strip agent added.

E. Tack Coat.
Tack Coat shall be considered incidental to HMA, and will not be measured separately.

F. Fabric Reinforcement.
The quantity of Fabric Reinforcement, in square yards (square meters), to the nearest 0.1 square yard (0.1 m^2), will be the quantity shown in the contract documents.

G. Adjustment of Fixtures.
The Engineer will count the number of fixtures adjusted to the finished grade.

H. Hot Mix Asphalt Pavement Samples.
HMA Pavement Samples of any finished pavement furnished according to Article 2303.04, D, or required elsewhere in the contract documents, will not be individually counted for payment.

2303.06 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 shall not be paid for separately, but shall be 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. Any pollution control testing shall be at the Contractor's expense. The installation of temporary Stop Sign Rumble Strips will not be paid for separately, but shall be considered incidental to the price bid for the HMA course for which it is applied.

A. Hot Mix Asphalt Mixture.
The Contractor will be paid the contract unit price for Hot Mix Asphalt Mixture of the type specified per ton (megagram) or square yard (square meter).

Surface course test strip placement in an intermediate lift will be paid for at the contract unit price for Hot Mix Asphalt Mixture, Surface Course, per ton (megagram).

Payment will be adjusted by the following percentages for the quality index for density determined for the lot:

Quality Index (Density) 7 Samples [1]	Percent of Full Payment
Greater than 0.72	100
0.40 to 0.72	95
0.00 to 0.39	85
Less than 0.00	75 maximum
[1] Or 6 samples and 1 outlier. Only one outlier will be allowed.	

When the basis of payment is by area, payment will be further adjusted by the appropriate percentage according to the quality index for thickness determined for that lot and the following table:

Quality Index (Thickness) 7 Samples	Percent of Payment (Previously Adjusted for Density)
Greater than 0.34	100
0.14 to 0.34	95
0.00 to 0.13	85
Less than 0.00	75 maximum

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 paid for according to Article 1105.04.

When liquid anti-strip agent is used and production quality control testing for AASHTO T 283 is required, the payment for HMA will be adjusted according to the following table:

Percent TSR	Percent of Full
Greater than 79	100
79 to 70	90
Less than 70	75 maximum

B. Asphalt Binder.
For the number of tons (megagrams) of asphalt binder used in the work, measured as provided in Article 2303.05, B, the Contractor will be paid the contract unit price per ton (megagram).

Payment for asphalt binder will be for all new asphalt binder and the asphalt binder in RAP salvaged from the project, the Contracting Authority owned stockpile, or certified Contractor owned stockpiles, which is incorporated in the mixture.

When scarification of asphalt material is required and is paid for on the basis of square yards (square meters) and no other use of the RAP is specified, the RAP shall become the property of the Contractor, and the Contractor shall not be charged for the asphalt binder in that material.

When the basis of payment for HMA is in square yards (square meters), compensation for asphalt binder will be included in the contract unit price per square yard (square meter).

C. Recycled Asphalt Pavement.
RAP which is 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.
When anti-strip agent is required according to Article 2303.02, E, 2, the incorporation of the anti-strip agent into the HMA mixture will be considered as extra work ordered by the Engineer. Payment will be made at the rate of ~~$1.00~~ $2.00 per ton (megagram) of HMA mixture in which the anti-strip agent is incorporated. This payment will be full compensation for designing, adding, and testing for anti-strip agent.

E. Fabric Reinforcement.
The Contractor will be paid the contract unit price for Fabric Reinforcement per square yard (square meter). This payment shall be full compensation for furnishing all materials, labor, and equipment necessary for installing the fabric as required, including the adhesive or heavy tack coat of asphalt binder used as the adhesive.

F. Adjustment of Fixtures.
For the number of fixtures adjusted to the finished grade line, the Contractor will be paid the contract unit price for each. If the contract contains no price for adjustment of fixtures, this work will be paid for as provided in Article 1109.03, B.

G. Hot Mix Asphalt Pavement Samples.
For cutting HMA pavement samples to determine density or thickness according to the specifications, when either of these is the responsibility of the Contractor, and elsewhere when required by the contract documents, the Contractor will be paid the lump sum contract price. This lump sum payment shall be full compensation for furnishing all such samples for all courses or items of work, and for delivery of samples as specified in Article 2303.04, D.

Section 2304

2304, Detour Pavement.

Add as a new section:

2304.01 DESCRIPTION.
This work shall consist of furnishing and placing a temporary or permanent hard surface composed of PCC or HMA to carry traffic during construction of permanent pavement.

2304.02 MATERIALS.
The Contractor has the option of using PCC or HMA for the detour pavement. The option used shall meet the following requirements.

A. PCC.
The PCC option shall meet the requirements of Section 2301 for Class A PCC Pavement. Class 2 durability coarse aggregate, or better, as defined in Article 4115.04, shall be used.

For median crossovers, the PCC option shall meet the requirements of Section 2301 for Class C PCC Pavement. Class 3 durability coarse aggregate, or better, as defined in Article 4115.04, shall be used.

B. HMA.
For projects with less than 10,000,000 total design year ESALs, the HMA option shall meet the requirements of Article 2303.02 for HMA 1,000,000 ESAL surface or intermediate course, 1/2 inch (12.5 mm) or 3/4 inch (19 mm). For projects with more than 10,000,000 total design year ESALs, the HMA option shall meet the requirements of Article 2303.02 for HMA 10,000,000 ESAL base course, 3/4 inch (19 mm).

The asphalt binder shall be PG 64-22.

For median crossovers, the HMA option shall meet the requirements of Article 2303.02 for HMA 10,000,000 ESAL base course, 3/4 inch (19 mm). The asphalt binder shall be PG 64-22. Class 1B compaction shall be used. The surface lift requires L-4 friction aggregate.

2304.03 CONSTRUCTION.
Earthwork quantities are based upon the PCC option and will not be adjusted for additional HMA depth. Additional cut material may be used as earth shoulder construction.

A. PCC.
The PCC option shall meet the requirements of Section 2301. Transverse joints, center tie bars, and sealing of the center longitudinal joint are not required.

Article 2301.16, B, C, and D, shall not apply unless stated otherwise in the contract documents.

Article 2316.01, B, shall apply.

B. HMA.
The HMA option shall meet the requirements of Section 2303.

2304.04 METHOD OF MEASUREMENT.
The quantity of Detour Pavement constructed, in square yards (square meters), will be the quantity shown in the contract documents.

2304.05 BASIS OF PAYMENT.
The Contractor will be paid the contract unit price for Detour Pavement, per square yard (square meter). This payment shall be full compensation for furnishing all material, equipment, and labor to construct the detour pavement in accordance with the contract documents. Removal of detour pavement will be paid for according to Section 2510.

Section 2306

2306.09, Traffic Control.

Replace the second paragraph:
Unless stated otherwise in the contract documents, the Contractor shall furnish signs and mounting devices including posts.

Replace the third paragraph:
The Contractor shall furnish and install these signs as follows:

2306.11, C, Traffic Control.

Replace the entire article:
Article 2528.12 shall apply.

2306.12, B, Traffic Control.

Replace the entire article:
Article 2528.13 shall apply.

Section 2307

2307.04, C, 1, General.

Delete the words “catch basins” from the second sentence of the third paragraph.

2307.04, F, 1

Replace the second row of the table:

3/8 inch (9.5 mm)	0.25 - 0.35 (1.1 - 1.6)	0.30 (1.4)

2307.04, H, Maintenance During Construction Period.

Delete the words “or catch basins” from the third sentence of the second paragraph.

2307.04, J, Traffic Control.

Replace the third paragraph:
Unless stated otherwise in the contract documents, the Contractor shall furnish the signs and mounting devices including posts.

Replace the fourth paragraph:
The Contractor shall furnish and install these signs as follows:

2307.06, E, Traffic Control.

Replace the entire article:
Article 2528.12 shall apply.

2307.07, E, Traffic Control.

Replace the entire article:
Article 2528.13 shall apply.

Section 2309

2309.02, E, Compaction of Mixture.

Replace “Article 2303.03, D, 2” with “Article 2303.03, E, 2” in the article.

2309.02, F, Joints.

Replace “Article 2303.03, D, 3” with “Article 2303.03, F” in the article.

2309.03, Limitations.

Replace “Article 2303.03, C” with “Article 2303.03, D” in the article.

Section 2310

2310, Portland Cement Concrete Overlay.

Replace the entire section:

2310.01 DESCRIPTION.
This work consists of overlaying an existing pavement with a PCC overlay. The various types of PCC overlay are as follows:

1. Bonded overlay consists of placing a PCC overlay over an existing PCC pavement.
2. Unbonded overlay consists of placing a PCC overlay over an existing pavement where a stress relief layer is placed on top of the existing PCC pavement or an existing PCC pavement that has been overlaid with HMA (composite pavement).
3. Whitetopping consists of placing a PCC overlay over an existing, full depth asphalt pavement.

The requirements of Section 2301 shall apply to this work with the modifications for each type of work identified below.

2310.02 MATERIALS.

A. Concrete.

Class C concrete shall be used for PCC Overlays as specified in Materials I.M. 529, except a C-3WR or C-4WR mix design shall be required for Bonded Overlays. Allowable substitutions shall be in accordance with Article 2301.04.

The Gradation of coarse aggregate shall meet the requirements of Section 4109, Aggregate Gradation Table, Gradation No. 3 or 5. The nominal maximum coarse aggregate size shall be no greater than one-third of the overlay thickness.

Unless otherwise specified, the coarse aggregate for bonded overlays shall be the same type of aggregate as the existing pavement.

B. Hot Mix Asphalt Stress Relief Course.

The HMA stress relief course for unbonded overlays shall consist of a nominal 1 inch (25 mm) course of HMA meeting the requirements of Section 2303. Asphalt binder shall be PG 58-28. Mixture shall meet 300,000 ESAL, 3/8 inch (9.5 mm), HMA mix requirements, target air voids is 3.0%, no maximum film thickness restriction, and no minimum filler/bitumen ratio restriction. Aggregate shall be Type B with no percent crushed particle requirements and gradation shall fall below the restricted zone.

2310.03 CONSTRUCTION.

A. Equipment.

Surface preparation equipment used shall be subject to approval of the Engineer and shall comply with the following:

1. Scarifying or Shotblasting Equipment.

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

2. Sand Blasting Equipment.

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

B. Preparation of Surface.

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

Surface preparation shall include the entire surface to be resurfaced. Materials removed in the preparation operation may be placed in the shoulder area unless otherwise specified in the contract documents.

1. Bonded Overlays.

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

2. Unbonded Overlays.

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

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

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

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

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

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

1. Bonded Overlays.

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

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

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

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

2. Unbonded Overlays.

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

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

c. Surface Condition.
The prepared surface shall be dry when concrete is placed on the surface of the HMA pavement to allow some absorption of the concrete mortar. If the surface of the HMA is above 110ºF (40ºC),

the Contractor may apply water to the surface of the HMA ahead of the paving operation in order to cool the surface. The water shall be applied far enough in advance of the paving operation that the surface will dry from evaporation before concrete is placed. No water shall be applied to the surface of the pavement when the HMA surface temperature is below 100ºF (38ºC).

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

3. Whitetopping.

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

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

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

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

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

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

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

2310.04 Method of Measurement.
The quantity of the various items of work involved in the construction of PCC overlay will be measured by the Engineer in accordance with the following provisions:

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

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

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

D. Hot Mix Asphalt Stress Relief Course.

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

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

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

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

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

A. Portland Cement Concrete Overlay, Furnish Only.
The Contractor will be paid the contract unit price per cubic yards (cubic meters) for Portland Cement Concrete, Furnish Only, as measured above. This payment shall be full compensation for furnishing all raw materials, and for proportioning, mixing, and delivery of concrete to the paving machine.

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

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

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

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

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

Section 2315

2315.02, C, Other Aggregate.

Replace “Section 4126” with “Section 4127”.

Section 2316

2316, Pavement Smoothness.

Replace the entire section:

2316.01 GENERAL.
This section shall apply when Section 2317 does not. Pavement smoothness shall be evaluated for all Interstate and Primary main line pavement surfaces, and all other road surfaces included on Primary projects, except when specifically excluded or modified by the contract documents. Pavement smoothness shall not be evaluated for non-Primary projects unless specified in the contract documents. Main line pavement is defined as all permanent pavement for traffic lanes, including tapers to parallel lanes or through lanes at intersections, tapers to climbing lanes, and tapers to ramps and loops. Pavement smoothness shall also be evaluated for all interchange ramps and loops.

If this specification is required by contract documents on non-Primary projects let by the Department, it will be added in its entirety. Selected portions of the specification will not be deleted.

Bridge approach sections which are a part of the paving contract will be tested according to Section 2428.

A. Smoothness Requirements.
The following shall apply to all projects when specified. Smoothness requirements in inches per mile (millimeters per kilometer) are listed in Schedules A and B. On lanes over 8.5 feet (2.6 m) in width, for through traffic which requires matching the surface of the new pavement to the surface of an existing old pavement, an Average Base Index (ABI) will be calculated as shown below; this will be the smoothness base in inches per mile (millimeters per kilometer) for payment for the new pavement unless otherwise specified. The requirements are shown in Schedule C.

Schedule for Identification of Pavements		
Pavement	Schedule By Posted Speed (mph) (Existing or Proposed)	
	45 or less	**Over 45**
Mainline, curbed (one or both sides of roadway)	B	A
Mainline, not curbed	A	A
Ramps and Collector Distributor Roads	A(3)	A(3)
Loops	B	B
Side Roads	B	A
Grade Separations (1)	B	A
Pavement adjacent to existing pavement (added lane)	C(2)	C(2)

(1) Including municipal and Secondary Roads therein.

(2) $ABI = \frac{PI + X}{2}$

Where,

PI = the profile index of the edge line of the abutting lane. If the computed ABI is less than X, use an ABI equal to X.

X = 7 inches/mile (110 mm/km) if Schedule A, or 22 inches/mile (345 mm/km) if Schedule B.

(3) When a ramp or collector distributor road terminates at an intersection with a traffic signal or stop sign, the 700 feet (215 m) nearest the intersection will be evaluated under Schedule B.

B. Exclusions.
Areas excluded from smoothness testing are detour pavement, crossovers, shoulders, and sections less than 50 feet (15 m) long.

All excluded areas will be checked with a surface checker by the Engineer and shall not exceed 1/8 inch in 10 feet (3 mm in 3 m).

2316.02 MEASUREMENT.
The Contractor shall provide and operate an Ames or California type profilograph to produce a profilogram (profile trace) of the surface tested in accordance with Materials I.M. 341. Other types of profilographs or profilers that produce compatible results and meet the requirements of Materials I.M. 341 may be used.

When a pavement, for which smoothness is to be tested is adjacent to an existing old pavement, smoothness must also be tested on the old pavement 3 feet (1 m) from the adjacent edge for ABI calculation. Should the surface of the old pavement be specified for correction, smoothness testing for ABI calculation shall be done after correction.

All objects and foreign material on the pavement surface, including protective covers, if used, shall be removed by the Contractor prior to testing, and if appropriate, protective covers shall be properly replaced by the Contractor after testing.

A profilogram shall be made for each segment of 50 feet (15 m) or more. The profilogram shall include the 16 feet (5 m) beyond the ends of the section.

A. Pavements.
The pavement surface will be divided into sections that represent continuous placement. A section will terminate at a day's work joint (header), a bridge, similar interruption, or when continuous placement crosses to a section with a different smoothness designation. Sections longer than 778 feet or 0.147 miles (240 m) placed without interruption will be separated into segments of 0.1 mile (160 m). The terminating segment may be shorter than 0.1 mile (160 m) and greater than 250 feet (80 m) and is still considered a segment. A segment is to be in only one traffic lane. Each traffic lane will be tested and

evaluated separately. Gaps in otherwise continuous sections, for temporary crossings, or similar construction sequencing, will be tested, when placed, and included in the adjacent section evaluation.

B. Bridge Approach Sections.
Bridge approach sections shall not be considered a part of a pavement segment, section, or project.

2316.03 PROFILOGRAPH TESTING.
The Contractor shall perform testing and furnish the profilogram results to the Engineer. The testing and evaluation shall be done by a trained and certified person, and the evaluation shall be certified in accordance with Materials I.M. 341.

Each segment shall be tested within 48 hours following placement. The profile index for each segment of paving shall be furnished to the Engineer by the end of the next day worked following the placement until there has been 3 consecutive days of paving where the index for all segments would result in 100% payment or better. Should any following day be evaluated to receive less than 100% payment, the Engineer shall be notified immediately, and corrective action shall be taken to modify paving methods and equipment to achieve 100% payment or better.

All final profilograph test reports and profile traces shall be submitted to the Engineer within 14 calendar days following completion of paving on the project. Selected reports and traces may be requested by the Engineer in advance of paving completion for purposes of validating the Contractor’s test results. Incentive payments for qualifying segments will be made following receipt of appropriate documentation of certified smoothness results.

The Engineer will perform verification testing to validate the contractor’s certified quality control testing. If the Engineer’s verification test results validate the Contractor’s test results, the Contractor's results will be used for acceptance. Disputes between the Contractor's and Engineer's test results will be resolved in accordance with Materials I.M. 341. The Engineer may test the entire project length if it is determined that the Contractor certified test results are inaccurate, and the Contractor will be charged for this work at a rate of $400.00 per mile ($250.00 per kilometer), per profile track, with a minimum charge of $800.00. Furnishing inaccurate tests may result in decertification of the Contractor's certified operator.

2316.04 PROFILE INDEX.
A profile index shall be calculated for each segment from the profilogram in accordance with Materials I.M. 341 except for:

1. Side road connections less than 600 feet (180 m) in length.
2. Single lift pavement overlays 2 inches (50 mm) or less in thickness unless the existing surface has been corrected by milling or scarification.
3. Storage lanes and turn lanes.
4. Pavement less than 8.5 feet (2.6 m) in width.
5. The 16 feet (5 m) at the ends of the section when the Contractor is not responsible for the adjoining surface.
6. Runout tapers on HMS overlays at existing pavement, bridges, or bridge approach sections when the thickness is less than the design thickness.

If there is a segment of 250 feet or 0.047 mile (80 m) or less in length at the end of a section, the profilograph measurements for that segment shall be added to and included in the evaluation of the adjacent segment in that section.

Bumps and dips shall be separately identified on all profilograms. These appear as high or low points on the profilogram and correspond to high points (bumps) or low points (dips) on the pavement surface. They are identified by locating vertical deviations exceeding 0.5 inches for a 25 foot (12.7 mm for a 7.6 m) span for both bumps and dips as indicated on the profilogram.

2316.05 SURFACE CORRECTION.
Surface correction for pavement smoothness may be required which includes bumps or dips. The correction shall be completed before the determination of pavement thickness.

Bump, dip, and smoothness correction work shall be for the full lane width of the paved surface.

All correction work shall be subject to the approval by the Engineer. After all required correction work is completed, the final profile index shall be determined.

A. Portland Cement Concrete Pavement.
PCC pavement surface correction shall be accomplished by grinding the pavement using a diamond grinder, by PCC resurfacing, or by replacement. Grinding and texturing equipment shall meet the requirements of Section 2532, except the cutting head shall have a minimum width of 24 inches (600 mm). Surface correction shall be performed parallel to lane lines or edge lines as directed by the Engineer and each pass shall be parallel to the previous passes. The ground surface shall be of uniform texture.

Adjacent passes shall not overlap more than 1 inch (25 mm) and they shall not have a vertical difference of more than 1/8 inch (3 mm) as measured from bottom of groove to bottom of groove. Smoothness correction shall begin and end at lines normal to the pavement lane lines or edge lines within any one corrected area. The grinding shall proceed from the center line or lane line toward the pavement edge to maintain pavement cross slope.

B. Hot Mix Asphalt Pavements.
For asphalt pavements, the surface correction shall be accomplished by diamond grinding, by overlaying the area, by replacing the area, or by inlaying the area.

If the surface is corrected by diamond grinding, the work and equipment shall be the same as specified for PCC pavement except that the ground surface shall be covered with a seal coat in accordance with Section 2307 with the following modifications.

The binder bitumen may be the same material used for tack coat, applied at a rate of 0.10 gallon per square yard (0.45 L/m^2). Hand methods may be used for spraying.

The cover aggregate shall be sand, applied at a rate of 10 pounds per square yard (5 kg/m2). Hand methods may be used may be used for spreading. The sand shall be slightly damp, but with no free moisture, as determined by visual inspection. Embedment shall be by at least one complete pneumatic roller coverage.

This seal coat is intended to be placed immediately after the diamond grinding is completed in the travel lane. This work shall be completed when the road surface temperature is above 60ºF (16ºC).

Labor, equipment, and materials used for this seal coat will not be paid for separately, but shall be considered incidental to the items for which correction is required.

If the surface is corrected by overlay, replacement or inlay, the surface correction shall begin and end with a transverse saw cut normal to the pavement lane lines or edge lines within any one area. Profile of surface must be smooth with no bumps or dips at beginning or end of correction. Overlay correction must be for the entire pavement width. Pavement cross slope must be maintained through the corrected areas.

2316.06 BUMPS AND DIPS.
Bumps and dips, including those at headers, on all pavements for which pavement smoothness is designated shall be evaluated. Correction work will be required in accordance with the following criteria and in areas excluded from profilograph testing, for deviations exceeding 1/8 inch in 10 feet (3 mm in 3 m).

A. Bumps.
For all pavements evaluated, all bumps exceeding 0.5 inch (2.7 mm) within a 25 foot (7.6 m) span, as indicated on the profilogram, shall be assessed a price adjustment or be corrected at the discretion of the Engineer except as stated in Article 2316.06, C.

Corrected bumps will be considered satisfactory when measurement by the profilograph shows that the bumps are 0.3 inch (8 mm) or less in a 25 foot (7.6 m) span.

When a lane over 8.5 feet (2.6 m) in width, for through traffic, is constructed adjacent to an existing old pavement, bump correction or price adjustment to the Contractor for a bump will not apply if a bump exists at that location in the adjacent existing old pavement.

B. Dips.
On all pavements, dips of 0.5 inch to 1.0 inch (12.7 mm to 25 mm) in a 25 foot (7.6 m) span, as indicated on the profilogram, shall be assessed a price adjustment or be corrected at the discretion of the Engineer except as stated in Article 2316.06, C The Contractor will be required to replace the pavement in areas with dips over 1.0 inch (25 mm). Corrected dips will be considered satisfactory when the profilogram shows the dips are less than 0.3 inch (8 mm) in a 25 foot (7.6 m) span.

When a lane over 8.5 feet (2.6 m) in width is constructed adjacent to an existing old pavement, correction of a dip or price adjustment to the Contractor for a dip will not be required if a dip exists at that location in the adjacent existing old pavement.

C. Exceptions.
When the Contractor is not responsible for the adjoining pavement, bumps and dips exceeding 0.5 inches (12.7 mm) located within 16 feet (5 m) either side of the end of a section will be evaluated by the Engineer. The Contractor will not be price adjusted for bumps and dips in this area. When instructed by the Engineer to repair these bumps and dips, the Contractor will be paid in accordance with Article 1109.03, B.

2316.07 SMOOTHNESS.
The smoothness of pavements will be compensated by the addition (incentive) or the subtraction (price reduction) of a determined amount for each segment of pavement to the price bid for pavement. These amounts are identified in the appropriate schedule of Article 2316.08.

A. Pavement Where Schedule A Smoothness is Required.
For the appropriate categories of highway, as shown in Schedule A, incentives for pavement smoothness will be paid for each segment of pavement with an initial index per mile (kilometer) per segment of 3.0 inches (48 mm) or less.

For segments with an initial index of 7.1 to 10.0 inches per mile (111 mm/km to 160 mm/km), the Contractor shall receive a price reduction.

For segments with an index of 10.1 inches per mile (161 mm/km) and greater, the Contractor shall grind the surface to a final index of 7.0 inches per mile (110 mm/km) or less.

B. Pavement Where Schedule B Smoothness is Required.
For all highways, incentives for pavement smoothness will be paid for each segment of pavement with an initial index of 12 inches per mile (190 mm/km) per segment or less.

For all segments with an initial index of 22.1 to 30.0 inches per mile (346 mm/km to 475 mm/km), the Contractor shall receive a price reduction.

For segments with an index of 30.1 inches per mile (476 mm/km) and greater, the Contractor shall grind the surface to a final index of 22.0 inches per mile (345 mm/km) or less.

C. Pavement Adjacent to Existing Pavement.
For each segment of new pavement 8.5 feet (2.6 m) or more in width, and over 600 feet (180 m) in length, which is to be matched to the surface of an existing pavement, smoothness will be evaluated by the Average Base Index (ABI) as defined in Article 2316.01, A or B.

Surface correction is required for smoothness exceeding ABI + 12 (190) when Schedule A is required and exceeding ABI + 30 (475) when Schedule B is required. Payment will be based on results after correction in accordance with Schedule C.

Areas not included in the profilograph test shall be checked longitudinally with a 10 feet (3 m) straight edge and the surface shall not deviate from a straight line by more than 1/8 inch in 10 feet (3 mm in 3 m). If correction is necessary, it shall meet requirements of Article 2316.05.

D. Bridge Approach Sections.
Smoothness of bridge approach sections will not be used in the calculations for incentive or price reduction of pavement segments, sections, or the project.

2316.08 SCHEDULE OF PAYMENT.
For each traffic lane of main line pavement and each traffic lane of interchange ramps and loops evaluated for smoothness, as defined in Article 2316.01, the Engineer will determine the length of each segment in miles (kilometers).

For roadways, the Contractor may receive an incentive payment or be assessed a price reduction based on the number of qualifying segments and the initial profile index.

Pavement segments excluding repair work that are subject to profilograph testing, as defined in Article 2316.04, will be considered for additional payment as a smoothness incentive or price reduction. For a segment to be qualified for incentive, there must be no grinding within that segment.

Surface correction (grinding) of bridge approach sections, and as stated in Article 2316.06, C, will not count as surface correction on adjacent pavement segments and will not detract from possible incentive payments on those segments.

Single lift pavement resurfacing 2 inches (50 mm) or more in thickness that have milling or scarification of the original pavement, shall be rated using the multi-lift schedules.

A $900 price adjustment shall be assessed for each dip not corrected in each pavement lane under Schedule A and B except as stated in Article 2316.06, C. In addition, a $900 price adjustment will be assessed for each bump not corrected under Schedule A and B except as stated in Article 2316.06, C. Bumps and dips not corrected will also be included in the evaluation for the segment smoothness.

The cost of certified smoothness and associated traffic control shall be incidental to the cost of the pavement.

These payments or assessments will be based on the following schedules:

A. Schedule A Smoothness Requirements.
Pavement segments which are designated for Schedule A smoothness will be evaluated for incentive or price reduction assessments as follows:

INCENTIVES FOR PAVEMENT SMOOTHNESS

INITIAL PROFILE INDEX	SINGLE LIFT PAVEMENTS		MULTI-LIFT PAVEMENTS	
Inches Per Mile (mm/km) Per Segment (1)	Primary Dollars Per Segment	Non-Primary Dollars Per Segment	Primary Dollars Per Segment	Non-Primary Dollars Per Segment
0-1.0	700	300	250	125
1.1-2.0	600	250	200	100
2.1-3.0	450	200	150	50
3.1-7.0	Unit Price	Unit Price	Unit Price	Unit Price
(0-16)	700	300	250	125
(17-32))	600	250	200	100
(33-48)	450	200	150	50
(49-110)	Unit Price	Unit Price	Unit Price	Unit Price

(1) For each segment of pavement that has an initial index, within the limits listed, with no grinding, the Contractor will receive an incentive payment as shown in the tabulation for the appropriate category.

PRICE REDUCTION FOR PAVEMENT SMOOTHNESS

Initial Profile Index	Single Lift Pavements		Multi-Lift Pavements	
Inches Per Mile (mm/km) Per Segment	Primary Dollars Per Segment	Non-Primary Dollars Per Segment	Primary Dollars Per Segment	Non-Primary Dollars Per Segment
3.1-7.0 7.1-10.0 10.1 & over [1)]	Unit Price 200 Grind Only	Unit Price 100 Grind Only	Unit Price 100 Grind Only	Unit Price 50 Grind Only
(48-110) (111-160) (161 & over) [(1)]	Unit Price 200 Grind Only	Unit Price 100 Grind Only	Unit Price 100 Grind Only	Unit Price 50 Grind Only

(1) For segments with an initial index of 10.1 (161) and over, the Contractor shall grind the surface to a final index of 7.0 (110) or better. In lieu of grinding the surface to a final index of 7.0 (110) or better, the Contractor may elect to replace part or all of the segment.

B. Schedule B Smoothness Requirements.

Pavement segments for which Schedule B smoothness is designated and which is indexed in segments greater than 50 feet (15 m), will be evaluated for incentive or price reduction as follows.

For individual segments shorter than 50 feet (15 m), properly corrected if required, no price reduction assessment will be made.

INCENTIVES FOR PAVEMENT SMOOTHNESS

Initial Profile Index	New Pavements	Resurfaced Pavements
Inches Per Mile (mm/km) Per Segment [(1)]	Dollars Per Segment	Dollars Per Segment
0 - 4.0 (0 - 65) 4.1 - 8.0 (66 - 130) 8.1 - 12.0 (131 - 190) 12.1 - 22.0 (191– 345)	600 500 400 Unit Price	300 250 200 Unit Price

(1) For each segment of pavement that has an initial index, within the limits listed, with no grinding, the Contractor will receive an incentive payment as shown in the tabulation for the appropriate category.

PRICE REDUCTION FOR PAVEMENT SMOOTHNESS

Per Segment Index	New Pavements	Resurfaced Pavements
Inches Per Mile (mm/km) Per Segment	Dollars Per Segment	Dollars Per Segment
12.1 - 22.0 (191 - 345) 22.1 - 30.0 (346-475) 30.1 & over [(1)](476 & over)	Unit Price 500 Grind Only	Unit Price 250 Grind Only

(1) For segments with an initial index of 30.1 (476) and over, the Contractor shall grind the surface to a finish index of 22.0 (345) or better. In lieu of accepting a price reduction and grinding the surface to a final index of 22.0 (345) or better the Contractor may elect to replace part or all of the segment.

C. Pavement Adjacent To Existing Pavement.
For new pavement which has been matched to an existing old pavement for which an Average Base Index (ABI) was calculated, the pavement will be evaluated for a price reduction for each segment based on Schedule A or Schedule B payment.

SCHEDULE C
INITIAL PROFILE INDEX or PROFILE INDEX AFTER CORRECTION

(Schedule A) Inches Per Mile (mm/km) Per Segment	(Schedule B) Inches Per Mile (mm/km) Per Segment	Dollars Per Segment
0 to ABI	0 to ABI	0
ABI + 0.1 (1) to ABI +4 (65) incl.	ABI + 0.1 (0.1) to ABI + 10 (160) incl.	300
ABI + 4.1 (66) to ABI+8.0 (130) incl.	ABI + 10.1 (161) to ABI+20 (315)incl.	500
ABI + 8.1 (131) to ABI +12 (190) incl.	ABI + 20.1 (316) to ABI+30(475) incl.	800
Greater than ABI +12 (190)	Greater than ABI +30 (470)	Grind Only

D. Bridge Approach Sections.
Bridge approach sections shall be corrected for smoothness as specified in Section 2428.

Section 2317

2317, Primary and Interstate Pavement Smoothness.
Note: Smoothness of Bridge Decks and Bridge Deck Overlays has moved to Section 2428.

Add as a new section:

2317, Primary and Interstate Pavement Smoothness.

2317.01 GENERAL.
Pavement smoothness shall be evaluated for all Interstate and Primary main line pavement surfaces, and all other road surfaces included on Primary projects, except when specifically excluded or modified by the contract documents. Main line pavement is defined as all permanent pavement for through lanes. Exclusions from profilograph testing are detour pavement, shoulders, crossovers, and individual sections of pavement less than 50 feet (15 m) in length.

The Engineer may determine the pavement smoothness according to Materials I.M. 341 using a 10 foot (3 m) straightedge or rolling straightedge on surfaces excluded from profilograph testing. The variation of the surface from the testing edge of the straightedge shall not exceed 1/8 inch (3 mm) between any two contacts, longitudinal or transverse. The Contractor shall correct all irregularities exceeding the specified tolerance using equipment and methods approved by the Engineer. After the Contractor has corrected an irregularity, the Engineer may perform monitor testing of the area to verify compliance with the specified tolerance.

2317.02 EQUIPMENT.
The Contractor shall provide and operate an Ames type or California type profilograph to produce a profilogram (profile trace) of the surface tested in accordance with Materials I.M. 341. Other types of profilographs or profilers that produce compatible results and meet the requirements of Materials I.M. 341 may be used. The Contractor's operator shall be trained and certified to operate the profilograph as required by the Contracting Authority.

If the Contractor's profilograph has a mechanical recorder, the Contractor shall provide automated trace reduction equipment in accordance with Materials I.M. 341. If the Contractor's profilograph has a computerized recorder, the trace produced will be evaluated without further reduction.

2317.03 SURFACE TOLERANCES, TESTING, AND EVALUATION.
A pavement segment is defined as a continuous area of finished pavement 0.1 mile (161 m) in length and one lane (10 to 12 foot (3.0 to 3.7 m) nominal) in width. A partial segment resulting from an interruption of the continuous pavement surface (i.e. bridge approaches, side road tie-ins, the cessation of the daily paving operations, etc.) is subject to the same evaluation as a whole segment.

A. Tolerances.
The Contractor shall produce pavement with an average profile index per 0.1 mile (161 m) segment as shown in Table 2317.03 below.

TABLE 2317.03: TOLERANCE FOR AVERAGE PROFILE INDEX PER 0.1 MILE (161m)
(0 inch blanking band)

Surface Type	Profile Index For greater than 45 mph	Profile Index For 45 mph or less and ramps
	Inches per mile (mm/km)	Inches per mile (mm/km)
PCC Pavement	40.0 or less (630 or less)	65.0 or less (1025 or less)
HMA Pavement	35.0 or less (550 or less)	45.0 or less (710 or less)

B. Testing.
The Contractor shall determine the pavement profiles for each lane according to the 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 the trace scallops to the nearest 0.01 inch (0.1 mm). The wheel paths are defined as the 3 feet (0.9 m) and 9 feet (2.7 m) from the center line or lane line. Average the two wheel path profile indexes for each segment. Additional profiles may be taken only to define the limits of an out-of-tolerance surface variation. The Engineer may use a 10 foot (3 m) straightedge (or other means) to detect irregularities outside the required trace paths. The Engineer may also use the straightedge to delineate the areas that require corrective action.

Bridge approaches shall be tested according to Section 2428.

C. Evaluation.
The Contractor shall determine a profile index based on the 0 inch (0 mm) blanking band following the same procedures shown in Materials I.M. 341 for each segment of finished pavement surface except for:

1. Primary side road connections less than 600 feet (180 m) in length.

2. Non-primary side road connections, which shall be evaluated according to Section 2316.

3. Bridge approaches, which shall be evaluated according to Section 2428.

4. Storage lanes, turn lanes, and other auxiliary lanes less than 600 feet (180 m).

5. Pavement less than 8.5 feet (2.6 m) in width.

6. The 16 feet (5 m) before and the 16 feet (5 m) beyond the ends of the section when the Contractor is not responsible for the adjoining surface.

7. Single lift pavement overlays 2 inches (50 mm) or less in thickness, unless the existing surface has been corrected by milling or scarification.

8. Runout tapers on HMA overlays at existing pavement, bridges, or bridge approach sections where the thickness is less than the design thickness.

For the following situations, the profile index will be evaluated. If the average profile index exceeds the tolerances listed in Article 2317.03, A, the Contractor may elect to eliminate that area from the profile index for the day's paving operation and evaluate the area using a 10 foot (3 m) straightedge as outlined in Article 2317.01.

1. Horizontal curves with a centerline radius of less than 1000 feet (300 m) and the pavement within the superelevation transition of such curves.

2. Crest and sag vertical curves with an L/A < 100 where L is the length of curve in feet and A is the grade change in percent (L/A < 30.5 where L is the length in meters and A is the grade change in percent).

The Contractor shall determine a daily average profile index for each day's paving operation. A day's paving operation is defined as a minimum of 0.1 mile (161 m) segment of pavement placed in a day. If less than 0.1 mile (161 m) segment is paved, the day's production will be grouped with the next day's production. If the production of the last day of project paving is less than 0.1 mile (161 m) segment, it will be grouped with the previous day's production.

Each segment shall be tested within 48 hours following placement. The profile index for each segment of paving shall be furnished to the Engineer by the end of the next day worked following the placement until there has been 3 consecutive days of paving where the index for all segments would result in 100% payment or better. Should any following day be evaluated to receive less than 100% payment, the Engineer shall be notified immediately, and corrective action shall be taken to modify paving methods and equipment to achieve 100% payment or better.

If the day's average profile index exceeds the values in Table 2317.03, the Engineer shall be notified and the paving operation suspended until corrective action is taken by the Contractor. When the paving is resumed, the paving operations will be evaluated with the start-up testing procedures in the preceding paragraph.

All final profilograph test reports and profile traces shall be submitted to the Engineer within 14 calendar days following completion of paving on the project. Selected reports and traces may be requested by the Engineer in advance of paving completion for purposes of validating the Contractor's test results. Incentive payments for qualifying segments will be made following receipt of appropriate documentation of certified smoothness results.

2317.04 CORRECTIVE ACTIONS.

The pavement will be evaluated in 0.1 mile (161 m) segments using the profilograph, to determine pavement segments where corrective work or pay adjustments will be necessary. Each individual profilograph trace will be evaluated (not the average of multiple traces) to determine the areas where corrective action on 0.5 inches (12.7 mm) bumps and dips is needed.

Within each 0.1 mile (161 m) segment, all areas representing high points (bumps) or low points (dips) with deviations in excess of 0.5 inches (12.7 mm) in a length of 25 feet (7.6 m) or less shall be corrected by the Contractor regardless of the profile index value. Pavement segments excluded from profile index evaluation in Article 2317.03 shall be evaluated for high points and low points with deviations in excess of 0.5 inches (12.7 mm) in a length of 25 feet (7.6 m) or less and shall be corrected by the Contractor.

Bumps and dips equal to or exceeding 0.5 inches (12.7 mm) in a length of 25 feet (7.6 m) or less shall be identified separately.

A. Roadways with a posted speed greater than 45 mph.

Any 0.1 mile (161 m) segment, including bumps, having an initial average profile index of greater than those tolerances shown in Article 2317.05 shall be corrected to reduce the average profile index to those shown in Table 2317.04 below, or replaced at the Contractor's option. On segments where corrections are made, the Contractor shall test the pavement to verify that corrections have met the average profile index as shown in Table 2317.04 below.

B. Roadways with a posted speed of 45 mph, or less, and ramps.

Any 0.1 mile (161 m) segment, including bumps, having an initial average profile index of greater than those tolerances shown in Article 2317.05 shall be corrected to reduce the average profile index to those shown in Table 2317.04 below, or replaced at the Contractor's option. On segments where corrections are made, the Contractor shall test the pavement to verify that corrections have met the average profile index as shown in Table 2317.04 below.

TABLE 2317.04: AVERAGE PROFILE INDEX PER 0.1 MILE (161 m) AFTER CORRECTIONS (0 inch blanking band)

Surface Type	Profile Index For greater than 45 mph Inches per mile (mm/km)	Profile Index For 45 mph or less and ramps Inches per mile (mm/km)
PCC Pavement	40.0 or less (630 or less)	65.0 or less (1025 or less)
HMA Pavement	40.0 or less (630 or less)	50.0 or less (790 or less)

C. Bridge approach sections shall be corrected according to Section 2428.

D. Corrective work shall be at the Contractor's expense except for the 16 feet (5 m) before and the 16 feet (5 m) beyond the end of the section when the Contractor is not responsible for the adjoining surface. Corrective work shall be completed prior to determining pavement thickness.

Bush hammers or other impact devices will not be permitted.

1. PCC Pavement.
On PCC pavement, corrections shall be made using an approved profiling device or by removing and replacing the pavement. The corrective methods used by the Contractor shall be applied to the full lane width. When completed, the corrected area (full lane width) shall have uniform texture and appearance, with the beginning and ending of the corrected area squared normal to centerline of the paved surface. Where surface corrections are made, transverse grooving will not be required.

2. HMA Pavement.
On HMA pavement, corrections shall be made by diamond grinding, by overlaying the area, by replacing the area, or by inlaying the area. If the surface is corrected by diamond grinding, the work and equipment shall be the same as specified for PCC pavement except that the ground surface shall be covered with a seal coat in accordance with Section 2307 with the following modifications:

The binder bitumen may be the emulsion or cutback asphalt used for tack coat, applied at a rate of 0.10 gallon per square yard (0.7 L/m^2). Hand methods may be used for spraying.

The cover aggregate shall be sand, applied at a rate of 10 pounds per square yard (5 kg/m^2). Hand methods may be used may be used for spreading. The sand shall be slightly damp, but with no free moisture, as determined by visual inspection. Embedment shall be by at least one complete pneumatic roller coverage.

This seal coat is intended to be placed immediately after the diamond grinding is completed in the travel lane. The Engineer may approve this construction when road surface temperatures are below 60ºF (16ºC).

Labor, equipment, and materials used for this seal coat will not be paid for, but shall be considered incidental to other items.

If the surface is corrected by overlay, replacement, or inlay, the surface correction shall begin and end with a transverse saw cut normal to the pavement lane lines or edge lines within any one area. The profile of the surface must be smooth with no bumps or dips at the beginning or end of correction.

Overlay correction must be for the entire pavement width. Pavement cross slope must be maintained through the corrected areas.

E. The Engineer will perform verification testing to validate the Contractor's certified quality control testing. If the Engineer's verification test results validate the Contractor's test results, the Contractor's results will be used for acceptance. Disputes between the Contractor's and Engineer's test results will be resolved in accordance with Materials I.M. 341. The Engineer may test the entire project length if it is determined that the Contractor certified test results are inaccurate, and the Contractor will be charged for this work at a rate of $400.00 per mile ($250.00 per kilometer), per profile track, with a minimum charge of $800.00. Furnishing inaccurate tests may result in decertification of the Contractor's certified operator.

On lanes over 8.5 feet (2.6 m) in width, for through traffic which requires matching the surface of the new pavement to the surface of an existing pavement, an Average Base Index (ABI) will be determined according to Section 2316.

2317.05 PAY ADJUSTMENTS.
Pay adjustments will be based on the initial average profile index determined for the segments prior to performing any corrective work. Areas excluded from the profilograph testing and bridges approaches will not be subject to price adjustments.

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

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

A. PCC Pavement.
The payment will be adjusted as shown in Table 2317.05A below according to the posted or proposed speed.

TABLE 2317.05A: SCHEDULE FOR ADJUSTMENT PAYMENT FOR PCC PAVEMENTS (0 inch blanking band)

Profile Index For greater than 45 mph	Profile Index For 45 mph or less and ramps	Dollars per 0.1 mi. segment per lane	
Inches per mile (mm/km)	Inches per mile (mm/km)	Interstate & Multi-Lane Divided Segments	Other Primary Segments
22.0 or less (345 or less)	25.0 or less (395 or less)	+950.00	+850.00
22.1 to 23.5 (346 to 370)		+800.00	+650.00
23.6 to 26.0 (371 to 410)	25.1 to 30.0 (396 to 475)	+600.00	+450.00
26.1 to 40.0 (411 to 630)	30.1 to 65.0 (476 to 1025)	0.00	0.00
40.1 to 45.0 (631 to 710)	65.1 to 70.0 (1025 to 1105)	-600.00	-450.00
45.1 or more (711 or more)	70.1 or more (1105 or more)	0.00*	0.00*

* These segments shall be corrected to the levels shown in Table 2317.04.

B. HMA Pavement.
The payment will be adjusted as shown in Table 2317.05B below according to the posted or proposed speed.

TABLE 2317.05B: SCHEDULE FOR ADJUSTMENT PAYMENT FOR HMA PAVEMENTS (0 inch blanking band)

Profile Index For greater than 45 mph	Profile Index For 45 mph or less and ramps	Dollars per 0.1 mi. segment per lane	
Inches per mile (mm/km)	Inches per mile (mm/km)	Interstate & Multi-Lane Divided Segments	Other Primary Segments
10.0 or less (160 or less)		+850.00	+750.00
10.1 to 11.5 (161 to 180)	15.0 or less (235 or less)	+650.00	+500.00
11.6 to 13.5 (181 to 215)		+500.00	+350.00
13.6 to 15.5 (216 to 245)	15.1 to 20.0 (236 to 315)	+350.00	+200.00
15.6 to 35.0 (246 to 550)	20.1 to 45.0 (316 to 710)	0.00	0.00
35.1 to 40.0 (551 to 630)	45.1 to 50.0 (711 to 790)	-350.00	-200.00
40.1 or more (631 or more)	50.1 or more (791 or more)	0.00*	0.00*

* These segments shall be corrected to the levels shown in Table 2317.04.

Section 2318

2318.04, A, Preparation.

Replace the title:

A. Surface Preparation.

Delete the last sentence:
~~Removal of this vegetation and debris shall be in accordance to Article 1104.08.~~

2318.05, Limitation of Operations.

Add as new second paragraph:
When resurfacing is part of the contract, all cold-in-place recycled surfaces shall be covered with at least one full lift of HMA prior to winter shutdown.

2318.07, A, Basis of Payment.

Replace the last sentence:

This payment shall be full compensation for all labor, material (including mixing water), and equipment necessary for surface preparation, milling, mixing, spreading, placing, shaping, and compaction of the completed In-Place Recycled Asphalt Pavement.

Section 2319

2319.01, Description.

Replace the second, third, and fourth paragraphs:

Slurry leveling work involves filling shallow depressions in the pavement at and adjacent to cracks with fine slurry mixtures. Application may be by hand lutes.

Slurry wedge work involves placing a fine or coarse slurry mixture in a narrow wedge-shaped strip to correct the differential elevation between the pavement edge and the shoulder as designated in the contract documents.

Strip slurry treatment work consists of longitudinal applications of fine or coarse slurry mixtures as designated in the contract documents. A spreader box shall be required to place the slurry mixture to pavement centerline, widening unit, pavement edge, wheel paths, and lanes, or at other locations and widths as designated by the contract documents or as directed by the Engineer.

2319.02, B, 1, Crushed Stone.

Replace “Article 4125.01, B” with “Section 4124”.

2319.02, B, 3, Gradations.

Replace entire article:

3. Gradation.

The composite aggregate, excluding mineral filler, shall comply with the following gradation limits for the specified slurry mixture required:

a. Fine Slurry Mixture.

The aggregate shall meet the requirements for Gradation No. 22 of the Aggregate Gradation Table in Section 4109.

b. Coarse Slurry Mixture.

The aggregate shall meet the requirements for Gradation No. 23 of the Aggregate Gradation Table in Section 4109.

2319.09, A, General.

Add as new second paragraph:

All applications of Strip Slurry Treatment shall be applied parallel to the centerline, edge line, or other reference, using a guide extending at least 3 feet (1 m) ahead of the application equipment.

2319.10, B, 1, Aggregate for Slurry Wedge.

Replace the first sentence:

The quantity of Slurry Wedge Aggregate, of the type specified, in tons (megagrams), measured to the nearest 0.1 ton (0.1 Mg), will be the quantity by weight (mass) of individual loads of aggregate used in accepted portions of the work.

2319.10, C, 1, Aggregate for Strip Slurry Treatment.

Replace the first sentence:
The quantity of Strip Slurry Treatment Aggregate, of the type specified, in tons (megagrams), measured to the nearest 0.1 ton (0.1 Mg), will be the quantity by weight (mass) of individual loads of aggregate used in accepted portions of the work.

2319.11, B, 1, Aggregate for Slurry Wedge.

Replace the first sentence:
The Contractor will be paid the contract unit price for Slurry Wedge Aggregate, of the type specified, per ton (megagram) of aggregate used measured as provided above.

2319.11, C, 1, Aggregate for Strip Slurry Treatment.

Replace the first sentence:
The Contractor will be paid the contract unit price for Strip Slurry Treatment Aggregate, of the type specified, per ton (megagram) of aggregate used measured as provided above.

Division 24. Structures.

Section 2401

2401.02, Notification for Complete Removal of Bridges.

Add the following as a new Article 2401.02, and renumber original Articles 2401.02 through 2401.10 as Articles 2401.03 through 2401.11:

2401.02 NOTIFICATION FOR COMPLETE REMOVAL OF BRIDGES.
The Contractor shall notify the Iowa DNR by mail and the Engineer, with the “Notification of Demolition” form, not less than 10 business days prior to the start of bridge demolition. If the Contractor is unable to begin work on the intended start date, the Contractor shall notify the Iowa DNR and the Engineer of the new intended start date by sending a revised “Notification of Demolition” form. Notification of the inability to commence work on the intended start date shall be made no later than 1 business day prior to the original intended start date. Failure to notify the Iowa DNR and 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.

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 “Notification of Demolition” form.

2401.04, Removal of Substructures.

Replace the first sentence of the article:
Unless otherwise provided or ordered, substructures of existing structures shall be removed to 1 foot (0.3 m) below natural stream bottom, and those parts outside the stream shall be removed to 1 foot (0.3 m) below natural ground surface.

Section 2403

2403.01, A, Class D Concrete.

Replace the entire article:
Bridge barrier rails shall be Class BR or Class C concrete.

2403.01, C, Class C Concrete.

Replace the entire article:

Refer to Article 2412.02 for concrete used for one course bridge floors and the first course of two course bridge floors. All other structural concrete, including concrete for bridge curbs, bridge medians, and bridge sidewalks, shall also be Class C concrete.

2403.03, B, Entrained Air Content.

Replace the fourth sentence:

To allow for loss during placement, the air content of fresh, unvibrated structural concrete shall be 6.5%, as a target value, with a maximum variation of - 1.0% and + 1.5%.

2403.03, C, Other Admixtures.

Add second and third paragraphs:

Approved retarding admixture complying with Section 4103 may be required by the contract documents or by the Engineer. The retarding admixture shall be used in amounts recommended by the manufacturer for conditions which prevail on the project and as approved by the Engineer. When used, it shall be introduced into the mixer after all other ingredients are in the mixer. Other procedures may be approved by the Engineer.

All retarding admixtures used shall be compatible with the air entraining agent used. Previous experience, satisfactory to the Engineer, will be required to indicate the approximate adjustments necessary by the addition of the admixture and compatibility with other materials to be used. The retarding admixture shall be agitated prior to and during its use.

Add as the fourth paragraph:

Calcium chloride will not be allowed where reinforcing steel is used.

2403.03, D, Use of Fly Ash and GGBFS.

Replace the entire article:

The Contractor may use fly ash or GGBFS as a substitute for a portion of the Portland cement in structural concrete. The fly ash and GGBFS shall meet the requirements of Section 4108. The maximum allowable substitution rates shall be 20% for fly ash and 35% for GGBFS with a maximum total mineral admixture substitution rate of 50%.

2403.07, A, 1, Tremies.

Replace the second sentence:

It shall not be more than 12 inches (300 mm) in diameter and there shall be no aluminum parts in contact with the concrete.

2403.07, B, Underwater Placement Equipment.

Replace the second sentence of the second paragraph:

The tremie shall not be more than 12 inches (300 mm) in diameter and there shall be no aluminum parts in contact with concrete.

2403.08, C, Placing Concrete.

Add as the second sentence:

A tremie will not be required for concrete placement of elements which have a maximum dimension no greater than 12 inches (300 mm) provided that the following Part D is adhered to and concrete is placed in lifts.

2403.11, Placing and Protection in Cold Weather.

Replace the first indented paragraph:

The concrete shall be maintained at a temperature of not less than 50ºF (10ºC) for the first 48 hours after placing. The temperature of the concrete shall then be gradually reduced at a rate not exceeding 25ºF (15ºC) in 24 hours. When heating and housing is used, temperature monitors shall be located in the concrete at the furthest and closest point from the heat source. The maximum temperature of the monitor point closest to the heat source shall not exceed 150ºF (65ºC).

2403.17, F, Falsework Plans.

Replace the entire article:

The Contractor shall submit plans for falsework and centering on all concrete slab and cast-in-place concrete girder bridges in accordance with Article 1105.03. Submittal of forming details for bridge decks on concrete beam and steel beam bridges is not required unless specified in the contract documents. In addition, calculations or evidence of adequacy may be required by the Engineer. Revised plans may be required by the Engineer later because of unforeseen site conditions, unusual construction procedures, or deviation from original falsework plans.

2403.18, A, Forms Which May be Removed in Less than 5 Calendar Days.

Add as the second sentence:

Forms for concrete open railing shall not be removed in less than 24 hours after concrete placement.

Add as the last sentence:

When Maturity Method, in accordance with Materials I.M. 383, for strength determination is used the above stated flexural strengths will be required, but the days of age will be dependent on the Maturity Curve for the concrete mix used.

2403.18, B, Forms Which Must Remain in Place 5 Calendar Days or Longer.

Add as the second sentence:

When Maturity Method, in accordance with Materials I.M. 383, for strength determination is used the flexural strength of 550 psi (3.8 MPa) will be required, but the days of age will be dependent on the Maturity Curve for the concrete mix used.

2403.19, B, Loads Producing Flexural Stresses.

Add following the third paragraph:

Unless otherwise specified in the contract documents, at the Contractor's option, the time for subjecting to loads may be determined through the use of the maturity method as described in Materials I.M. 383. When the maturity method is used, the time for loading will be based on strength requirements only, as specified above. The Contractor shall furnish all labor, equipment, and materials necessary for the development of the maturity-strength relationship as described in Materials I.M. 383.

Determining that sufficient strength has been achieved for loading a part of a structure shall remain the responsibility of the Engineer when the maturity method is used. The Contractor's maturity testing may be used as the basis for this determination. The Contractor shall provide sufficient documentation of maturity testing before a part of a structure may be loaded or opened to traffic.

The following shall apply when the maturity method is used:

1. Should circumstances arise which are beyond the Contractor's or Engineer's control and strength cannot be determined by maturity method, the minimum age, minimum flexural strength, and fly ash restrictions shall apply. Flexural strength specimens shall be cured under conditions similar to those of the concrete in the structure.

2. Any changes of a material source or proportion in the concrete mixture shall require a new maturity curve.

Personnel performing maturity testing shall be Level I PCC certified technicians, with training for maturity testing. This certified technician may supervise other persons who may then perform the temperature testing of the constructed structure.

2403.23, Basis of Payment.

Replace “$4.00” and “$5.25” with “$5.00” and “$6.60”, respectively, in the third paragraph.

Replace the seventh paragraph:
When an admixture is required to be added by the contract documents or by the Engineer for the purpose of retarding the set, the cost of the retarding admixture shall be considered incidental to the contract unit price per cubic yard (cubic meter) of structural concrete.

Section 2404

2404.06, Placing and Fastening.

Add as the fourth sentence of the first paragraph:
Welding of reinforcing steel will not be permitted unless specified in the contract documents or approved by the Engineer.

Add a new third sentence to the last paragraph:
Cutting of reinforcing steel in the field shall be by mechanical methods and not by flame cutting.

2404.07, Reinforcing Supports.

Replace the title and entire article:

2404.07 Reinforcing Supports and Spacers.
All horizontal reinforcement shall be supported using support devices or tied to vertical reinforcing steel. All vertical reinforcement shall be positioned using side-form spacers. Support devices and side-form spacers, either plastic or steel, shall meet the requirements of Materials I.M. 451.01. Epoxy coated reinforcing steel shall be held in place with epoxy or plastic coated bar supports, and epoxy or plastic coated tie wires. Concrete block inserts, bricks, stones, wood blocks, wood stakes, and similar materials shall not be used for supporting reinforcement if the manner of their use is such that these materials are likely to become embedded in the concrete.

Support devices shall be spaced in accordance with the manufacturer's recommendations or as recommended by the current Concrete Reinforcing Steel Institute's Manual of Standard Practice. The support system spacing shall not exceed 4 feet (1.2 m) in each direction for bolsters or continuous high chairs and 3 feet (0.9 m) in each direction for individual bar chairs. The base of all chairs and support bolsters shall rest on the supporting false work. Supporting chairs shall have either upturned legs or a horizontal bar spot welded at the base of the leg. If necessary to prevent spreading of upturned legs, the legs shall be cross-tied at their bases or nailed to the forms. For situations where two or more separate mats of reinforcing steel are required, each mat shall be independently supported by an approved support system.

Side-form spacers shall be placed at intervals sufficient to ensure that all reinforcing is at the required clearance.

Section 2405

2405.02, Construction of Cofferdams.

Replace the second sentence of the second paragraph:
The cofferdam plans, including the computations and drawings, shall be submitted in accordance with Article 1105.03.

2405.09 Anchor Bolts for Bridge Bearings.

Replace the title and the entire article:

2405.09 Anchor Bolts for Bridge Bearings and Foundations.
Anchor bolts shall meet the requirements of ASTM F 1554, Grade 36, and be full-length galvanized. Anchor bolts shall be Unified Coarse Thread Series and have Class 2A tolerance. The end of each anchor bolt intended to project from the concrete shall be color coded in blue to identify the grade. Washers shall be galvanized and shall meet the requirements of ASTM F 436. Nuts shall meet the requirements of ASTM A 563, DH, be heavy hex, and be galvanized. Nuts may be over-tapped in accordance with the allowance requirements of ASTM A 563. Galvanizing shall meet the requirements of ASTM A 153, Class C; or ASTM B 695, Class 50.

A. For Bridge Bearings.
Unless otherwise specified in the contract documents, anchor bolts to be embedded in concrete substructures shall be set in drilled holes. Anchor bolts shall be set prior to the time the concrete is placed, when specified in the contract documents.

1. Anchor Bolts Set in Drilled Holes.
Anchor bolts for bridge bearings shall be accurately set perpendicular to the plane of the bridge seat in clean, dry holes. The locations of anchor bolts in relation to slotted holes in expansion shoes shall be varied to compensate for the temperature of the structure. The nuts on anchor bolts at the expansion bearings of spans shall be adjusted to permit movement of the span with changes in temperature. Anchor bolts shall be set with a hydraulic cement or polymer grout.

When a hydraulic cement grout is used, it shall meet the requirements of Materials I.M. 491.13. The diameter of the hole shall be 1/2 inch (13 mm) larger than the bolt diameter, and the annular space shall be slightly overfilled with grout.

When polymer grout is used, it shall meet requirements of Materials I.M. 491.11. The diameter of the hole shall be 1/8 inch (3 mm) larger than the bolt diameter, and the annular space shall be filled with the grout in accordance with the manufacturer's recommendations and limitations, as approved by the Engineer.

2. Preset Anchor Bolts.
When the contract documents specify, anchor bolts for bridge bearings shall be set prior to placing concrete. The bolts shall be held firmly in a rigid template which spans the concrete with sufficient clearance to permit proper finishing of the surface of the concrete. Welding on anchor bolts will not be allowed. The Contractor shall obtain a template from the manufacturer/fabricator for proper placement of the anchor bolts. The template shall remain in place until the concrete has hardened. Anchor bolts shall be set accurately at points specified in the contract documents and be plumb within 1/4 inch (6 mm) per 12 inches (300 mm).

B. For Foundations.
Welding on anchor bolts will not be allowed. The bolts shall be held firmly in a rigid template which spans the concrete with sufficient clearance to permit proper finishing of the surface of the concrete. The Contractor shall obtain a template from the manufacturer/fabricator for proper placement of the anchor bolts. The template shall remain in place until the concrete has hardened. Anchor bolts shall be set accurately at points specified in the contract documents and be plumb within 1/4 inch (6 mm) per 12 inches (300 mm).

2405.12, Reconstruction of Substructures.

Replace the first paragraph:
When the work involves reconstruction of an existing substructure, the Contractor shall submit detailed plans for supporting the superstructure in accordance with Article 1105.03.

Section 2407

2407.01, Description.

Add as the second paragraph:

Unless modified elsewhere in the contract documents, all fabrication shall be done only in precast fabrication plants that are approved prior to the letting as per Materials I.M. 445.

2407.02, A, Aggregates.

Replace the entire article:

Sections 4110 and 4115 shall apply, except the gradation requirements of Articles 4110.02 and 4115.03. The aggregate gradations and proportions shall be submitted with the mix design to the District Materials Engineer for approval. Aggregates similar to Class V shall be used only when 30% or more of the total weight (mass) of aggregate is limestone.

2407.02, H, Cement.

Add as the first sentence:

Section 4101 shall apply.

2407.02, I, Fly Ash.

Replace the entire article:

I. Mineral Admixtures.
Section 4108 shall apply.

Fly ash may be substituted for Portland cement. The substitution rate shall not be more than 15% by weight (mass).

GGBFS may be substituted for Portland cement. The substitution rate for GGBFS as a mineral admixture shall not exceed 35% by weight (mass).

2407.03, Concrete.

Replace the first sentence of the second paragraph:

If the units are to form curbs or floors of structures, air entrainment shall be required and be accomplished by addition of an approved air-entraining admixture.

2407.04, C, Stressing Equipment.

Replace the entire article:

Equipment used to tension tendons shall be of a type such that the prestressing force may be accurately known. Load cells, dynamometers, and hydraulic gages of hydraulic pump and jacking systems shall be capable of measuring the force applied to the tendons within 2% of the actual force. This equipment shall be calibrated at least once every 12 months or anytime the tensioning system indicates erratic results. Hydraulic gages, pumps, hoses, and connections shall be calibrated as a system.

All tensioning equipment calibrations shall be performed using load cells calibrated by a testing laboratory or calibration service. Equipment used for calibration purposes shall have current calibration references. The Engineer shall be allowed opportunity to witness calibration of equipment during the Engineer's normal working hours or at a mutually agreeable time.

2407.08, Post Tensioned Prestressed Concrete.

Replace the numbering:

2407.~~08~~11, Post Tensioned Prestressed Concrete.

2407.06, Prestressing Steel Stresses and 2407.07, Pretensioned Prestressed Concrete.

Replace all of both articles:

2407.06 PRESTRESSING STEEL STRESSES.
The number, size, and position of individual tendons (7-wire strand) and the prestressing force shall be as shown in the contract documents.

If anchored at other than 70°F (20°C), the initial prestressing force shall be adjusted as follows:

Temperature of Tendons	Initial Prestressing Force
70°F (20°C)	As shown in the contract documents
Below 70°F (20°C)	Increase 1.0% per 10°F (5°C)
Above 70°F (20°C)	Decrease 1.0% per 10°F (5°C)

After the tendons have been positioned, an initial force between 1,000 and 4,500 pounds (4.5 kN and 20 kN) shall be applied to each tendon. The initial force shall be measured within a tolerance of ± 100 pounds (0.5 kN) for initial forces under 3,000 pounds (13 kN) and a tolerance of ± 200 pounds (1 kN) for initial forces of 3,000 pounds (13 kN) or more.

The theoretical elongation of the tendons is calculated from material properties furnished by the manufacturer and allowable losses. Allowable losses may include seating losses, bed shortening, abutment movement, and temperature adjustments.

The pretensioning shall be measured by the net elongation of the tendons. The calculated theoretical net elongation shall be considered the target. A tolerance of ± 1/2 inch (13 mm) from the calculated net elongation, after seating, may be allowed.

The tensioning procedure shall be conducted so the indicated stress, measured by the tensioning system, is within 5% of the calculated stress, based upon the corresponding elongation. The distribution of the stress shall be within 5% of the calculated stress at all points along the tendon or when measured at the end of the bed.

Temporary overstressing of the tendons is allowed, but shall at no time exceed 80% of the specified tensile strength of the tendons. Tendons shall not be seated in this overstress condition.

Tendons shall be tensioned between fixed end anchorages by means of jacks either separately or in a group. Several units may be cast in one continuous line in which case they shall be tensioned simultaneously.

Deflected tendons may be tensioned in place. Alternatively, deflected tendons may be partially tensioned and then raised to the predetermined final position at the beam ends, achieving the required prestressing force. Tendons may be raised simultaneously to the predetermined final position or at any one point, in a single lift, provided the sequence of lifting commences at the point nearest the center of the bed and then progresses alternately at points equidistant from the center to the ends.

Tendons shall be supported at each deflection point on a freely rotating metal pulley not less than 3/4 inch (19 mm) in diameter.

The number of broken strand wires shall not exceed 2% of the total number of strand wires nor one broken wire of any one strand.

2407.08 PRESTRESS TRANSFER.
When accelerated heat curing is used, prestress transfer shall be performed immediately after the curing period is completed and while the concrete is warm and moist.

Deflected tendons, if any, are to be released first, either by lowering holdup devices at beam ends as nearly simultaneously as practical, or if this is not feasible, deflected tendons shall be flame cut in each beam interval in rotation until all deflected tendons are released. The procedure for flame cutting deflected tendons shall be subject to approval by the Engineer.

The hold down devises shall then be released from the bed and the straight line tendons released simultaneously and gradually with the jack. If this is not feasible, heating of the individual tendons shall be employed as follows:

Heating of each individual tendon shall be done simultaneously on the tendon at a minimum of two locations along the casting bed. Heating shall be done along the tendon over a minimum 5 inch (125 mm) distance. The application of heat shall be controlled so that failure of the first wire in the tendon does not occur for at least five seconds after heat is applied, followed by a gradual elongation and failure of the remaining wires. The tendon shall also be heated until failure occurs at each beam interval before proceeding to the next tendon. The sequence of prestress transfer between individual tendons shall be such that there is minimum eccentricity of prestress load. Alternate procedures for releasing deflected or straight-line tendons may be submitted for the Engineer's approval.

The camber due to prestress shall be measured while the beam is on the bed by checking the beam profile within three hours after prestress transfer.

2407.09, Proportioning, Mixing, and Placing Concrete.

Change the article number 2407.~~09~~07.

2407.~~09~~07, Proportioning, Mixing, and Placing Concrete.

Replace in the first sentence of the second paragraph of the new Article 2407.07:
Concrete shall not be placed when the ambient temperature is below 35°F (2°C) unless the plant has been approved by the Engineer for cold weather concrete placement.

Delete the last sentence of the third paragraph of the new Article 2407.07:
~~All surfaces which will be exposed in the finished structure shall be finished as provided in Article 2403.21, Paragraph B.~~

2407.10, Curing.

Change the article number 2407.~~10~~09.

2407.~~10~~09, Curing.

Replace "artificial" with "accelerated" the first sentence of the third paragraph of Article 2407.~~10~~09, Curing.

Replace the first sentence of the fourth paragraph of Article 2407.09, Curing:
In all cases, the concrete shall be covered and remain covered until curing is completed.

2407.11, Removal of Forms.

Change the article number 2407.~~11~~10.

2407.12, B, Precast Prestressed Units.

Replace the first item in the list:
Length: ± 1/4" per 25' and ± 1" max. for beams 100' or longer
(± 6 mm per 8 m and ± 25 mm max. for beams 30 m or longer)

Replace the seventh item in the list:
Sweep (deviations from straight line parallel to centerline of member): L/80 (L in feet, sweep is in inches (L in meters, sweep is in millimeters))

Add as the fourteenth item in the list:
Deviation from net theoretical
elongation after final seating: ± 1/2 inch (13 mm)

Replace the twenty-fifth item in the list:
Elongation (standard gauge length to be a minimum of 20 feet (6 m)):

2407.14, Finish.

Replace the entire article:
All surfaces, which will be exposed in the finished structure, shall be finished as provided in Article 2403.21, B, and be free of honeycomb or surface defects. Structural Repair procedures shall be submitted to the Engineer for approval.

The outer surface of exterior beams shall be finished as follows:

As soon as practicable after removal of the forms, all fins and other surface projections shall be removed, and a prepared grout shall be brushed or sprayed onto the prewetted surface.

The grout shall consist of one part of silica sand and one part of Portland cement blended with acrylic bonding agent and water to produce a consistency sufficient to fill the cavities. The Engineer may require white Portland cement to be used in amounts necessary to obtain a uniform finish.

Immediately after application of the grout, the surface shall receive a float finish with a cork or other suitable float. This operation shall completely fill all holes and depressions on the surface. When the grout is of such plasticity that it will not be pulled from holes or depressions, a float of sponge rubber shall be used to remove excess grout. When the surface is thoroughly dry, it shall be rubbed vigorously with dry burlap to completely remove excess dried grout. The surface finish shall be cured in a manner satisfactory to the Engineer, and heat curing may be required in cold weather. When finished, the surface shall be free from stain and have a uniform color.

Tendon projections shall be cut and bent as detailed in the contract documents. Where the tendon end will be exposed in the completed structure, it shall be cut off reasonably flush with the concrete. The end of each cut off tendon shall be cleaned to a bright appearance.

Beam ends exposed in the completed structure shall be coated and sealed with an approved gray or clear epoxy listed in Materials I.M. 491.12, Appendix A. The epoxy coating and sealing of beam ends shall be as indicated on the plans and shall be applied at the fabricating plant.

Section 2408

2408.01, Description.

Replace the second sentence:
Unless modified elsewhere in the contract documents, all fabrication to which this section applies shall be done in the states, territories, and possessions of the United States and in other locations within the geographic limits of North America and only in steel fabrication shops and plants that are approved prior to the letting as per Materials I.M. 557.

2408.02, Working Drawings, Shop Drawings, Changes, and Substitutions.

Replace the first sentence of the first paragraph:
The Contractor shall submit detailed shop drawings in accordance with Article 1105.03.

Delete Article 2408.02, B and **Renumber** Articles “C”, “D”, and “E” to be “B”, “C”, and “D” respectively.

2408.09, Bars and Plates.

Delete “to hold paint” from the second sentence of the second paragraph.

2408.13, Welding.

Replace the first sentence of the first paragraph:

Welding procedures and requirements for the following items shall conform to the ANSI/AWS D1.1 Structural Welding Code, except that filler metal and welder qualification requirements shall be according to AASHTO/AWS D1.5M/D1.5-02 as modified below.

Replace the second unindented paragraph:

Welding and fabrication of steel structures shall conform to AASHTO/AWS D1.5M/D1.5-02, as modified by this Specification.

Replace the third unindented paragraph:

Each of the modifications in this Article is referenced by the appropriate paragraph number in AASHTO/AWS D1.5M/D1.5-02, to which it is a modification. **Table of Contents for Modifications to AASHTO/AWS D1.5M/D1.5-02 Bridge Welding Code**	
SECTION 1, GENERAL PROVISIONS 1.3 Welding Processes Paragraph 1.3.1.1 Paragraph 1.3.1.2 Paragraph 1.3.2 SECTION 3, WORKMANSHIP 3.2 Preparation of Base Metal Paragraph 3.2.2 Paragraph 3.2.7 3.5 DIMENSIONAL TOLERANCES Paragraph 3.5.1.3 Paragraph 3.5.1.4 Paragraph 3.5.1.14 3.7 REPAIRS Paragraph 3.7.4 Paragraph 3.7.7 Paragraph 3.7.8 SECTION 5, QUALIFICATION Part A, General Requirements 5.2 Qualification Responsibility Part B, Welding Operator, and Tack Welder Qualification	5.21 General Requirements Paragraph 5.21.4 Paragraph 5.21.6 Paragraph 5.21.6.1 5.23 Qualification Tests Required Paragraph 5.23.1 Paragraph 5.23.3 SECTION 6, INSPECTION Part A, General Requirements 6.7 Nondestructive Testing Subparagraph 6.7.1.2(1) Subparagraph 6.7.1.2(2) Part B, Radiograph Testing of Groove Welds in Butt Joints 6.10 Radiograph Procedure Paragraph 6.10.5.4 6.12 Examination, Report and Disposition of Radiographs Paragraph 6.12.3

2408.13, Section 1, 1.3, Welding Processes.

Add as new paragraph 1.3.1.2:

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 the second sentence of Paragraph 1.3.1.1:

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.

2408.13, Section 5, Part B, 5.21.

Delete the last sentence of Paragraph 5.21.2:

~~The WPS shall be posted at the welder's work station at all times during welding operations.~~

2408.13, Section 5, Part B, 5.21.4.

Replace the first sentence:

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.

Delete the third sentence:

~~In all cases, requalification will be required every 5 years.~~

2408.13, Section 6.10, Radiographic Procedure.

Replace all of Paragraph 6.10.5.4:

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

2408.14, Annealing Normalizing, and Stress Relieving.

Replace the title:

Stress Relief Heat Treatment

Replace the first paragraph:

Structural members which are in the contract documents to be stress relieved, shall have finished machining, boring, and straightening done subsequent to heat treatment. Stress relief heat treatment shall be done in accordance with Section 4.4 of AASHTO/AWS D1.5M/D1.5-02.

Replace the last paragraph:

All members, such as bridge shoes, pedestals, rockers, or other parts, which are built up by welding sections of plate together, shall be stress relieved, unless otherwise stated in the contract documents.

2408.16, Camber of Rolled Beam and Plate Girder Spans.

Delete the eigth paragraph:

~~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 ± 1/2 inch (13 mm).~~

Delete the last paragraph:

~~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.~~

2408.17, Bolt Holes.

Replace the last sentence of the first paragraph:

Holes in other than a main stress carrying member in metal not thicker than 3/4 inch (19 mm) for carbon steel and 5/8 inch (16 mm) for alloy steel shall be punched or drilled full size.

Add a second and third paragraph:

When reaming is required all holes shall be subpunched or subdrilled. Subdrilling will be required if thickness limitations govern. The subpunching or subdrilling shall be 3/16 inch (5 mm) smaller and, after assembling, reamed 1/16 inch (2 mm) larger or drilled full size to 1/16 inch (2 mm) larger than the nominal diameter of the bolts.

All steel templates shall have hardened steel bushings in holes accurately dimensioned from the centerline of the connections as inscribed on the template. The centerline shall be used in accurately locating the template from the milled or scribed ends of the members.

2408.17, A, Punched Holes.

Replace the entire article:

The diameter of the die shall not exceed the diameter of the punch by more than 1/16 inch (2 mm). If any holes must be enlarged to admit the bolts, such holes shall be reamed. Holes must be clean cut without torn or ragged edges. The slightly conical hole that naturally results from punching operations is considered acceptable with the approval of the Engineer.

2408.17, B, Subpunched and Reamed Holes.

Replace the title and entire article:

B. Reamed or Drilled Holes.
Reamed or drilled holes shall be cylindrical and perpendicular to the member. Where practical, reamers shall be directed by mechanical means. Reaming and drilling shall be done with twist drills, twist reamers, or rotobroach cutters. Connecting parts requiring reamed or drilled holes shall be assembled and securely held while being reamed or drilled and shall be match marked before disassembling.

2408.17, C, Drilled Holes.

Replace the title and entire article:

C. Accuracy of Holes.
Holes not more than 1/32 inch (1 mm) larger in diameter than the true decimal equivalent of the nominal diameter that may result from a drill or reamer of the nominal diameter are considered acceptable. The width of slotted holes, which are produced by flame cutting or a combination of drilling or punching and flame cutting, shall generally be not more than 1/32 inch (1 mm) greater than the nominal width. The flame cut surface shall be ground smooth.

2408.17, D and E

Re-letter article 2408.17, ~~D~~F and 2408 17, ~~E~~G.

2408.17, D, Accuracy Before Reaming.

Add new title and article:

D. Accuracy Before Reaming.
All holes subpunched or subdrilled shall be so accurate that after assembling (before any reaming is done) a cylindrical pin 1/8 inch (3 mm) smaller in diameter than the nominal size of the hole may be entered perpendicular to the face of the member, without drifting, in at least 75% of the contiguous holes in the same plane. If the requirement is not fulfilled, the badly subpunched/subdrilled pieces will be rejected. If any hole does not allow a pin 3/16 inch (5 mm) smaller in diameter than the nominal size of the subpunched/subdrilled hole to pass, it will be cause for rejection.

2408.17, E, Accuracy After Reaming.

Add new title and article:

E. Accuracy After Reaming or Drilling.
When holes are reamed or drilled, 85% of the holes in any contiguous group shall, after reaming or drilling, show no offset greater than 1/32 inch (1 mm) between adjacent thicknesses of metal.

2408.19, Shop Assembly.

Replace the first sentence of the last paragraph:
Members to be welded shall be brought into correct alignment and held in position by bolts, clamps, wedges, guylines, struts, tack welds, or other suitable devices, until welding has been completed.

2408.30, A, Surface Preparation.

Replace the first and second sentences of the first paragraph:
All steel surfaces to be painted shall be given a near white metal blast cleaning in accordance with SSPC-SP10. Bearing assemblies shall be cleaned of any surface contamination using suitable solvents in accordance with SSPC-SP1 and then given a near white metal blast cleaning in accordance with SSPC-SP10.

2408.30, A, 1, Non-weathering Structural Steel Applications.

Replace the last sentence:
All surfaces to be top coated shall be clean in accordance with the specification requirements and dry.

2408.30, A, 2, Weathering Structural Steel Applications.

Replace the second paragraph:
To ensure uniform weathering, all unpainted areas of outside surfaces of the fascia girders shall receive, after blasting, at least three uniform applications of water mist at 24 hour interval between applications. Each application shall be applied on dry surfaces. The water mist application shall be performed within 48 hours after the painted surfaces have been properly cured. All water mist application shall be witnessed by a representative of the Contracting Authority.

2408.30, B, Painting.

Replace the third sentence of the second paragraph:
Prior to painting, all surfaces shall be free of all moisture, dirt, oxidation products, oil, and other detrimental material, and shall be of a suitable temperature in accordance with the manufacturer's recommendations.

2408.30, B, 1, b, Prime Coat.

Replace the fifth sentence:
Steel members with coating areas measuring less than 3 mils (75µm) that have not been corrected within 24 hours shall be completely reblasted and repainted.

2408.30, B, 1, c, Top Coat.

Replace the first sentence of the first paragraph:
When designated by the contract documents, a top coat of waterborne acrylic paint shall be shop applied to all primed surfaces. The galvanized fasteners shall be painted in accordance with Article 2408.30, B, 1, d, after bolting.

Add as the fourth sentence of the first paragraph:
To avoid moisture condensation, top coat shall be kept under a roof, protected from dirt, dust, and moisture, in an area where the temperature is maintained above 40°F (5°C) for a minimum of 24 hours after painting is completed.

2408.30, B, 1, e, Cleaning of Paint System.

Replace the title:

e. Cleaning of Paint Surfaces.

2408.30, B, 2, Weathering Structural Steel Applications.

Replace "30045" with 20045" in the sixth sentence of the first paragraph and the last sentence of the third paragraph.

Replace the seventh sentence of the first paragraph:
The top coat shall cover all the primed surfaces except faying surfaces of bolted joints with a uniform film of paint.

2408.30, B, 2, d, Weathering Structural Steel Applications.

Replace the entire article:

d. Exterior surfaces of all galvanized components which are indicated in the plans to be painted and all galvanized floor drains shall be prepared according to the written recommendations of the paint manufacturer and painted with the same type of waterborne acrylic paint used for top coat as noted in this specification.

2408.33, Falsework.

Replace the first sentence of the first paragraph:
Detailed plans for falsework or centering shall be supplied in accordance with Article 1105.03.

Section 2409

2409.11, Bracing.

Replace the first sentence:
The ends of bracing shall be bolted through the pile, post, or cap with bolts not less than 5/8 inch (~~6~~ 16 mm) in diameter.

Section 2412

2412.02, Materials.

Replace the second paragraph:
Concrete used shall meet the requirements for C-4WR and C-V47B concrete mixtures, as specified in Materials I.M. 529. Coarse aggregate Gradation No. 3 or 5 of the Aggregate Gradation Table in Section 4109 shall be used. The fly ash and GGBFS shall meet the requirements of Section 4108. The maximum allowable substitution rates shall be as follows:

Cement Type	Maximum Allowable Substitution *	Time Period
Type I, Type II	35% GGBFS 20% Fly Ash	March 16 to October 15
Type IS, IP	0% GGBFS 20% Fly Ash	March 16 to October 15
Type I, II, IS, IP	0% GGBFS 0% Fly Ash	October 16 to March 15

* Maximum total mineral admixture substitution shall be 50%.

Replace the third paragraph:
Retarding admixture may be required by the contract documents or by the Engineer. A water reducing/retarding admixture meeting the requirements of Materials I.M. 403, Appendix B, shall be used in accordance with Section 2403. When placements require extended working times, the dosage rate shall be increased for the appropriate working time and temperature. For placements requiring normal working times, the dosage rate shall be in accordance with Section 4103. Other admixtures may be approved by the Engineer.

2412.03, Swinging The Span and Support of Forms.

Add as the new third paragraph:
Welding on structural steel in the field will not be permitted, unless specified in the contract documents or approved by the Engineer.

2412.04, Placing Reinforcement.

Add as new second sentence of the first paragraph:
Welding of reinforcing steel will not be permitted unless specified in the contract documents or approved by the Engineer.

2412.06, Surface Finish.

Replace the fourth paragraph:
Promptly after smoothing and checking for smoothness and while the concrete is still plastic, the surface shall be given a final finish. When the contract documents show a second course of bridge floor surfacing or other wearing course, the surface of the first course shall be finished by a burlap drag. For one course bridge floors on Interstate and Primary projects, the final finished surface shall be smoothed and surface checked for smoothness without additional finishing.

Add as new fifth paragraph:

When the surface being placed is the final surface of a bridge sidewalk, the surface of sidewalk shall be given a transverse coarse broom texture.

Replace “2317” with “2428” in the last paragraph.

2412.06, A, Interstate and Primary Projects.

Add as paragraph A under the fourth paragraph:

A. Interstate and Primary Projects.
Transverse grooving or tining in plastic concrete of bridge decks (and bridge approaches when included in the bridge project) will not be allowed unless stated otherwise in the contract documents. Longitudinal grooves shall be cut into hardened concrete surfaces using a mechanical cutting device. Longitudinal grooving shall be done after surface correction grinding.

Longitudinal grooves shall be 1/8 inch +/- 1/64 inch (3 mm +/- 0.4 mm) in width, 1/8 inch +1/32 inch or -1/16 inch (3 mm +0.8 mm or -1.6 mm) in depth, and shall be uniformly spaced at 3/4 inch (19 mm) intervals measured center to center of groove.

Longitudinal grooving shall terminate approximately 6 inches (150 mm) from bridge joints. Longitudinal grooving on bridge decks and double reinforced bridge approach sections shall not be within the area closer than 1.5 feet (0.5 m) adjacent to curbs. To accommodate varying widths of grooving equipment, the width of the ungrooved area adjacent to curbs may be up to 3.0 feet (900 mm). Longitudinal grooving of single reinforced and non-reinforced bridge approach sections shall not be applied within 6 inches (150 mm) of the edge of outside lane lines.

For staged bridge and bridge approach construction, the Contractor may cut longitudinal grooves in the hardened concrete at the end of each stage of construction or wait until all stages have been completed. If the Contractor elects to delay cutting of the longitudinal grooves until completion of all stages, the concrete deck and bridge approach for any stage opened to traffic shall receive an interim coarse broom finish during placement. Within 30 calendar days following completion of the last stage of the project, the Contractor shall establish temporary lane closures to accomplish longitudinal grooving for all stages. The interim coarse broom finish will not be allowed as a surface texture when opened to traffic over a winter season. If the interim coarse broom texture is present and the Contractor is not in a position to finish all stages of the project, longitudinal grooving shall be cut into the hardened concrete in order to establish an acceptable driving surface texture for the winter season.

2412.06, B, Other Projects.

Add as paragraph B following the fourth paragraph:

B. Other Projects.
When the surface being placed is the wearing course, the entire surface, except the area within approximately 2 feet (0.6 m) of the curbs, shall be given a suitable grooving by hand methods. Grooving shall be similar to that described in Article 2301.16, A, with the following exceptions:

- Grooving shall be transverse to the centerline of the roadway.
- Transverse grooving shall be randomly spaced from 3/4 inch to 1 5/8 inches (20 mm to 40 mm) with no more than 50% of the spacings exceeding 1 1/4 inches (30 mm) with a minimum of four different spacings in a 2 foot (0.6 m) width.

2412.07, Curing.

Replace the title and the entire article:

2412.07 Curing Concrete Floors.

Burlap prewetted with sufficient water, prior to placement, to prevent absorption of moisture from the concrete surface shall be used. It shall be kept wet. The first layer of prewetted burlap shall be placed in the following manner:

A. Interstate and Primary Projects.
The first layer of prewetted burlap shall be placed on the concrete within 10 minutes after final finishing.

B. Other Projects.
Immediately after final finishing and grooving, the area finished shall be covered with white pigmented curing compound, meeting requirements of Article 4105.05, applied at a rate of not more than 135 square feet per gallon (3.3 square meters per liter). The first layer of prewetted burlap shall be placed on the concrete within 30 minutes after the concrete has been finished and grooved.

As soon as practical, but not later than 2 hours after the first layer is placed, a second layer of burlap shall be placed on the floor. Water shall be applied to the burlap covering for a period of 4 calendar days by means of a pressure sprinkling system that is effective in keeping the burlap wet during the moist curing period. The system may be interrupted only to replenish the water supply, during periods of natural moisture, or during construction contiguous to the concrete being cured. Interruptions for periods longer than 4 hours may be approved by the Engineer on the basis of the method of keeping the concrete moist.

Continuous contact, except as noted above, shall be maintained between all parts of the concrete floor and the burlap during the 4 calendar day moist period.

On concrete floors placed after October 1 and prior to April 1, after 20 hours of the application of water, the Contractor may substitute the application of a moisture proof plastic film not less than 3.4 mils (86 μm) thick over the wet burlap in lieu of applying water. Intimate contract must be maintained between the surface of the concrete, the burlap, and the plastic film.

2412.11, Method of Measurement and Basis of Payment.

Replace the first sentence of the first paragraph:
Structural concrete, reinforcement, and structural steel will be measured and paid for in accordance with Sections 2403, 2404, and 2408, respectively.

Replace “2317” with “2428” in the second paragraph.

Add as the fifth paragraph:
The quantity of Longitudinal Grooving in Concrete, in square yards (square meters), will be the plan quantity shown in the contract documents. The Contractor will be paid the contract unit price for longitudinal grooving in concrete per square yard (square meter).

Section 2413

2413. Surfacing and Repair and Overlay of Bridge Floors.

Replace the title and entire section:

2413. Bridge Floor Surfacing, Repair, and Overlay.

2413.01, Description.
Bridge Floor Surfacing shall consist of placing a wearing course on a new bridge deck prepared surface, and other necessary work shown in the contract documents or specified herein.

Repair and overlay of bridge floors shall consist of removing concrete from the existing surface, replacing and overlaying with new concrete, and other necessary work shown in the contract documents or as specified. When structural repairs are included in the project, Class C concrete may be mixed using equipment meeting requirements of Article 2413.03, B. The concrete mixture used for the overlay may be used for the repair; the water and consistency shall be as specified in Article 2403.03, A. Unless otherwise provided in the contract documents, overlay shall accomplish a raise of the existing roadway

surface and shall cover the entire concrete floor surface, including those areas to be repaired. Bridge floor repair and overlay shall be classified as follows:

A. Class A Bridge Floor Repair.
Class A bridge floor repair shall consist of removing floor concrete below the level described for Bridge Floor Overlay, but less than full depth, transporting the existing concrete removed from the project, and replacing the excavated volume with concrete to a level bounding the Bridge Floor Overlay classification. Lower limit for Class A Bridge Floor Repair shall be to suitable existing concrete, as determined by the Engineer, but to at least the level of the top of the top reinforcing steel.

B. Class B Bridge Floor Repair.
Class B bridge floor repair shall consist of removing floor concrete below the level described for Bridge Floor Overlay for the full depth of the floor, transporting the existing concrete removed from the project, and replacing the excavated volume with concrete to a level bounding the Bridge Floor Overlay classification.

C. Bridge Floor Overlay.
Bridge floor overlay shall consist of removing floor concrete to a depth 1/4 inch (5 mm) below the existing, finished surface, except at drains and elsewhere as noted in the contract documents, transporting the existing concrete removed from the project, and overlaying with a concrete course of a depth designated. Thickness of the concrete overlay shall be measured from a level 1/4 inch (5 mm) below the original surface to a final raised surface as shown. Where removal to a level lower than 1/4 inch (5 mm) below the original surface is necessary because of surface fixtures, the minimum thickness of abutting overlay shall be 3/4 inch (20 mm) and shall be tapered to the full designated thickness.

2413.02, Materials.
All materials shall meet requirements for the respective items in Division 41.

Only one brand of cement shall be used during an individual placement.

Sections 4110, and 4115 shall apply to the aggregates. Only those coarse aggregates specifically allowed by Article 4115.05 for this work shall be used.

Mix shall be either of the following:

A. Class O Portland Cement Concrete.
Class O PCC shall meet the requirements of Materials I.M. 529 and the following requirements:

Fly ash substitution is not permitted for Class O PCC.

The slump, measured in accordance with Materials I.M. 317 shall be 3/4 inch (20 mm) with a maximum of 1 inch (25 mm) and no minimum requirement. Testing for slump of concrete from a continuous mixer shall commence within 2 to 4 minutes after the concrete is discharged.

The intended air entrainment of the finished concrete is 6%, but the air content of fresh, unvibrated concrete at the time of placement, as determined by Materials I.M. 318 shall be 6.5%, with a maximum variation of plus 2.0% and minus 1.0%.

B. Class HPC-O High Performance Concrete.
Class HPC-O shall meet the requirements of Materials I.M. 529 and the following requirements:

The slump, measured in accordance with Materials I.M. 317 shall be 1 inch (25 mm) to 3 inches (75 mm) with a maximum of 4 inches (100 mm). Testing for slump of concrete from a continuous mixer shall commence within 2 to 4 minutes after the concrete is discharged. Testing for slump of concrete from ready mix shall be done prior to placement.

A mid-range water reducing admixture meeting the requirements of Materials I.M. 403, Appendix C, shall be used. Other admixtures may be approved by the Engineer.

Air content shall be the same as required for Class O PCC.

Type IS or Type IP cement shall be used. If Type I/II is used, 25% replacement with ground granulated blast furnace slag shall be required.

Fly ash substitution rate shall not exceed 15% replacement by weight.

Grout for bonding new concrete to previously placed concrete shall consist of about 5 to 6 gallons of water to each 94 pound bag (0.45 to 0.50 L/kg) of cement. The consistency shall be so that the slurry can be applied with a stiff brush or broom to the previously placed concrete in a thin, even coating that will not run or puddle in low spots. An equivalent grout of Portland cement and water, applied by pressure spray may be substituted with approval of the Engineer. For sealing vertical joints between adjacent lanes and at the curbs, this grout shall be thinned to paint consistency.

2413.03, Equipment.
Equipment used shall be subject to approval of the Engineer and shall comply with the following:

A. Preparation Equipment.
Preparation equipment shall be of the following types:

1. Sawing Equipment.
Sawing equipment shall be capable of sawing concrete to the specified depth.

2. Sandblasting or Shot Blasting Equipment.
Sandblasting or shot blasting equipment shall be capable of removing rust, oil, and concrete laitance from the existing surface of the bridge floor and exposed uncoated reinforcing bars.

3. Power Driven Hand Tools.
Power driven hand tools will be permitted with the following restrictions:

a. Jack Hammers heavier than nominal 30 pound class (with a mass greater than 14 kg) shall not be used.

b. Jack Hammers or mechanical chipping tools shall not be operated at an angle in excess of 45 degrees measured from the surface of the slab.

c. Chipping Hammers heavier than a nominal 15 pound (with a mass greater than 7 kg) class shall not be used.

4. Hand Tools.
Hand tools such as hammers and chisels shall be provided for removal of final particles of unsound concrete or to achieve the required depth.

5. High Pressure Water Blasting Equipment.
High pressure water blasting equipment shall be capable of removing rust, oil, concrete laitance, and unsound concrete from the existing surface of the bridge floor and exposed uncoated reinforcing bars.

B. Proportioning and Mixing Equipment.
Proportioning and mixing equipment for Class O PCC or Class HPC-O shall meet requirements of Article 2001.20, D, and Article 2001.21, C. In addition, the device for proportioning water shall be accurate within 1.0%, and the mixer shall be a construction or stationary concrete mixer of the rotating paddle type. A continuous mixer used in conjunction with volumetric proportioning, described above, may be used.

Sufficient mixing capacity or mixers shall be provided for either type of mixture to permit the intended quantity to be placed without interruption.

The cement, fly ash, and GGBFS for Class HPC-O shall be pre-blended by the producer or by using equipment capable of thoroughly mixing the materials to the tolerances in ASTM C 685 when concrete is produced using a volumetric mixer.

For Class HPC-O, ready mixed concrete equipment meeting the requirements of Articles 2001.20 and 2001.21 will be allowed. For ready mixed concrete, the cement, fly ash, and GGBFS are not required to be pre-blended.

C. Placing and Finishing Equipment for Bridge Floor Surfacing and Bridge Floor Overlay.
Placing and finishing equipment shall include adequate hand tools for placement of the mixture and for working it down to approximately the correct level for striking off with the screed. A self propelled finishing machine will be required for all surfacing and overlays. The machine shall operate on supporting rails which are adequately secured to the previously placed surface and are adjustable to the correct profile without shimming, which do not deflect under the load of the machine, and which may be removed without damage to the edge of the new surface that is to remain in place. When placing the mixture in a lane abutting a previously completed lane, that side of the finishing machine adjacent to the completed lane shall be suitably equipped to travel on the completed lane. The finishing machine shall be inspected and approved before work is started on each project.

The finishing machine shall meet the following additional requirements for the type of mixture to be placed:

1. Class O Portland Cement Concrete.
The finishing machine shall meet requirements of Article 2412.06 and shall have a mechanical strike off to provide a uniform thickness of mixture in front of the screed designed to consolidate the mixture by vibration, as specified. The front screed shall be designed to consolidate the mixture to be placed to 100% of the rodded density. The bottom face of this screed shall be at least 5 inches (125 mm) wide with a turned up or rounded leading edge to minimize tearing of the surface of the plastic concrete. Each screed shall have an effective weight (mass) of at least 75 pounds for each square foot (365 kg/m2) of bottom face area. Each screed shall be provided with positive control of the vertical position, the angle of tilt, and the shape of the crown. Design of the finishing machine together with appurtenant equipment shall be such that positive machine screeding of the plastic concrete will be obtained within 1 inch (25 mm) of the face of the existing curbs. The length of the screed shall be sufficient to extend at least 6 inches (150 mm) beyond the line where a saw cut is intended to form the edge of a subsequent placement section, and shall overlap the sawed edge of a previously placed course at least 6 inches (150 mm).

Internal vibration equipment will be required for consolidation at the edges of the placement for Class O PCC.

2. Class HPC-O High Performance Concrete.
The finishing machine shall meet the requirements of Article 2412.06 and be capable of finishing the surface to within 1 foot (0.3 m) of the edges of the area being placed.

The screeds shall be provided with positive control of the vertical position.

The finishing machine shall be self propelled and shall be capable of forward and reverse movement under positive control. Provision shall be made for raising all screeds to clear the screeded surface for traveling in reverse.

D. General.
The overall combination of labor and equipment for proportioning, mixing, placing, and finishing the new surface shall be of such minimum capability as to meet the following requirements except when noted otherwise in the contract documents.

MINIMUM CAPACITY AND LABOR REQUIREMENTS	
Total Surface Area per Bridge, sq. yd. (m^2)	**Minimum Requirement, cu. yd. per hour (m^3 per hour)**
0-328 (0-274)	1.0 (0.8)
329-492 (274.1-410)	1.5 (1.2)
493-656 (410.1-550)	2.0 (1.6)
over 656 (over 550.1)	2.5 (2.0)

The finishing machine shall be designed so that when the mixture is being mixed and placed at the specified minimum rate, under normal operating conditions, the elapsed time between depositing the mixture on the floor and final screeding shall not exceed 10 minutes.

2413.04, Preparation of Surface for Bridge Floor Surfacing and Bridge Floor Overlays.
Material for test wells (for Class O PCC density testing) and all loose, disintegrated, or unsound concrete shall be removed from the bridge floor, as designated by the Engineer. Test wells for nuclear density checks shall have nominal dimensions of 1 1/2 inches x 10 inches x 10 inches (40 mm x 250 mm x 250 mm). On bridge floor overlays, Class A bridge floor repair removal areas may be used as test wells provided they meet the nominal dimensions and are located in the testing frequency areas. Nuclear density testing of Class O PCC will be in accordance with Materials I.M. 358.

For bridge floor overlays, the entire existing concrete floor area shall be uniformly scarified or prepared to a depth of 1/4 inch (5 mm), except over areas of Class A and Class B repair where the 1/4 inch (5 mm) removal may be coincidental with operations for repair removal. Removal to a greater depth will be required at drains and elsewhere as noted in the contract documents.

The thickness of all new concrete above the prepared surface, for bridge floor surfacing, shall be as specified in the contract documents. The thickness of concrete above the prepared surface (for bridge floor surfacing) and above the prepared surface or reinforcing steel (for bridge floor overlay) shall be at least 1 3/4 inches (45 mm) and shall be greater if specified in the contract documents. The thickness and clearance shall be checked in the following manner before concrete is placed:

A filler block having a thickness 1/4 inch (5 mm) less than the overlay thickness shall be attached to the bottom of the screed; with screed guides in place, the screed shall be passed over the area to be concreted. As an alternate to passage of the finishing machine, an approved template, supported by the screed guides, may be passed over the overlay area. Where the intended clearance does not allow use of this method, a string line or other means shall be used, subject to approval of the Engineer. If the filler block or other method used to check does not clear the area to be concreted, the profile of the new surface shall be adjusted as approved by the Engineer.

For bridge floor overlays, all old concrete which does not have sufficient clearance shall be removed. All reinforcing steel which does not have sufficient clearance shall be depressed and fastened down. It may be necessary to remove concrete beneath some reinforcement to permit depressing the reinforcement adequately. The minimum clear distance around these bars for placement of new concrete shall be 3/4 inch (20 mm).

In preparation for placement of new concrete, the surface shall be sandblasted or shot blasted, followed by an air blast. This cleaning shall remove all dirt, oil, and other foreign material, as well as any unsound concrete, laitance, or loose material from the surface and edges against which the surface mixture is to be placed. It is desired that the surface be roughened by the cleaning to provide satisfactory bond with the surfacing mixture. Metal floor drains and areas of the curb or railing above the proposed surface shall be protected from the cleaning.

It is not intended or desired that existing concrete, prepared for surfacing, be presaturated before grout and new concrete is placed. The prepared surface shall be dry to allow some absorption of the grout.

Areas from which concrete has been removed shall be kept free of slurry produced by wet sawing of concrete joints. All of this slurry shall be removed from prepared areas before new concrete is placed.

Hand tools shall be used to remove final particles of concrete or to achieve the required depth. The entire surface against which new concrete is to be placed, including curbs and exposed reinforcement, shall be sandblasted or shot blasted. The cleaning shall be of an extent to remove all dirt, oil, and other foreign

material, as well as any unsound concrete. Cleaning of epoxy coated reinforcing shall be with hand tools that will not damage the epoxy coating. Immediately before applying grout in preparation for placement of new concrete, the surface shall be cleaned with air blast. It is not intended or desired that existing concrete, prepared for repair, surfacing, or overlay, be pre-saturated with water before grout and new concrete is placed. The prepared surface shall be dry to allow some absorption of the grout.

At the time of placement of either Class O PCC or Class HPC-O, the area shall be clean and all exposed reinforcement free of rust. Rust forming because of dew on clean reinforcement overnight will not be considered objectionable, but reinforcement with a greater amount of rust shall be subject to recleaning before the concrete is placed. The area shall be cleaned by air blast before the concrete is placed.

2413.05, Preparation of Surface for Repair.
Concrete shall be removed from each area, designated in the contract documents or by the Engineer, to a depth and in a manner consistent with the classification for that area. Areas as shown in the contract documents are based on the best information available; actual areas will be determined by the Engineer.

A. Class A Bridge Floor Repair.
Concrete may be removed by chipping, shot blasting, hydro blasting, or by a combination of these, except that final clean up, in any case, shall be by use of hand tools. Class A repair removal shall be considered to start 1/4 inch (5 mm) below the existing surface, but this shall not preclude removal coincidental with preparation for overlay. Removal for Class A repair shall extend at least to the level of the top reinforcing bars, and the removal shall extend deeper, as necessary, to remove unsound concrete.

For Class A repair and in preparation for bridge deck overlay, the surface may also be prepared or partially prepared using a high pressure water system, at the Contractor's option. Procedures shall be as recommended by the equipment manufacturer, subject to approval of the Engineer and within such limitations as may be imposed.

Additional removal may be required to provide for test wells.

B. Class B Bridge Floor Repair.
Within all areas designated for Class B repair, and any designated areas of Class A repair in which the depth of the remaining sound concrete is less than 50% of the original depth of the bridge floor, all concrete shall be removed. Designated Class A repair areas shall be measured as Class B Bridge Floor Repair when full depth removal is required. At the direction of the Engineer, limited areas of removal greater than 50% of the floor thickness, such as beneath reinforcing, may be allowed; these limited areas of excess depth will be measured as Class A Bridge Floor Repair. Concrete shall be removed by jack hammer, chipping hammer, or by a combination of scarifying and chipping hammer, except that the final removal at the periphery of Class B repair areas shall be accomplished by 15 pound (7 kg) jack hammer, chipping hammer, or hand tools. Class B repair removal shall be considered to start 1/4 inch (5 mm) below the existing surface, but this shall not preclude removal coincidental with preparation for overlay.

Forms shall be provided to enable placement of new concrete in the full depth opening. The forms shall preferably be suspended from existing reinforcing bars by wire ties. Forms may, in the case of large area openings, be supported by blocking from the beam flanges. Forms will in all cases be supported by elements of the existing superstructure unless specifically noted or shown otherwise in the contract documents.

All reinforcing bars and newly exposed concrete shall be thoroughly cleaned by sandblasting or shot blasting. Cleaning of epoxy coated reinforcing shall be with hand tools that will not damage the epoxy coating. Where bond between existing concrete and reinforcing steel has been destroyed, the concrete adjacent to the bar shall be removed to a depth that will permit new concrete to bond to the entire periphery of the exposed bar. A minimum of 3/4 inch (20 mm) clearance shall be required around the bar. Care shall be exercised to prevent cutting, stretching, or damaging any exposed reinforcing steel. The Engineer may require enlarging a designated area should inspection indicate deterioration of concrete or corrosion of reinforcing beyond the limits previously designated.

Areas from which concrete has been removed shall be kept free of slurry produced by wet sawing of concrete joints. All of this slurry shall be removed from prepared areas before new concrete is placed.

Hand tools shall be used to remove final particles of concrete or to achieve the required depth. The entire surface, including curbs and exposed reinforcement, against which new concrete is to be placed shall be sandblasted or shot blasted. Cleaning of epoxy coated reinforcing shall be with hand tools that will not damage the epoxy coating. The cleaning shall be of an extent to remove all dirt, oil, and other foreign material, as well as any unsound concrete. Immediately before applying grout in preparation for placement of new concrete, the surface shall be cleaned with air blast. It is not intended or desired that existing concrete prepared for repair be presaturated with water before grout and new concrete is placed. The prepared surface shall be dry to allow some absorption of the grout.

At the time of placement of either Class O PCC or Class HPC-O, the area shall be clean and the reinforcement free of rust; rust forming because of dew on clean reinforcement overnight will not be considered objectionable, but reinforcement with a greater amount of rust shall be subject to recleaning before the concrete is placed. The area shall be cleaned by air blast before the concrete is placed.

2413.06, Proportioning and Mixing.
For Class O PCC, the mixture shall be proportioned and mixed at the project site. Ready mixed concrete will not be approved.

For Class HPC-O, ready mixed concrete or portioned and mixed concrete at the project site will be allowed.

The water reducing admixture for improved workability of Class O PCC or HPC-O shall be incorporated and mixed into the concrete in accordance with the manufacturer's recommendations and the Engineer's instructions.

A. Stationary Mixer.
When a construction or stationary mixer is used, proportioning and mixing shall be in accordance with applicable provisions of Article 2403.06.

B. Continuous Mixing Equipment.
When continuous mixing equipment is used, the following shall apply:

1. Mobile continuous mixers shall accurately proportion all materials for the specified mixture.

2. The proportioning equipment for each material shall be calibrated in the presence of the inspector, or the Engineer may accept a previous calibration and require satisfactory verification checks only, at the settings indicated by the previous calibration.

3. The proportioning equipment shall be operated at the speed recommended by the manufacturer during calibration, checks, or normal operation.

4. Continuous mixers shall be recharged at the site.

5. The Contractor may make yield checks or other checks and the inspector will cooperate in such checking.

6. The materials shall be mixed in an approved mixer within 1 mile (2 km) of the site of placement. They shall be mixed in accordance with the specified requirements for the equipment used. The mixture, as discharged from the mixer, shall be uniform in composition and consistency.

2413.07, Placing and Finishing.

A. Repairs.
The following applies to repair work:

Although repair classes are considered to begin 1/4 inch (5 mm) below the original concrete surface, repair concrete shall be placed monolithically with the overlay course, except as described for larger areas of Class B repair. Fresh concrete, 3 inches (75 mm) or more in thickness, shall be vibrated internally.

Areas of Class B repair 2 square yards (2 m^2) or greater shall have floor forms supported by beams or stringers. These larger areas of Class B repair shall have individual concrete replacement to the lower boundary for the superimposed overlay. Class C structural concrete meeting the requirements of Sections 2403 and 2412 shall be used for Class B repair. Floor repair concrete described in Article 2413.02, or Class C structural concrete meeting requirements of Sections 2403 and 2412, may be used for the partial placements. Surfaces of these individual placements are to be left rough, and all placements for each construction stage shall be complete before the overlay course is started. If a full depth repair is staged, a beveled keyway not less than 1 1/2 inch by 3 inches (35 mm by 75 mm) shall be provided at the vertical joint. Concrete placement and reinforcing support shall comply with applicable portions of these specifications except as modified by the contract documents. The partial placement shall have a 72 hour cure as described for the overlay surface. After the cure, partial placements are to be surface dried, sandblasted or shot blasted, and cleaned prior to the application of the grout and overlay course.

B. Bridge Floor Surfacing and Bridge Floor Overlay.
An approved finishing machine will be required as specified in Article 2413.03, C. Supporting rails upon which the finishing machine travels shall be placed outside the area to be surfaced. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Engineer. A hold down device shot into concrete will not be permitted unless the concrete is to be subsequently surfaced. Hold down devices of other types leaving holes in exposed areas will be approved provided the holes remaining are grouted full. Plans for anchoring support rails and the mixture placing procedure shall be submitted to the Engineer for approval.

The locations of longitudinal joints may be shown in the contract documents. If not shown, the locations shall be subject to approval of the Engineer, and the approval will be based on avoiding joints in the wheel paths as much as practical.

In order to insure a junction with properly consolidated concrete, the surface course previously placed shall be sawed to a straight and vertical edge at longitudinal and transverse joints and removed before adjacent concrete is placed. The Engineer will determine the extent of such removal.

The Contractor shall take every reasonable precaution to secure a smooth riding bridge deck. Prior to placement operations, the Contractor shall review the equipment, procedures, personnel, and previous results with the Engineer, and the inspection procedures will be reviewed to assure coordination. Precautions shall include the following:

Assurance that concrete can be produced and placed within the specified limits, continuously and with uniformity.

After finishing, the Contractor shall check the surface with a 10 foot (3 m) straightedge; causes for irregularities exceeding 1/8 inch (3 mm) should be eliminated, and corrections should be made, if practical.

Each placement will be checked in accordance with Section 2428 the day following placement or before another section is placed.

After the surface has been cleaned and immediately before placing Class O PCC or Class HPC-O, a thin coating of bonding grout shall be scrubbed into the dry, prepared surface. At the Contractor's option, the grout may be sprayed onto the surface in a manner subject to approval of the Engineer. Care shall be exercised to insure that all parts receive a thorough, even coating and that no excess grout is permitted to collect in pockets. The rate of progress in applying grout shall be limited so that the grout does not become dry before it is covered with new concrete. If the grout becomes dry, it shall be removed by sandblasting and new grout applied.

Concrete shall be placed in a continuous operation. For Class O PCC, the new concrete shall be manipulated and mechanically struck off slightly above final grade. It shall then be mechanically consolidated to 100% of the rodded density, with a minus tolerance of 2%, and screeded to final grade. The rodded density will be determined in accordance with Materials I.M. 358.

The rodded density measurement is not required for Class HPC-O.

For Class O PCC overlay, internal vibration shall be used for consolidation at the curb side, and along the longitudinal construction joint adjacent to a previously constructed lane.

The concrete temperature and theoretical evaporation rate shall be in accordance with Article 2412.05.

Section 2428 shall apply to smoothness of the completed bridge floor surfacing and bridge floor overlay for Interstate and Primary projects and when specifically required for other projects.

C. Placement of Grooving.

1. Interstate and Primary Projects.
Transverse grooving or tining in plastic concrete of bridge floor surfacing or bridge deck overlay (and bridge approach overlay when included in a bridge deck overlay project) will not be allowed. Longitudinal grooving shall be in accordance with Article 2412.06, A

2. Other Projects.
When a tight, uniform surface has been achieved, the surface shall be given a suitable grooving, by hand methods, similar to that described in Article 2301.16, A, with the following exceptions:

- Grooving shall be transverse to the centerline of roadway.
- Transverse grooving shall be randomly spaced from 3/4 inch to 1 5/8 inches (20 mm by 40 mm) with no more than 50% of the spacings exceeding 1 1/4 inches (30 mm) with a minimum of four different spacings in a 2 foot (0.6 m) width.

This operation shall be done at a time and manner that the desired texture will be achieved while minimizing displacement of the larger aggregate particles. The texture should not extend into the areas within approximately 2 feet (0.5 m) of curbs. As soon as finishing has been completed, all vertical joints with adjacent concrete shall be sealed by painting with thinned grout.

2413.08, Curing.

A. Interstate and Primary Projects.
The first layer of prewetted burlap shall be placed on the concrete within 10 minutes after finishing. If Class O PCC is revibrated because of failure to meet density requirements with initial vibration, the time for placement of prewetted burlap shall be within 10 minutes after finishing of the revibrated area.

B. Other Projects.
Immediately after final finishing, the area finished shall be covered with white pigmented curing compound meeting requirements of Article 4105.05, applied at a rate of not more than 135 square feet per gallon (3.3 square meters per liter). The first layer of prewetted burlap shall be placed on the concrete within 30 minutes after the concrete has been deposited on the floor. If Class O PCC is revibrated because of failure to meet density requirements with initial vibration, this time will be extended 15 minutes.

The concrete shall be cured as provided in the following paragraphs:

For Class O PCC or Class HPC-O, the surface shall be cured for at least 72 hours. For the first 24 hours, the burlap shall be kept continuously wet by means of an automatic sprinkling or wetting system. After 24 hours, the Contractor may cover the wet burlap with a layer of 4 mil (100 µm) polyethylene film for a minimum of 48 hours in lieu of using the sprinkling or wetting system. Failure to apply wet burlap within the required time shall be cause for rejecting the work so affected. Surface

concrete in the rejected area shall be removed and replaced at no additional cost to the Contracting Authority.

Burlap shall be prewetted with sufficient water, prior to placement, to prevent absorption of moisture from the concrete surface.

At the Contractor's option, partial depth concrete for Class B repair may be cured with white pigmented curing compound only. When this curing is completed, the surface shall be sandblasted and allowed to dry, and the existing concrete in that vicinity shall be sandblasted, prior to placement of the overlay course.

2413.09, Sealing for Bridge Floor Overlay.
The tops and traffic sides of curbs, retrofit barrier rails, and concrete barrier rails shall be sealed in accordance with Article 2403.21, D. In addition, for Class O PCC overlay or Class HPC-O overlay, the sealer shall be applied along each gutter line, extending 1 foot (0.3 m) onto the roadway. Other areas requiring concrete sealer may be designated in the contract documents or by the Engineer.

2413.10, Limitations of Operations.
Work on the surface shall not be commenced until the lower course meets the requirements of Article 2403.19, B.

If traffic is to be maintained during the construction period of this contract, it will be noted in the contract documents. The Contractor shall provide traffic controls that are required by the contract documents.

Night work will be permitted. Adequate lights for nighttime work shall be furnished at the direction of the Engineer by the Contractor without additional compensation. The Engineer shall be given reasonable notice.

A construction dam or bulkhead shall be installed in case of major delay in the placement operation. During minor delays of 1 hour or less, the end of the placement may be protected from drying with several layers of wet burlap.

Adequate precautions shall be taken to protect freshly placed concrete from sudden or unexpected rain. The Engineer may order removal of any concrete damaged by rainfall.

Screed rails may be removed at any time after the concrete has taken initial set. Adequate precaution shall be taken during screed removal to protect the edge of the new surface from damage.

Concrete shall not be placed adjacent to a surface course less than 36 hours old, however, this restriction does not apply to a continuation of placement in a lane or strip beyond a joint in the same lane or strip.

If concrete placement is stopped or delayed for a period of 90 minutes or more, further placement shall be discontinued and may resume only after a period of not less than 12 hours. This restriction does not prohibit continuation of placement provided a gap is left in the lane or strip; the gap shall be sufficient in length for the finishing machine to clear previously placed concrete.

Preparation work will not be allowed in a lane or strip until the lane is closed to traffic. In areas where there is no traffic, preparation of the area may be started in a lane or strip adjacent to newly placed surface the day following its placement. If this work is started before the end of the 72 hour curing period, the work will be restricted as follows:

Sawing or other operations shall interfere with the curing process for the minimum practical time only, and in the immediate work area only, and the curing shall be resumed promptly.

Chipping hammers heavier than a nominal 15 pound (with a mass greater than 7 kg) class shall not be used.

Air compressors shall be operated on the floor only directly over the piers.

Loads other than construction equipment shall not be permitted on any portion of the bridge floor that has undergone preparation and prior to placement and curing of new concrete.

Traffic shall not be permitted on a finished surface course until 72 hours after placement. At temperatures below 55°F (13°C), the Engineer may require a longer waiting time.

PCC shall not be placed when the air or floor temperature is below 40°F (4°C).

Concrete mixture shall not be placed after October 1 and prior to April 1 without written approval of the Engineer.

2413.11, Method of Measurement.
Bridge Floor Surfacing (Class O PCC) and Bridge Floor Surfacing (Class HPC-O) will be computed by the Engineer in square yards (square meters) from measurements of the areas surfaced. For bridge floor surfacing, concrete removal for Class O PCC test wells may be required by the Engineer. This removal will not be measured for payment.

Class A Bridge Floor Repair, Class B Bridge Floor Repair, Bridge Floor Overlay (Class O PCC), and Bridge Floor Overlay (Class HPC-O) will be computed by the Engineer in square yards (square meters) from measurements of the areas repaired or overlaid.

Sealing, as required in Article 2413.09, will not be measured separately for payment.

Longitudinal Grooving in concrete shall be measured in accordance with Article 2412.11.

2413.12, Basis of Payment.
For the performance of acceptable work, measured as provided above, the Contractor will be paid the contract unit price in accordance with the following provisions:

For the number of square yards (square meters) of Bridge Floor Surfacing (Class O PCC) or Bridge Floor Surfacing (Class HPC-O) constructed, the Contractor will be paid the contract unit price per square yard (square meter). This payment shall be full compensation for furnishing all material, equipment, forms, and labor necessary to complete this work in accordance with the contract documents.

When Section ~~2317~~ 2428 applies, payment may be modified as specified therein.

For the number of square yards (square meters) of Class A Bridge Floor Repair, Class B Bridge Floor Repair, Bridge Floor Overlay (Class O PCC), and Bridge Floor Overlay (Class HPC-O) constructed, the Contractor will be paid the respective contract unit price per square yard (square meters). This payment shall be full compensation for removal of excess concrete from the project and it becoming the property of the Contractor, for furnishing all material, equipment, forms, and labor necessary to complete the work in accordance with the contract documents.

When there is no item for Class B Bridge Floor Repair, but such work is required, payment for each square yard for 5 square yards (square meter for 4 m^2) or less will be at three times the contract unit price per square yard (square meter) for Class A Bridge Floor Repair. Should the quantity exceed 5 square yards (4 m2), payment shall be made as extra work.

The cost of sealing as required in Article 2413.09 shall be included in the contract unit price for Bridge Floor Overlay (Class O PCC), or Bridge Floor Overlay (Class HPC-O).

The profile may be improved by raising the finished overlay surfaces up to 1/2 inch (15 mm) above that shown in the contract documents with no additional compensation to the Contractor. At each location where the raise exceeds 1/2 inch (15 mm), the Contractor will be paid, as extra work, for the materials which represent the volume in excess of the 1/2 inch (15 mm) raise.

Longitudinal Grooving in Concrete will be paid for in accordance with Article 2412.11.

Section 2414

2414.02, B, Concrete Open Railing.

Replace the second sentence:

Concrete open railing shall be constructed to the dimensions and length shown in the contract documents. The requirements of Sections 2406 and 2513 shall apply.

2414.07, A, Concrete Railings.

Add as the last paragraph:

When the contract documents include an item for Electrical Circuits, measurement will be in accordance with Article 2523.22, B. When electrical conduit and junction boxes are installed as part of Section 2525, measurement will be in accordance with Article 2525.07. Otherwise, electrical conduit and junction boxes will not be measured.

2414.08, A, Concrete Railings.

Add as the third paragraph:

When the contract documents include an item for Electrical Circuits, payment will be in accordance with Article 2523.23, B. When electrical conduit and junction boxes are installed as part of Section 2525, payment will be in accordance with Article 2525.07. Otherwise, electrical conduit and junction boxes will be incidental to the concrete railing.

Section 2415

2415.01, Description.

Replace “ASTM C 850” and “ASTM C 789” with “ASTM C 1433” in the second paragraph.

Replace the second sentence of the second paragraph:

These culvert sections shall meet requirements of ASTM C 1433.

Replace the sixth sentence of the second paragraph:

Concrete strength will be based on cylinder tests.

Section 2416

2416.0~~5~~4, E, Joints for Concrete Pipe.

Replace “Type C-1” with “Type C” in the first sentence of the third paragraph.

2416.05, Method of Measurement.

Replace the entire article:

The quantity of pipe culvert, in feet (meters), will be the measured length of culvert installed, excluding aprons, to the nearest foot (0.1 m) with no deductions for elbows, tees, and other fittings. The quantity of pipe will be determined along the axis. Pipe laterals terminating at a tee will be from the point of inlet to a point 6 inches (150 mm) from the outside of the main, less the length of the apron, if any.

The quantity of aprons will be the quantity shown in the contract documents.

The quantity of appurtenances (elbows, tees, and other fittings) will be shown on the contract documents but will not be measured for payment.

Type C adaptors required by the contract documents or installed to correct faulty work will not be measured for payment. Type C adaptors not shown in the contract documents, but required because of changes in alignment, shall be paid for in accordance with Article 1109.03, B.

Excavation for roadway culverts will be measured for payment as provided in Article 2402.12, B. Excavation for entrance culverts will not be measured for payment. Sand required for Class B bedding will not be measured for payment.

When granular backfill is required and furnished, Article 2402.12, D, shall apply.

When foundation treatment material has been placed at the direction of the Engineer, Article 2402.12, E, shall apply.

2416.06, Basis of Payment.

Replace the entire article:

The Contractor will be paid the contract unit price for pipe culvert of type and size specified per linear foot (meter). The cost of wrapping pipe joints, Type C adapters, and appurtenances shall be included in the contract unit price per linear foot (meter) for the pipe culvert.

The Contractor will be paid the contract unit price for aprons of the size specified per unit.

For the quantity of excavation for roadway culverts and the quantity of extra excavation for embankments, the Contractor will be paid the contract unit price per cubic yard (cubic meter). For entrance culverts, excavation shall be considered as incidental to the contract unit price for rigid pipe culvert. Sand required for Class B bedding shall be incidental to the contract unit price for pipe culvert.

When Granular backfill is required and furnished, it will be paid for in accordance with Article 2402.13, F.

Foundation treatment material furnished and placed will be paid for in accordance with Article 2402.13, E.

Section 2417

2417.02, Materials.

Replace the third paragraph:

Corrugated steel culverts placed under roadways shall be coated according to Article 4141.02.

2417.05, Installation.

Replace the entire article:

Installation of corrugated metal pipe or polyethylene pipe for roadway culverts shall be with a Class A bedding.

A. Class A Bedding.

Class A bedding shall consist of a uniform uncompacted cushion of sand as detailed in the contract documents and meeting the gradation requirements of Gradation No. 1 or 32 of the Aggregate Gradation Table referenced in Section 4109.

B. Deflection Testing for Polyethylene Pipes.

No sooner than 30 calendar days following completion of pipe installation and backfilling, or before paving, the Contractor shall perform deflection testing on at least 10% of the pipe locations along their entire length at locations as determined by the Engineer. The internal diameter of a pipe shall not be reduced by more than 5.0% of its nominal inside diameter. If any pipe fails post installation testing, the Engineer may require the Contractor to perform post installation testing on any additional pipes or all of the remaining pipes. Pipes failing post installation testing shall be considered unacceptable. New pipe or pipe that is not damaged shall be reinstalled. The reinstalled pipe shall be tested for deflection.

1. Pipe Diameter of 30 Inches (750 mm) or Less.

Deflection testing shall be performed using a properly sized nine-point mandrel test.

2. Pipe Diameter Greater than 30 Inches (750 mm).

A measurement by the Contractor shall be made to insure the internal diameter of the entire length of the pipe is not reduced by more than 6.5% of its nominal inside diameter.

2417.06, Method of Measurement.

Replace the entire article:

The quantity of corrugated pipe culvert, in feet (meters), will be the measured length of culvert installed, excluding aprons, to the nearest foot (0.1 m). The quantity of pipe will be determined along the axis. Pipe laterals terminating at a tee will be measured from the point of inlet to a point 6 inches (150 mm) from the outside of the main, less the length of the apron, if any.

The quantity of aprons will be the quantity shown in the contract documents.

The quantity of appurtenances (elbows, tees, and other fittings) will be shown on the contract documents but will not be measured for payment.

Excavation for roadway culverts will be measured in accordance with Article 2402.12, B. Excavation for entrance culverts will not be measured for payment.

When granular backfill is required and furnished, measurement will be in accordance with Article 2402.12, D.

When foundation treatment material has been placed at the written direction of the Engineer, measurement will be in accordance with Article 2402.12, E.

2417.07, Basis of Payment.

Replace the entire article:

The Contractor will be paid the contract unit price for corrugated pipe culvert of the type and size specified per linear foot (meter). Appurtenances shall be included in the contract unit price per linear foot (meter) for the corrugated pipe culvert.

The Contractor will be paid the contract unit price for aprons of the size specified per unit.

For the quantity of excavation for roadway culverts and the quantity of extra excavation for embankments, the Contractor will be paid the contract unit price per cubic yard (cubic meter).

For entrance culverts, excavation shall be considered as incidental to the contract unit price for corrugated pipe culverts.

When granular backfill is required and furnished, it will be paid for in accordance with Article 2402.13, F.

The cost of deflection testing required according to the contract documents will be considered incidental to the contract unit price for polyethylene pipe.

Foundation treatment material furnished and placed will be paid for in accordance with Article 2402.13, E.

Section 2418

2418.06, Method of Measurement.

Replace the first paragraph:

The quantity of jacked pipe culvert, in feet (meters), will be the measured length of culvert installed, excluding aprons, to the nearest foot (0.1 m). The quantity of jacked pipe culvert will be determined along the axis.

2418.07, Basis of Payment.

Replace the entire article:

The Contractor will be paid the contract unit price for jacked pipe culvert of the type and size specified per linear foot (meter). This payment shall be full compensation for materials, labor, and equipment necessary to complete the work. Culverts that consist of both jacked pipe culvert and conventionally placed pipe culvert will include separate bid items for each portion.

Section 2420

2420.12, Method of Measurement.

Replace the first paragraph:

The quantity of structural pipe culvert, in feet (meters), will be the quantity shown in the contract documents for each culvert to the nearest foot (0.1 m). The quantity of pipe will be determined as follows:

2420.13, Basis of Payment.

Replace the entire article:

The Contractor will be paid the contract unit price for structural pipe culvert of the type and size specified per linear foot (meter). This payment shall be full compensation for furnishing all materials, labor, and equipment necessary to complete the work.

Excavation for structures, structural concrete, and reinforcement will be paid for separately.

Section 2422

2422.01, Description.

Delete the second sentence of the first paragraph:

~~The type of pipe to be used will be specified only by group number in accordance with Article 2422.02.~~

2422.02, Materials for Unclassified Pipe Culvert.

Replace the second row of the “Unclassified Roadway Pipe Culverts” table:

Coated Corrugated Steel Pipe Section 2417

Replace the third row of the “Unclassified Entrance Pipe Culverts” table:

Corrugated Steel Pipe Section 2417

Add as the last table in this article:

UNCLASSIFIED ROADWAY LETDOWN PIPE CULVERT	
Coated Corrugated Steel	Section 2417
Polyethylene Pipe	Section 2417

2422.04, Method of Measurement.

Replace the first paragraph:

Unclassified pipe culverts will be measured as provided in Articles 2416.05 and 2417.06.

2422.05, Basis of Payment.

Replace the entire article:

Payment for unclassified pipe culverts will be as provided in Articles 2416.06 or 2417.07.

Section 2423

2423.02, General Requirements.

Replace the second paragraph:

Before fabrication, shop drawings shall be submitted in accordance with Article 1105.03.

2423.05, A, Fabrication and Assembly.

Replace the second sentence:

Non-destructive testing of welds for aluminum structures shall be in accordance with the AWS D1.2, Section 5. Testing shall be limited to the flange connection of the overhead section and the end supports.

Add as the fourth sentence:
For steel structures, testing shall also include the column-to-base plate, full penetration weld.

Section 2424

2424.02, D, Coarse Aggregate for Concrete.

Replace the entire article:

D. Coarse Aggregate for Concrete.
Coarse aggregate for concrete shall meet requirements of Section 4115 and the following gradation requirements:

GRADATION	
Sieve No.	**Percent Passing**
3/4" (19 mm)	100
1/2" (12.5 mm)	97-100
3/8" (9.5 mm)	40-90
No. 4 (4.75 mm)	0-30
No. 200 (75 µm)	0-1.5
The maximum percent passing the No. 200 (75 µm) sieve may be increased to 2.5%, provided the documented production limit agreed to and maintained is 1.0% or less and any increase up to 2.5% is due to degradation of the parent material and not to contamination by other material.	

Section 2425

2425.03, Design.

Add as the second sentence:
Shop drawings shall be submitted in accordance with Article 1105.03.

Section 2426

2426.01, B, Regular Repair.

Replace the fifth sentence:
Forms shall be removed in accordance with Article 2403.18.

2426.02, B, 1, Shallow Repair.

Replace "Article 4115.06" with "Article 4115.05" in the last item of the table.

Section 2428

2428, Smoothness of Bridge Decks and Bridge Deck Overlays.

Add as a new section:

Section 2428. Smoothness of Bridge Decks and Bridge Deck Overlays

2428.01 GENERAL.
Smoothness shall be evaluated for all Interstate and Primary bridge decks, new approaches and bridge deck overlays, and overlaid approaches except when specifically excluded by the contract documents. Smoothness shall also be evaluated for all non-Primary bridge decks, new approaches and bridge deck overlays, and overlaid approaches for projects where the Department is the Contracting Authority, except when specifically excluded by the contract documents.

If this specification is required by contract documents on non-Primary projects let by the Department, it will be added in its entirety. Selected portions of the specification will not be deleted.

2428.02 MEASUREMENT.
The Contractor shall provide and operate an Ames type or California type profilograph to produce a profilogram (profile trace) of the surface tested in accordance with Materials I.M. 341. Other types of profilographs or profilers that produce compatible results and meet the requirements of Materials I.M. 341 may be used.

2428.03 PROFILOGRAPH TESTING.
The Contractor shall remove all objects and foreign material from the deck surface, including protective covers, if used, prior to testing by the Engineer. If appropriate, properly replace protective covers after testing.

A profilogram will be made by a test in each wheel path of each traffic lane. The profilogram will include a minimum of 16 feet (5 m) beyond the bridge section when there is adjoining pavement. Bridge decks and bridge deck overlays will be treated as one section. The profilogram will include a minimum of 100 feet (30 m) beyond the approach section when there is adjoining pavement.

For bridge lengths of 778 feet (240 m) or less, each traffic lane shall be a segment. For bridges longer than 778 feet (240 m), a segment shall be 0.1 miles (160 m) of the traffic lane. If the remaining segment is 250 feet (80 m) or less in length, it shall be included in the adjacent bridge segment. If the remaining segment is more than 250 feet (80 m) in length, it shall be evaluated on its own. When bridge deck overlay expansion joints are not new or replaced, segments shall begin and end at the expansion joints.

Each bridge approach lane shall be a separate segment.

The Contractor shall perform quality control testing and furnish the profilogram results to the Engineer. The testing and evaluation shall be done by a trained and certified person, and the evaluation shall be certified in accordance with Materials I.M. 341.

2428.04 PROFILE INDEX.
An average profile index shall be calculated for each segment from the two wheel path profilograms in accordance with Materials I.M. 341 except for:

1. Bridge decks or bridge deck overlays less than 100 feet (30 m) in length.
2. New bridge approach sections or bridge approach overlays less than 100 feet (30 m) in length.
3. Bridge decks for new concrete slab bridges.
4. The 16 feet (5 m) at the ends of the section.
5. The 16 feet (5 m) on each side of the expansion joints that are not new or replaced.

Limits for average profile index per 0.1 mile (160 m) segment shall be as follows:

New Bridge Deck	less than 22.1 inches/mile (351 mm/km)
Bridge Deck Overlay	less than 15.1 inches/mile (241 mm/km)
Bridge Approach (New or Overlaid)	less than 22.1 inches/mile (351 mm/km)

The Engineer will perform verification testing to validate the Contractor’s certified quality control testing. If the Engineer’s verification test results validate the Contractor’s test results, the Contractor's results will be used for acceptance. Disputes between the Contractor's and Engineer's test results will be resolved in accordance with Materials I.M. 341. The Engineer may test the entire project length if it is determined that the Contractor’s certified test results are inaccurate, and the Contractor will be charged for this work at a rate of $500 per bridge deck. In addition, providing inaccurate test results may result in decertification.

If the placements are less than 100 feet (30 m), each lane shall be tested and evaluated. The Contractor shall provide the Engineer with the final trace and index and the final evaluation within 14 calendar days of the completion of the deck.

On deck placements of 100 feet (30 m) and greater, the Contractor shall provide the Engineer with the initial profile trace and index for each lane by noon of the fifth working day following each of the first two placements. On subsequent placements, the Contractor shall provide the Engineer with the trace and index following every third placement until completion of the deck. On single-pour bridges, the Contractor shall provide the Engineer with the final profile trace and index and the final evaluation within 2 weeks of the completion of the deck.

2428.05 SURFACE CORRECTION.
Surface correction work shall be for the full segment width of the paved surface.

All correction work shall be subject to the approval by the Engineer. After all required correction work is completed, the final profile index shall be determined.

Surface correction shall be accomplished by grinding or by other methods approved by the Engineer. This work shall be as identified in Section 2532, except the cutting head shall have a minimum width of 24 inches (600 mm). Surface correction shall be performed parallel to lane lines or edge lines as directed by the Engineer and each pass shall be parallel to the previous passes. The ground surface shall be of uniform texture.

Adjacent passes shall not overlap more than 1 inch (25 mm) and they shall not have a vertical difference of more than 1/8 inch (3 mm) as measured from bottom of groove to bottom of groove. Smoothness correction shall begin and end at lines normal to the lane lines or edge lines within any one corrected area. The grinding shall proceed from the center line or lane line toward the edge to maintain cross slope.

Cross slope must be maintained throughout the corrected area.

Corrective grinding shall be done before longitudinal grooving.

2428.06 BUMPS AND DIPS.
Bumps and dips, including those at headers, on all surfaces for which smoothness is designated will be evaluated. Correction work will be required in accordance with the following criteria. Areas excluded from profilograph testing shall be corrected for deviations exceeding 1/8 inch in 10 feet (3 mm in 3 m).

A. Bumps.
All bumps exceeding 0.5 inch (12.7 mm) within a 25 foot (7.6 m) span, as indicated on the profilogram, shall be corrected except as stated in Article 2428.06, C.

Corrected bumps will be considered satisfactory when measurement by the profilograph shows that the bumps are 0.3 inch (8 mm) or less in a 25 foot (7.6 m) span.

B. Dips.
All dips exceeding 0.5 inch (12.7 mm) in a 25 foot (7.6 m) span, as indicated on the profilogram, shall be corrected only when required by the Engineer except as stated in Article 2428.06, C. The Contractor will be assessed a price adjustment of $900 for each dip exceeding 0.5 inch (12.7 mm) that is not corrected except as stated in Article 2428.06, C. A dip in both wheel paths at a lane location will be considered a single dip when assessing a price adjustment. Corrected dips will be considered satisfactory when the profilogram shows the dips are less than 0.3 inch (8 mm) in a 25 foot (7.6 m) span.

C. Exceptions.
When the Contractor is not responsible for the adjoining surface, bumps and dips exceeding 0.5 inches (12.7 mm) located within 16 feet (5 m) either side of the end of a section will be evaluated by the Engineer. The Contractor will not receive a price adjustment for bumps and dips in this area. When instructed by the Engineer, the Contractor will be paid to repair these bumps and dips in accordance with Article 1109.03, B.

2428.07 SCHEDULE OF PAYMENT.
The cost of certified profilograph testing and associated traffic control shall be incidental to the contract unit price for the item for which the testing is required.

A. Incentives
New bridge decks or bridge deck overlays which are designated for smoothness shall be evaluated for incentives using the initial profile index and the number of segments on the bridge.

For each segment of a bridge to be qualified for an incentive payment, the profilogram for that segment before correction must meet the specification requirement so there is no price reduction.

For each segment of the bridge deck or bridge deck overlay, the incentive index is 12.0 inches per mile (190 mm/km) for new bridge decks, and 4.0 inches per mile (65 mm/km) for bridge deck overlays. The incentive payment will be in accordance with the following schedule:

INCENTIVES

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
0- 6.0 (0-95)	6000	0- 2.0 (0-32)	2000
6.1-12.0 (96-190)	3000	2.1-4.0 (33-65)	1000
12.1-22.0 (191-350)	Unit Price	4.1-15.0 (66-240)	Unit Price

B. Price Reduction
New bridge decks or bridge overlays which are designated for smoothness shall be evaluated for price reduction assessment using the final profile index and the number of segments.

The Contractor may grind the surface of the bridge deck to a final index of 22.0 inches per mile (350 mm/km) or less, or the surface of a bridge deck overlay to a final index of 15.0 inches per mile (240 mm/km) in lieu of a price reduction.

For each segment of bridge deck with a final index of 22.1 inches per mile (351 mm/km) or greater or bridge deck overlay with a final index of 15.1 inches per mile (241 mm/km) or greater, the Contractor shall accept a price reduction in accordance with the following schedule:

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)	*	over 30.0 (over 470)	*
* Correction shall be 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.			

C. Bridge Approach Sections and Overlay of Bridge Approach Sections.
Bridge approach sections and overlay of bridge approach sections shall be corrected for smoothness as specified in Article 2428.05 in lieu of a price reduction.

Division 25. Miscellaneous Construction.

Section 2501

2501.05, Steel H-Piles.

Add as new second paragraph:

The number of permitted welds used to develop plan specified lengths of steel H-piles shall be limited to the following:

Plan Pile Length Feet (m)	Number of Permitted Welds (splices)
0 – 50 (0-15.0)	0
51-100 (15.1-30)	1
101-150 (30.1-45.0)	2

Welds (splices) in excess of the number specified above will not be permitted unless required for a pile extension. When steel H-piles are to be spliced, the shortest pile length shall be the last added length.

2501.07, Determination of Length of Piles.

Replace the second and third sentences:

When the length of piles is not specified, the Engineer will determine the length from the results obtained under the procedure specified in the contract documents. The length of wood piles will be in multiples of 2 feet (0.5 m) for lengths of 20 feet (6 m) and less, and in multiples of 5 feet (1.5 m) for lengths over 20 feet (6 m). Steel H-piles and steel pipe piles will be in multiples of 5 feet (1.5 m). Precast concrete piles may be specified in any length of whole feet (to the nearest 0.5 m).

2501.13, A, Wave Equation Analysis.

Replace the entire article:

Wave equation analysis will be used on all Interstate and Primary projects, on other projects when specified in the contract documents, or as directed by the Engineer. Piles shall be driven with approved driving equipment to full penetration. Retaps or pile extensions may be necessary to obtain the required pile bearing capacity including potential adjustments for scour or downdrag conditions. Driving shall not continue beyond a depth at which acceptable pile stress is exceeded. Driving may be stopped when the rate of driving exceeds 160 blows per foot (0.3 m) with approval from the Engineer.

2501.13, B, 2.

Replace the entire article:

Driving may be stopped when the rate of driving exceeds 160 blows per foot (0.3 m) with approval from the Engineer.

2501.20, Method of Measurement.

Replace the entire article:

For the quantities of Wood Piles, Steel HP-Piles (either encased or not), Steel Pipe Piles, Concrete Piles, and Steel Sheet Piles; the length measured for payment will be the plan length. The quantity may be modified by Article 2501.20, D or F.

A. Wood Piles.

When a wood pile is broken in driving through no fault of the Contractor, the length measured for payment will be the plan length.

B. Sheet Piles.

The area of walls of sheet piles will be determined from the plan length and the horizontal center line length measured to the nearest 0.1 foot (0.1 m) of wall.

C. Concrete Encasement.

The length of concrete encasement of steel HP-piles constructed will be measured to the nearest 0.1 foot (0.1 m).

D. Extension and Splices.

Wood, steel HP (either encased or not), or steel pipe piles that are extended, the length measured for payment will be the length of the extension specified by the Engineer. Portions of pile cut-offs used as extensions on the same contract will not be remeasured as additional plan quantity.

Concrete piles that are extended, the length measured for payment will be the length of the extension specified by the Engineer, plus the additional length required to be removed for splicing the reinforcement.

E. Prebored Holes.

The length of prebored holes will be calculated in linear feet (meters) from elevations as shown in the contract documents to the nearest 0.1 foot (0.1 m).

Preboring required by Article 2501.16 will be measured for payment to the nearest 0.1 foot (0.1 m).

F. Extra Pile.

Extra piles ordered, in addition to the plan quantities, will be measured for payment.

2501.21, Basis of Payment.

Replace the entire article:

For the quantities of Wood Piles, Steel HP-Piles (either encased or not), Steel Sheet Piles, Steel Pipe Piles, and Concrete Piles measured as provided above, the Contractor will be paid the contract unit price.
The price bid for piles shall be full compensation for delivering piles to the site, preparing, driving, cutting, and filling (concrete pipe piles only) piles; except as modified in this article.

A. Increased or Decreased Length or Size of Piles.
Unused piling; either ordered as directed by the Engineer or specified in the contract documents; and delivered to the job site, without having been placed in the leads; shall be returned to the supplier. Payment will be made for freight, restocking, and handling charges.

When the plans designate steel HP-piles 60 feet (18 m) or shorter and the Engineer subsequently orders steel H-piles longer than 60 feet (18 m), the adjusted price for such piles will, when required, also include payment for one extension splice for each pile at the rate specified in Paragraph C.

If extensions or extra piles are furnished by the Contracting Authority, payment for driving will be paid according to Article 1109.03, B.

The Contracting Authority may purchase unused piles at the invoice cost plus 10% overhead charge. The Contractor’s cost for handling and transporting shall be included in this cost.

B. Extension of Concrete Piles.
When concrete piles are extended, the Contractor will be paid for the extension at twice the contract unit price per linear foot (meter) of pile. The length of extension shall be as directed by the Engineer.

C. Extension of Steel H-piles or Pipe Piles.
When steel HP-piles or pipe piles are required to be spliced to obtain lengths greater than specified in the contract, payment for each such splice, welded or mechanical, shall be at ten times the contract unit price per linear foot (three times per meter) and shall include all equipment, labor, and materials necessary to complete the splice.

D. Splicing of Wood Piles.
Splicing of wood piles will be paid for according to Article 1109.03, B.

E. Pile Cut-Offs.
Pile cut-offs not used as extensions on the same contract shall become the property of the Contractor. Steel pile cut-offs that are used as extensions on the same contract will not be paid for as additional plan quantity.

All piles, or portions thereof, which become the property of the Contractor, shall be removed from the project site.

F. Encasement.
For the length of concrete encasement measured as provided above, the Contractor will be paid the contract unit price per linear foot (meter).

G. Test Piles.
The contract may provide a lump sum item for test piles. If an item is not provided, test piles ordered by the Engineer and driven under the Engineer's supervision will be considered as extra work and will be paid for as provided in Article 1109.03, B.

H. Pile Points.
When the contract documents require that points of piles be protected with metal points, these points shall be furnished without extra compensation. When metal points are not specified in the contract documents, they shall be furnished only upon direction of the Engineer, in which case payment shall be made as provided in Article 1109.03, B.

I. Sheet Piles.
When sheet piles are specified to become a part of the permanent structure, they shall be paid for at the contract unit price per square foot (square meter) for steel sheet piles of the specified weight (mass) and cross section for the area of the wall or walls placed.

J. Pile Loading Tests.
When pile loading tests are required, they will be paid for at the contract lump sum price. This payment shall be full compensation for all labor, material, and equipment required to comply with the procedure shown in the contract documents, including the test and anchor piles, welding, and placing and removing the test beam.

For pile loading tests ordered by the Engineer, the Contractor will be paid a lump sum price of $3000. When this test is performed within a cofferdam, the lump sum price will be $6000. This payment shall be full compensation for all labor, material, welding, and equipment, for placing and removing the test beam, and for loss of time.

K. Prebored Holes.
When prebored holes are required by the contract documents, they will be paid for at the contract unit price per linear foot (meter). This payment shall be full compensation for all labor, equipment, and materials including bentonite slurry.

Prebored holes required by Article 2501.16 will be paid for according to Article 1109.03, B.

L. Dynamic Pile Test.
When required by the contract documents, or ordered as directed by the Engineer, the dynamic pile test will be paid for as a lump sum price. This payment will be $250 per test pile. The payment shall be full compensation for all labor, materials, equipment, and time associated with this test as outlined in Article 2501.13.

M. Jetting.
When required by Article 2501.16, jetting will be paid for according to Article 1109.03, B.

Section 2502

2502.03, Placing Standard Subdrains.

Add new ninth paragraph:
All subdrain outlets shall be marked with a steel post. The post shall meet the requirements of Article 4154.09. The Contractor shall drive the post 3 feet (1 m) into the ground and install a 4 foot (1.1 m) plastic sleeve over the post. When sleeves are furnished by the Contracting Authority, the Contractor shall install them. Only one post will be required to mark the location of a double outlet.

2502.05, Placing Longitudinal Subdrains.

Replace the last paragraph:
All subdrain outlets shall be covered with a rodent guard described in Article 4143.01, B. All subdrain outlets, except for medians, shall be marked with a steel post meeting the requirements of Article 4154.09. The Contractor shall drive the post 3 feet (1 m) into the ground and install a 4 foot (1.1 m) plastic sleeve over the post. When sleeves are furnished by the Contracting Authority, the Contractor shall install them. Only one metal fence post will be required to mark the location of a double outlet.

2502.08, C, Subdrain Outlet.

Replace the entire article:
For each subdrain outlet installed, the Contractor will be paid the contract unit price. This payment shall be full compensation for furnishing and installing corrugated metal pipe, double walled PE, or PVC pipe; including the outlet coverings, grouted joints and special connections, drilling or forming into an existing drainage facility, and associated excavation, backfill with specified material, furnishing and installing steel post and concrete patio block, installing plastic sleeve, and restoration of the site.

Section 2503

2503.02, Materials.

Replace “Article 4149.02” with “Article 4149.03” in the second paragraph.

Add as a new third paragraph:
All steel reinforcing bars used in intakes and utility accesses shall be ASTM A 615/A 615M, Grade 60 (400).

2503.03, B, Laying and Placing Pipe.

Replace “Type C-1 connections” with “Type C adapters” in the second sentence of the second paragraph.

2503.03, D, Catch Basins, Intakes, and Utility Accesses.

Replace the title and entire article:

D. Intakes and Utility Accesses.
Intakes and utility accesses shall be constructed in accordance with the contract documents. These items shall include forming walls and placing necessary pipe sections through the walls for inlet and outlet lines. All concrete in intakes or utility accesses shall be Class C concrete.

Precast concrete intakes and utility access units may be utilized and shall meet requirements of Article 4149.04.

If the unit is cast in place, the storm sewer pipe shall be installed before intake sidewall construction is started. Sidewalls shall be constructed with openings for storm sewer pipe(s) smoothly shaped and inlet pipe(s) not projecting into the well. Outlet pipe(s) shall not project beyond the inside face of the sidewall.

A concrete fillet shall be placed in the bottom of the intake approximately as shown in the contract documents. Special shaping of this fillet shall provide a smooth channel through the intake. The top surface of the fillet shall slope at a rate of approximately 12:1 toward the channel.

The insert area shall be included with the quantities for either concrete pavement or curb and gutter (only when curb and gutter is being added to existing pavement). Concrete for the insert area may be Class C or the approved paving mixture for the paving project. Finish on the insert area shall be the same as for the pavement. Finish of the intake top or any exposed portion shall be in accordance with Article 2403.21.

2503.04, Method of Measurement.

Replace the first paragraph with a new first, second, and third paragraphs:
The quantity of storm sewer pipe, in feet (meters), will be the quantity shown in the contract documents, for each storm sewer to the nearest foot (0.1 m). Such lengths shall exclude the space across, intakes and utility access where pipe is not actually placed.

Type C adapters required by the contract documents or installed to correct faulty work will not be measured for payment. Type C adapters not shown in the contract documents, but required because of change in alignment, shall be paid for in accordance with Article 1109.03, B.

The quantity of aprons will be the quantity shown in the contract documents.

Add as a new fifth paragraph:
The quantity for each intake and utility access will be the quantity shown in the contract documents.

2503.05, Basis of Payment.

Replace the first paragraph:
The Contractor will be paid the contract unit price for storm sewer pipe of the type and size specified as follows:

Replace the second to last paragraph:

These payments shall be full compensation for furnishing all materials, equipment, tools, and labor for all excavation, furnishing and placing pipe, and placing backfill, in accordance with the contract documents. It shall include furnishing sections of pipe for inlet and outlet lines through walls of intakes and utility accesses.

Replace “as extra work” with “in accordance with Article 1109.03, B” in the last paragraph.

2503.05, A.

Replace the last sentence of the first indented paragraph:

For depths of excavation more than 1 foot (0.3 m) below the specified bedding elevation, shown in the contract documents, payment for overdepth excavation will be made in accordance with the following schedule:

2503.05, D.

Replace the entire article:

The Contractor will be paid the contract unit price for each intake and utility access constructed and placed, for the type indicated, as shown in the contract documents. This payment shall be full compensation for satisfactory connection to new or existing storm sewer (connections to precast units shall be grouted); frames and covers (grates); and furnishing all materials and constructing the special shape insert area.

When the depth of flow line is increased by more than 1 foot (0.3 m), payment will be increased by the ratio of the actual depth to the intended depth, measured from the flow line of the gutter to the depth of flow line. If the plans do not indicate the depth to flow line, the intended depth will be assumed to be 6 feet (1.8 m). When the depth is increased by more than 6 feet (1.8 m), payment will be made as extra work.

Price adjustment will not be made because of class of excavation encountered in the excavation for intakes, or utility accesses.

2503.05, E.

Replace the entire article:

E. Type C adapters shown in the contract documents or installed to correct faulty quality of work will be included in the cost per foot (meter) of pipe. Type C adapters required because of change in alignment will be paid for in accordance with Article 1109.03, B.

The Contractor will be paid the contract unit price for aprons of the type and size specified per unit.

2503.05, F.

Replace “as extra work as provided in” with “in accordance with” in the second sentence.

Section 2504

2504.02, Materials.

Add a new second paragraph:

All steel reinforcing bars used in utility accesses shall be ASTM A 615/A 615M, Grade 60 (400).

2504.03, E, Utility Access.

Replace the sixth paragraph:

Precast concrete utility access units shall meet the requirements of Article 4149.04. The length of any section of pipe through which notches or holes are cut or framed shall be at least twice the greatest dimension of the largest hole or notch, measured parallel to the centerline of the pipe.

Add a new ninth paragraph:

Inlet pipes shall not project into the well and outlet pipes shall not project beyond the inside face of the sidewall.

Replace the tenth paragraph:

A concrete fillet shall be placed in the bottom of the utility access approximately as shown in the contract documents. Special shaping of this fillet is required to provide a smooth channel through the intake. The top surface of the fillet shall slope at a rate of approximately 12:1 toward the channel. Half-pipe sections bedded in concrete to form the flow line through the utility access shall be accurately joined to the sections built into the walls. Pipe sections to be installed in the utility access shall be furnished by the Contractor for the lines of pipe. The Contractor may be required to make adjustments to the proposed sewer lines for proper connection to the utility access.

Add a new eleventh paragraph:

The Contractor shall install accessory units (spacer, utility access top, casting, etc.) as necessary to obtain utility access elevations as shown in the contract documents.

2504.05, Method of Measurement.

Replace the first sentence of first paragraph:

The quantity of sanitary sewer pipe, in feet (meters), to the nearest foot (0.1 m), of each size of sanitary sewer placed will be the quantity shown in the contract documents. The number of utility accesses and lamp holes will be the quantity shown in the contract documents.

Add as new second paragraph:

Aprons and appurtenances of the type specified will be measured in accordance with Articles 2416.05 or 2417.06.

2504.06, Basis of Payment.

Replace the first paragraph:

When the contract documents indicate the depth of sanitary sewer excavation and the pipes have been laid substantially to the elevation of the flow line indicated, the Contractor will be paid the contract unit price per linear foot (meter) of sanitary sewer complete and the contract unit price for each lamp hole and utility access complete. The Contractor will be paid the contract unit price for sanitary sewer pipe of the type and size specified per linear foot (meter).

Add as new second paragraph:

Aprons and appurtenances of the type specified will be paid in accordance with Articles 2416.06 or 2417. 07.

Replace “as extra work as provided in” with “in accordance with” in the first sentence of the third paragraph.

Replace the fourth paragraph:

The payment for each Lamp Hole shall be full compensation for furnishing all material, labor, and equipment necessary to complete the work including excavation, backfilling, constructing lamp holes, special shaping through lamp holes, and removal of excess material from the project. It shall include furnishing sections of pipe for inlet and outlet lines through walls of lamp holes.

Add a new fifth paragraph:

The payment for Utility Access shall be full compensation for furnishing all material, labor, and equipment necessary to construct the utility access to the depth required, including accessory units, as necessary; excavation; backfilling; special shaping through utility accesses; frames and covers, and constructing drop inlet pipe and concrete encasement, if required.

Section 2505

2505, Removal and Construction of Guardrail.

Replace the word “anchorages” with “anchors” throughout the entire section.

2505.03, B, 2, Guardrail Cable.

Replace entire article:

a. Three Cable Guardrail.
Three cables shall be attached to the posts and end anchors in accordance with the contract documents. Compensation devices and turnbuckles shall be attached in such a manner as to not cause any interference with the function of any part of the installation. Cables shall be attached to the posts by means of an approved hook bolt or other means when specified in the contract documents.

Individual cables may be spliced by use of an approved device installed where no interference with any other function will occur. One splice will be allowed per cable. Cable may not be spliced within 250 feet (75 m) of another splice.

Tightening of individual cables shall be accomplished by mechanical means. Cables shall be stretched tight so that no sags occur between posts and so that, in the opinion of the Engineer, the finished installation presents a satisfactory appearance.

b. Wire Rope Safety Barrier.
The Contractor shall install wire rope safety barrier according to the manufacturer's recommendations. The barrier shall be tensioned according to the manufacturer's recommendations at the time of installation, and then checked and adjusted approximately 3 weeks after installation.

At least one turnbuckle per 1000 foot (300 meter) strand shall be included to allow for tensioning of the cables. For installations less than 1000 feet (300 meters) in length, one turnbuckle per strand shall be included near the center of the installation to allow for tensioning of the cables.

Concrete post foundations shall be constructed in accordance with Article 2505.03, B, 4.

2505.03, B, 4, End Anchors and Terminals.

Add as the second and third sentences of the first paragraph:
When anchor bolt holes in concrete bridge end posts do not align correctly for the formed steel beam guardrail terminal connection, the Contractor shall drill new anchor bolt holes in the locations required for the terminal connection. Drilling of new anchor bolt holes shall be done with a core bit to ensure correct anchor bolt hole location and alignment.

2505.03, B, 5, Guardrail Markers and Barrier Markers.

Replace "Article 4186.08" with "Article 4186.12".

2505.03, B, 6, Delineators and Object Markers.

Replace "Article 4186.08" with "Article 4186.12".

2505.05, Limitations.

Replace the fifth paragraph:
On a roadway that is open to traffic during guardrail construction, each guardrail installation exceeding the 5 working day completion requirement will be subject to a $100 per working day contract price adjustment.

2505.06, B, Installation of Guardrail.

Replace the first sentence of the second paragraph:
The cable guardrail quantity will be calculated using one of the cables of cable guardrail, with no deductions for turnbuckles or compensating devices.

2505.06, D, Cable Guardrail End Anchorages.

Replace the title and entire article:

D. Cable Guardrail End Anchors.

1. Three Cable Guardrail.
The Engineer will count the quantity of end anchors constructed.

2. Wire Rope Safety Barrier.
The Engineer will count the quantity of end anchors constructed.

2505.07, B, Installation of Guardrail.

Replace the third paragraph:
For cable guardrail the number of posts, hook bolts, turnbuckles, compensating devices; concrete; and remaining hardware will be incidental to the item.

2505.07, C, Beam Guardrail End Anchors and Terminal Devices.

Add as the second sentence:
Drilling of new anchor bolt holes in concrete bridge end posts for formed steel beam guardrail connection shall be incidental to the terminal device.

2505.07, D, Cable Guardrail End Anchorage.

Replace the title and entire article:

D. Cable Guardrail End Anchors.

1. Three Cable Guardrail.
The Contractor will be paid the contract unit price for each end anchor.

2. Wire Rope Safety Barrier.
The Contractor will be paid the contract unit price for each end anchor.

Section 2506

2506.02, A, Cement.

Replace the entire article:
Cement shall meet the requirements of Section 4101.

2506.02, G, Granular Backfill.

Replace the entire article:
Granular backfill for use under flowable mortar shall meet the requirements of Section 4133.

2506.06, Placement of Mortar as Culvert Backfill.

Delete the change to the first sentence in the third paragraph made effective in GS-01007.
~~Replace “Section 4133” with “Article 2506.02, G,” in the first sentence of the third paragraph.~~

2506.07, Limitation of Operations.

Add new article:
D. Flowable mortar shall be kept out of streams and waterways.

Section 2507

2507.02, B, 1, Cement.

Replace the entire article:
Cement shall be in accordance with Section 4101, at the rate of 10 sacks (940 pounds) per cubic yard (558 kg per cubic meter).

2507.02, B, 2, Fly Ash.

Replace the second sentence:
Fly ash may be substituted for cement for up to 25% by weight (mass) of cement.

2507.02, B, 3, Fine Aggregate.

Replace the entire article:
Fine Aggregate shall meet requirements of Section 4110. 2100 pounds (surface dry weight) per cubic yard (1246 kg (surface dry weight) per cubic meter).

2507.02, C, Filter Blanket.

Add title and article:

C. Filter Blanket.
Article 2107.11 shall apply.

2507.03, D, Class D and Class E Revetment.

Replace “Article 4130.04” with “Section 4130” in the first sentence of the first and third paragraphs.

2507.03, F, Erosion Stone.

Replace “Article 4130.05” with “Section 4130” in the first sentence.

2507.04, Method of Measurement.

Replace the first two paragraphs:
The quantity of Class A or C revetment will be computed by the Engineer in square yards (square meters) from measurements of the surface as constructed to the nearest 0.1 foot (0.1 m).

Class B, D, and E revetment and Erosion Stone will be measured in tons (megagrams) to the nearest 0.1 ton (0.1 Mg). Only material placed in accordance with the contract documents will be measured.

Replace the fourth paragraph:
The quantity of engineering fabric will be computed in square yards (square meters) from measurements of the material placed to the nearest 0.1 foot (0.1 m).

2507.05, Basis of Payment.

Replace the first indented paragraph:
For the quantity of revetment furnished and placed, the Contractor will be paid the contract unit price per square yard (square meter) for Class A or C revetment, or per ton (megagram) for Class B, D, or E revetment and Erosion Stone.

Section 2508

2508.01, B, 3, b, Preconstruction Sampling and Testing.

Replace the second sentence of the first paragraph:
An accredited laboratory shall test waste material.

Add a new third sentence:

Laboratories accredited by the American Industrial Hygiene Association or National Environmental Laboratory Accreditation Program, or any EPA certified laboratory may perform the paint waste testing.

Delete the fifth paragraph:

~~Acceptable testing laboratories are listed in Materials I.M. 482.07 or any EPA approved participating Federal Contract testing laboratory. If the Contractor chooses to use a laboratory not listed, the Contractor shall include the full contact information for that laboratory in the Site Work Plan described below.~~

2508.01, B, 7, f, Prior to Painting.

Replace “Article 2508.01, B, 6, e” with “2508.02, E, 4” in the first paragraph.

Replace “Article 2508.01, B, 6, e” with “2508.02, B, 2” in the second paragraph.

Replace “Article 2508.01, B, 6, e” with “2508.02, E, 7” in the third paragraph.

2508.02, D, Acceptable Products.

Replace “Materials I.M. 482” with “Materials I.M.s 482.02 through 482.06” in the first paragraph.

2508.04, A, Bridge Cleaning.

Replace the title and first sentence:

A. Bridge Cleaning for Painting.
The Contractor will be paid the lump sum contract price for Bridge Cleaning for Painting.

Section 2509

2509, Crash Cushions.

Add as a new section:

2509.01 General.
This work shall consist of furnishing and installing crash cushions.

Crash cushions shall be accepted as a crashworthy device by the FHWA and shall meet the requirements of NCHRP Report 350, Test Level 3 criteria. Approved products are listed in Materials I.M. 455, Appendix A. All products listed in Materials I.M. 455, Appendix A, are acceptable for use as temporary crash cushions. When a permanent, redirective, or severe-use crash cushion is required by the contract documents, one of the crash cushions specifically designated for such use in Materials I.M. 455, Appendix A, shall be installed.

In case of a discrepancy between these Specifications and the manufacturer’s recommendations, these Specifications shall govern.

2509.02 Materials.
Crash cushion materials shall meet the manufacturer’s requirements. All crash cushions shall be in good repair when installed. For permanent crash cushions and spare parts kits, equipment and materials shall be of new stock unless the contract documents provide for the relocation or the use of fixtures furnished by others.

Spare parts kits shall include all parts listed in Materials I.M. 455, Appendix A. Spare parts kits shall be supplied by the crash cushion manufacturer and shall contain materials designated for repairing the specific brand and model of crash cushion furnished.

2509.03 Construction.
Crash cushions shall be installed according to the manufacturer's recommendations. Prior to installation, the Contractor shall provide the Engineer with:

- Three copies of the manufacturer's most current product manuals covering installation and maintenance of the unit.
- Required certification statements.
- Additional hardware, tools, or documentation supplied by the manufacturer.

The manufacturer may require the use of additional connection hardware, construction of a backup structure, or construction of a paved footing for a specific installation. When required, these items shall be constructed and attached to the obstacle, the crash cushion, or both, in a manner specified by the manufacturer.

Grading work, if required, shall be completed prior to installation of crash cushions.

When a roadway is closed to public traffic for construction, all crash cushions shall be installed prior to opening the road to traffic.

Attachments to new concrete or to anchor bolts set in epoxy resin shall not be stressed until the new concrete or epoxy resin has attained an age of 3 calendar days. This time requirement may be lengthened by the Engineer during cool weather.

A. Temporary Crash Cushions.
Unless otherwise shown in the contract documents, the Contractor shall apply a retroreflective panel as described for permanent crash cushions.

When damaged, the Contractor shall repair or replace the crash cushion. Initiation of service to a damaged crash cushion shall be within one hour of notification. The object that is being shielded shall not be exposed to traffic for more than 12 hours.

When a temporary crash cushion is no longer required, the crash cushion shall be removed and become the property of the Contractor. The Contractor shall remove any anchor bolts and fill the bolt holes with one of the non-shrink grouts listed in Materials I.M. 491.13, Appendix B.

When a crash cushion is required after the final stage of a project, the crash cushion will remain in place and become the property of the Contracting Authority.

B. Permanent Crash Cushions.
The approach end of the crash cushion shall be marked with a rectangular panel consisting of materials approved by the manufacturer and installed according to the manufacturer's recommendations. The panel shall be covered with alternating black and retroreflective yellow stripes. Stripes shall be a minimum of 3 inches (75 mm) in width and shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the crash cushion. If traffic can pass to either side of the crash cushion, the alternating black and retroreflective yellow stripes shall form chevrons that point upwards. Yellow stripes shall meet the retroreflectivity requirements for Type III or Type IV reflective sheeting.

For crash cushions with a flat face, the panel shall cover the entire face of the crash cushion.

For crash cushions with a rounded face, the panel shall cover the entire height and width of that portion of the face between the sides of the crash cushion. However, the panel need not cover that portion of the face within 12 inches (300 mm) of the ground or higher than 42 inches (1050 mm).

Permanent crash cushions will become the property of the Contracting Authority.

2509.04 Method of Measurement.
The Engineer will count the number of temporary or permanent crash cushions installed and the number of spare parts kits delivered to the local maintenance office.

Backup structures, paved footings, and additional connection hardware will not be measured separately for payment.

2509.05 Basis of Payment.

A. Temporary Crash Cushions.

For each crash cushion installed, the Contractor will be paid the contract unit price. For repairing or replacing crash cushions damaged by public traffic, the Contractor will be paid as extra work in accordance with Article 1109.03, B.

B. Permanent Crash Cushions.
For each crash cushion installed, the Contractor will be paid the contract unit price.

C. Crash Cushion Spare Parts Kit.
For each spare parts kit delivered, the Contractor will be paid the contract unit price.

Section 2510

2510.01, Description.

Replace the first sentence:
This work involves removal of PCC pavement including reinforcing, pavement widening, HMA pavement, detour pavement, and integral and separate curb.

2510.02, Removal of Pavement.

Replace “integral curb” with “integral and separate curb” in the second sentence of the first paragraph.

Delete the last sentence of the second paragraph:
~~If processing is required, the processing will be defined elsewhere in the contract documents.~~

Replace the first sentence of the third paragraph:
When a portion of concrete pavement is to be removed and the remaining portion is later abutted at its top surface with new pavement, the breakout line of the old slab shall be sawed to full depth.

2510.02, A, Portland Cement Concrete.

Replace the second paragraph:
If PCC pavement or broken concrete is used as revetment, it shall meet the requirements of Article 4130.01.

2510.02, C, PCC Pavement with HMA Resurfacing (Composite Pavement Section).

Replace the entire article:
The contract documents may specify that the HMA Resurfacing be removed from the PCC pavement as a separate operation. When not specified, the Contractor may remove the composite pavement as a single operation.

2510.02, D, Removal and Crushing of Pavement.

Add as a new article:

D. Removal and Crushing of Pavement.
The contract documents may require the pavement be removed and crushed. When required, the contract documents will specify the size and/or gradation the pavement shall be crushed to, and specify where the crushed material is to be stockpiled or used in the contract.

2510.02, E, Removal of Intakes and Utility Accesses.

Add as a new article:
The top and sides of the structure shall be removed a minimum of 10 feet (3 m) below the subgrade or 6 feet (1.8 m) below the finished grade in other areas. All the pipes in the structure to be removed shall be plugged using Class C concrete. If the structure is more than 10 feet (3 m) deep, the remaining structure shall be filled using flowable mortar. Place compacted fill over excavation.

2510.04, A, Removal of Pavement.

Replace the entire article:

The quantity of Removal of Pavement will be measured in square yards (square meters). This quantity will include areas of utility accesses and intakes within the pavement area; and integral and separate curb. Removal of reinforcing steel will be incidental to removal of pavement and will not be measured for payment.

2510.04, D, Pavement Scarification.

Add as a new article:

D. Pavement Scarification.
The quantity of pavement in square yards (square meters) where the HMA Resurfacing has been scarified prior to the removal of the pavement will be considered the area of pavement scarification. HMA Resurfacing removed and crushed with the PCC pavement will be included in the area of pavement scarification if the composite crushed material meets the gradation and composition required by the contract documents.

2510.04, E, Removal and Crushing of Pavement.

Add as a new article:

E. Removal and Crushing of Pavement.
The quantity removed and crushed, of pavement in square yards (square meters) in accordance with the contract documents will be considered the area of removal and crushing of pavement.

2510.04, F, Removal of Intakes and Utility Accesses.

Add as a new article:

The Engineer will count the number of intakes and utility accesses removed.

2510.05, A, Removal of Pavement.

Replace the first sentence of the first paragraph:

For the area of pavement removed measured in square yards (square meters), the Contractor will be paid at the contract unit price for Removal of Pavement.

Delete the last sentence of the first paragraph:

~~The cost of saw cut, removal of utility accesses, intakes, and integral and separate curb shall be included in the contract unit price for the removal and crushing of pavement.~~

Add as the second and third paragraphs:

When recycling is not mandatory, the cost of recycling pavement removal into granular subbase, granular shoulders, or special backfill shall be included into the cost of the items for which the recycled pavement material will be used.

The cost of saw cut and integral and separate curb shall be included in the contract unit price for the Removal of Pavement, Pavement Scarification, or Removal and Crushing of Pavement.

2510.05, D, Pavement Scarification.

Add as article D:

D. Pavement Scarification.
The quantity of pavement where the HMA Resurfacing has been scarified, in square yards (square meters), will be paid for at the contract unit price.

2510.05, E, Removal and Crushing of Pavement.

Add as article E:

E. Removal and Crushing of Pavement.
The quantity of pavement removed and crushed, in square yards (square meters), in accordance with the contract documents will be paid for at the contract unit price.

2510.05, F, Removal of Intakes and Utility Accesses.

Add as a new article:
The Contractor will be paid the contract unit price for Removal of Intakes and Utility Accesses per each unit. This payment shall be full compensation for the work of plugging pipes, filling remaining structures with flowable mortar, and placing compacted fill.

Section 2511

2511, Removal and Construction of Portland Cement Concrete Sidewalks.

Replace the title and entire section:

Section 2511. Removal and Construction of Sidewalks and Recreational Trails

2511.01 DESCRIPTION.
This work shall consist of removal of sidewalks and recreational trails or portions of them and/or the construction of new sidewalks and recreational trails according to the contract documents.

2511.02 MATERIALS.

A. Portland Cement Concrete.
The Portland cement concrete used for sidewalks and recreational trails shall be Class B concrete produced and placed in accordance with Section 2301. For sidewalk and recreational trail construction included in PCC paving projects, the Contractor may use the approved paving mixture for the project. A Class 2 durability or better aggregate, in accordance with Article 4115.04, will be required.

When construction of a sidewalk or recreational trail is associated with a bridge project the Contractor may use the concrete approved for the bridge structure with Class C as the minimum.

B. Hot Mix Asphalt.
The HMA used for sidewalks and recreational trails not adjacent to pavement shall be 100,000 ESAL, 3/8 inch (9.5 mm) in accordance with Section 2303. When the recreational trail or sidewalk is adjacent to the pavement and also functions as the pavement shoulder, 1,000,000 ESAL, 1/2 inch (12.5 mm) base mixture shall be used. The Performance Grade binder shall be PG 58-28 or PG 52-34 as specified in the plans.

C. Subbase and Granular Surface.
The subbase and granular surface shall be as specified in the contract documents.

D. Detectable Warnings.
Detectable warnings shall be in accordance with Materials I.M. 411.

2511.03 CONSTRUCTION.

A. Removal of Sidewalks and Recreational Trails.
The Contractor shall remove the sidewalks and recreational trails as shown in the contract documents. If only portions of the sidewalks or recreational trails are to be removed, the boundaries of removal shall be made by a full depth saw cut before breaking the removal. Any areas of the sidewalk or recreational trail not designated for removal but which are removed, broken, or damaged by the Contractor's operations shall be removed and replaced by the Contractor with no additional cost to the Contracting Authority. Removal of sidewalks and recreational trails shall be in accordance with Article 2510.02.

B. Preparation of Subgrade.

1. Sidewalks.

The subgrade for sidewalks shall be prepared by excavating or filling with suitable earth to a depth below the finished grade line so that, when tamped or rolled until smooth, firm, and hard, the subgrade will be uniform and at the required depth below the finished grade line.

2. Recreational Trails.
When the recreational trail is to be constructed on natural subgrade special compaction of subgrade for the recreational trail will be required. The Contractor shall disk, scarify, mix, and recompact the top 12 inches (300 mm) of subgrade with moisture and density control. Compact to not less than 95% maximum density as determined by Iowa DOT Materials Laboratory Test Method 103; moisture content not less than optimum or more than 4% above optimum moisture content.

When the recreational trail surface is to be constructed on an existing granular surface, the subbase (existing granular surface) shall be prepared in accordance with the contract documents.

C. Portland Cement Concrete.

1. Placing.

a. Hand Finished Sidewalks and Recreational Trails.
Forms of wood or steel shall be in accordance with Article 2301.07, A, 1, b.

The subgrade shall be thoroughly moistened. Concrete shall be deposited for the full depth of slab in one operation. It shall be consolidated by tamping or vibration, and the excess concrete screeded off flush with the forms. Edges adjacent to all forms, expansion joints, curbs, or fixtures in the surface shall be thoroughly consolidated.

b. Slip Form Sidewalks and Recreational Trails.
Self propelled slip form pavers shall meet the requirements of Section 2301. Other slip form paving machine shall be approved by the Engineer and designed for the specific purpose of placing, consolidating, and finishing concrete sidewalk and recreational trail slabs without use of fixed side forms.

2. Curb Ramps.
Construction of curb ramps shall require detectable warnings.

All detectable warnings shall be installed according to the manufacturer's recommendations. The detectable warnings shall contrast visibly with the adjoining surfaces, either light-on-dark or dark-on-light. Refer to Americans with Disabilities Act Accessibility Guidelines (ADAAG) for contrast requirements at http://www.access-board.gov/adaag/html/adaag.htm#4.29.2.

If crossings are marked; the ramp, exclusive of flares, shall be located entirely within the crosswalk markings.

3. Finishing.
After consolidation, the concrete surface shall be finished to a uniform, slip resistant, wet burlap drag or broom finish texture true to the line and grade specified in the contract documents. The broom finish shall be obtained by dragging a suitable broom transversely across the surface of the plastic concrete.

a. Sidewalks.
After the surface has been floated, the edges of the slabs shall be finished with a suitable edging tool. Unless otherwise shown, the finished surface shall have a cross slope of 1/4 inch per foot (20 mm/m) for drainage.

For PCC sidewalks the transverse joint spacing shall be equal to the pavement width. The concrete shall be cut through for not less than 25% of the depth with a pointed trowel or suitable spading tool, and the concrete edged on both sides. In lieu of using a pointed trowel or suitable spading tool, the Contractor may cut these lines within 12 hours after placement of concrete with a 1/8 inch (3 mm) blade saw that is approved by the Engineer. Metal dividers will be considered for approval, in lieu of cutting.

b. Recreational Trails.
For PCC recreational trails the transverse joints spacing shall be equal to the pavement width. All transverse joints shall be saw cut not tooled. The transverse joints shall be cut 1/8 inch (3 mm) wide and not less than 1 inch (25 mm) in depth. No sealant will be required.

Recreational trails 12 feet (3.6 m) wide or less, shall not have a longitudinal joint.

4. Protection and Curing.
After finishing, the concrete shall be cured and protected by one of the methods described in Article 2301.19.

5. Isolation Joints.
Isolation joints shall be constructed at all points where sidewalks or recreational trails meet other walks, curbs, or fixtures in the surface. These joints shall be constructed by installing a 1/2 inch (13 mm), full depth strip of approved premolded joint material.

6. Time for Opening Pavement for Use.
PCC sidewalks and recreational trails shall be opened a minimum of 7 calendar days after placement or when flexural strength reaches 400 psi (2.75 MPa) as determined by Materials I.M. 383.

D. Hot Mix Asphalt.
HMA sidewalks and recreational trails shall be constructed in accordance with Article 2303.03 and 2303.04. Compaction shall be Class 1C.

E. Smoothness.
Sidewalk and recreational trail smoothness shall be in accordance with Article 2301.16, D, except for the requirements for pavement and bridge approach sections for Primary projects.

Areas may be checked by the Engineer with a surface checker and shall not exceed 1/4 inch in 10 feet (6 mm in 3 m). For each bump exceeding these requirements, the Contractor will be assessed $50 or the bump corrected as agreed upon by the Engineer and Contractor.

F. Weight Limits.
Construction equipment on both PCC and HMA sidewalks and recreational trails shall be limited to 5 ton (5 Mg).

G. Pavement Markings.
Pavement markings shall be placed in accordance with Section 2527.

2511.04 METHOD OF MEASUREMENT.

A. Removal of Sidewalks or Recreational Trails.
The quantity of sidewalk or recreational trail removed, in square yards (square meters), will be the quantity shown in the contract documents.

B. Construction of Sidewalks or Recreational Trails.
The quantity of Sidewalk or Recreational Trail constructed of the material type and depth specified, in square yards (square meters), will be the quantity shown in the contract documents. Deductions will not be made for fixtures having an area of 1 square yard (1 m^2) or less.

C. Special Compaction of Subgrade for Recreational Trail.
The quantity of Special Compaction of Subgrade for Recreational Trail, in stations (meters), will be the quantity shown in the contract documents.

D. Detectable Warnings for Curb Ramps.
The quantity of detectable warnings for curb ramps, in square feet (square meters) will be the quantity shown in the contract documents.

2511.05 BASIS OF PAYMENT.

A. Removal of Sidewalks or Recreational Trails.
The Contractor will be paid the contract unit price for Removal of Sidewalk or Removal of Recreational Trail per square yards (square meters). This payment shall be full compensation for all equipment, labor, and disposal for removal of the sidewalk or recreational trail as specified in the contract documents.

B. Construction of Sidewalks or Recreational Trails.
The Contractor will be paid the contract unit price for construction of Sidewalk or Recreational Trail, of the material type and thickness specified, per square yard (square meter). This payment shall be full compensation for furnishing all material, equipment, and labor to construct the sidewalk or recreational trail in accordance with the contract documents.

C. Special Compaction of Subgrade for Recreational Trail.
The Contractor will be paid the contract unit price for Special Compaction of Subgrade for Recreational Trail, per station (meter). This payment shall be full compensation for furnishing all material, equipment, and labor to construct the special compaction of subgrade for recreational trail in accordance with the contract documents.

D. Detectable Warnings for Curb Ramps.
The Contractor will be paid the contract unit price for Detectable Warnings for Curb Ramps, per square foot (square meter). This payment shall be full compensation for furnishing all material, equipment, and labor to construct the detectable warnings for curb ramps in accordance with the contract documents.

Section 2513

2513.01, Description.

Replace the first sentence of the first paragraph:
The provisions of this section shall apply to production and construction of concrete barrier, both permanent and temporary, as shown in the contract documents.

Add as the second sentence of the last paragraph:
F-shape TBR, Type A, as defined in the Standard Road Plans, shall be used in all situations requiring the railing to be in place during the winter work period as defined in Article 1108.02, E.

2513.02, F, Guardrail and Barrier Markers.

Replace “Article 4186.08” with “Article 4186.12”.

2513.03, A, Precast.

Replace the last paragraph:
The air content of fresh, unvibrated concrete shall be 7.0%, as a target value, with a maximum variation of plus 1.5% or minus 1.0%.

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

Add as the first paragraph:
Class C concrete in accordance with Materials I.M. 529 shall be used for cast-in-place. Class BR in accordance with Materials I.M. 529 shall be used for slip form.

Add as the first sentence of the second paragraph:
Class BR mix design shall be submitted to the District Materials Engineer for approval at least 7 calendar days prior to placement.

Delete the last sentence:
~~Class D concrete may be substituted and Section 2403 shall apply.~~

2513.03, B, 1, Cast-in-Place and Slip Form.

Replace the entire article:

1. Cement for Class BR. Cement content shall be a minimum of 603 pounds per cubic yard (358 kg/m^3).

2513.03, B, 2, Water.

Replace the table:

Class of Concrete	Pounds (kg) of Water Per Pound (kg) of Cementitious Material
BR (Slip Form)	0.450
C (Cast-in-Place)	0.488

Add as the second paragraph:

Slump for slip form rail shall be a minimum of 1/2 inch (12.5 mm).

2513.03, B, 3, Aggregates.

Replace the title and entire article:

3. Aggregates for Class BR. The combination of aggregates shall be well graded in accordance with Materials I.M. 532. The Contractor shall provide a target gradation and the following limits shall apply:

Sieves	Limits
No. 4 (4.75 mm) and larger	± 5%
No. 8 (2.36 mm) to No. 30 (600 µm)	± 4%
No. 50 (300 µm)	± 3%
No. 100 (150 µm)	± 2%
No. 200 (75 µm)	Maximum 1.5% Passing

A new target gradation will require approval by the Engineer.

2513.03, B, 4, Admixtures.

Replace the third sentence:

The air content of fresh, unvibrated concrete shall be 7.0%, as a target value, with a maximum variation of plus 1.5% or minus 1.0%.

2513.03, B, 5, Fly Ash.

Replace the title and entire article:

5. Fly Ash and GGBFS. The conditions and allowable rates of fly ash and GGBFS substitution shall be as follows:

Cement Type	Maximum Allowable Substitution *	Time Period
Type I, II	35% GGBFS 20% Fly Ash	March 16 to October 15
Type IS, IP	20% Fly Ash	March 16 to October 15
Type I, II	20% Fly Ash	October 16 to March 15
Type IS, IP	0%	October 16 to March 15

* Maximum total mineral admixture substitution shall be 50%.

2513.06, A, Cast-in-Place and Precast.

Replace “Article 2407.10” with “Article 2407.09” in the second sentence of the first paragraph.

Replace the fourth sentence of the second paragraph:

Once finishing and any necessary repairs have been accomplished, clear curing compound shall be applied to all exposed surfaces as specified.

2513.06, B, Slip Form.

Add as the third sentence:
Clear curing compound shall be applied to the concrete barrier rail within 15 minutes after final finishing provided that the free water (sheen) has appreciably disappeared from the concrete surface.

2513.06, C, Clear Curing Compound.

Replace the first sentence of the paragraph:
A clear curing compound shall be applied, when specified, to all exposed surfaces in a fine spray to form a continuous, uniform film on the surface and vertical edges of the pavement slab as soon as the free water has appreciably disappeared, but no later than 30 minutes after finishing.

Add as the third sentence:
To ensure uniform application and coverage, a fugitive dye shall be used with clear curing compounds meeting Article 4105.07.

2513.09, Tolerances.

Add new third paragraph:
Tolerances for concrete barrier shall be as follows:

Item	Precast Fabrication [1] (Permanent or Temporary)	Cast-in-Place or Slip Form Installation
Length	± 3/4 inch (± 19 mm)	
Width	± 1/4 inch (± 6 mm)	[2]
Height	± 1/4 inch (± 6 mm)	[2]
Horizontal Straightness (Sweep)	1/2 inch maximum in 10 feet (12 mm maximum in 3 m)	3/4 inch maximum in 10 feet (19 mm maximum in 3 m)
Top Straightness (Vertical)	1/4 inch maximum in 10 feet (6 mm maximum in 3 m)	3/4 inch maximum in 10 feet (9 mm maximum in 3 m)
Exposed Ends (Deviation from square)	± 1/4 inch (± 6 mm)	

[1] Installation of permanent precast barrier shall include shimming and grouting such that adjoining sections match within 1/4 inch (6 mm) on the sides and top, and the finished height is not less than required by the contract documents.
[2] The width and depth shall not be less than required by the contract documents.

Section 2515

2515.02, Materials.

Add as the first paragraph:
When paved driveways are to be constructed in conjunction with a PCC paving project, the class of concrete being used on the project may be used for driveways. If the Contractor does not elect to use the class of concrete specified for the pavement or the contract contains no item for PCC pavement, pavement widening, or base, then Class C concrete shall be used.

2515.03, Removal of Paved Driveways.

Replace the second sentence:
When old concrete pavement is to be removed and later abutted at its top surface with new concrete pavement, the designated breakout line shall be sawed to full depth before breaking the pavement.

2515.04, Construction of Paved Driveways.

Replace the entire article:
Unless otherwise specified, new paved driveways shall be constructed to the dimensions shown in the contract documents.

A. Preparation of Subgrade.
The subgrade shall be prepared by excavating or filling with suitable earth to a depth below the finished grade line so that, when tamped or rolled until smooth, firm, and hard, the subgrade will be uniform and at the required depth below the finished grade line.

B. Portland Cement Concrete.

1. Placing.

a. Hand Finish.
Forms of wood or steel shall be in accordance with Article 2301.07, A, 1, b.

The subgrade shall be thoroughly moistened. Concrete shall be deposited for the full depth of slab in one operation. It shall be consolidated by tamping or vibration, and the excess concrete screeded off flush with the forms. Edges adjacent to all forms, expansion joints, curbs, or fixtures in the surface shall be thoroughly consolidated.

b. Slip Form.
Self propelled slip form pavers shall meet the requirements of Section 2301. Other slip form paving machine shall be approved by the Engineer and designed for the specific purpose of placing, consolidating, and finishing concrete driveway slabs without use of fixed side forms.

2. Finishing.
After consolidation, the concrete surface shall be finished with a burlap drag.

After the surface has been floated, the edges of the slabs shall be finished with a suitable edging tool.

3. Protection and Curing.
After finishing, the concrete shall be cured and protected by one of the methods described in Article 2301.19.

4. Joints.
The concrete shall be cut through for not less than 25% of the depth with a pointed trowel or suitable spading tool, and the concrete edged on both sides. In lieu of using a pointed trowel or suitable spading tool, the Contractor may cut these lines within 12 hours after placement of concrete with a 1/8 inch (3 mm) blade saw that is approved by the Engineer. Metal dividers will be considered for approval, in lieu of cutting.

Isolation joints shall be constructed at all points where driveways meet other walks, curbs, or fixtures in the surface. These joints shall be constructed by installing a 1/2 inch (13 mm), full depth strip of approved premolded joint material.

Contraction joints shall be sealed according to Article 2301.25.

5. Time for Opening Pavement for Use.
PCC driveways shall be opened a minimum of 7 calendar days after placement or when flexural strength reaches 400 psi (2.75 MPa) as determined by Materials I.M. 383.

C. Hot Mix Asphalt.
HMA driveways shall be constructed in accordance with Articles 2303.03 and 2303.04. Compaction shall be Class II.

D. Smoothness.
Where abutting pavement is to be placed adjacent to the pavement being checked, the surface shall not deviate by more than 1/4 inch (6 mm) when checked 1 inch (25 mm) from the edge with a 3 foot (1 m) straightedge used transversely and a 10 foot (3 m) straightedge used longitudinally.

Areas may be checked by the Engineer with a surface checker and shall not exceed 1/4 inch in 10 feet (6 mm in 3 m). For each bump exceeding these requirements, the Contractor will be assessed $50 or the bump corrected as agreed upon by the Engineer and Contractor.

E. Weight Limits.
Construction equipment on both PCC and HMA driveways shall be limited to 5 ton (5 Mg).

2515.05, Method of Measurement.

Replace the entire article:

A. Removal of Paved Driveway.
The quantity of Removal of Paved Driveway, in square yards (square meters), will be the quantity shown on the contract documents for each paved driveway removed to the nearest square foot (0.1 m^2).

B. Portland Cement Concrete Driveways.
The quantity of PCC Driveway of the thickness specified in square yards (square meters), will be the quantity shown on the contract documents for each paved driveway to the nearest square foot (0.1 m^2). This will include areas through sidewalks. No deductions will be made for fixtures having an area of 1 square yard (1 m^2) or less.

2515.06, Basis of Payment.

Replace entire article:

A. Removal of Paved Driveway.
The Contractor will be paid the contract unit price for Removal of Paved Driveway per square yard (square meter). This payment shall be full compensation for all equipment, tools, and labor for removal of the driveways as specified in the contract documents.

B. Portland Cement Concrete Driveway.
The Contractor will be paid the contract unit price for PCC Driveway of the thickness specified per square yard (square meter). This payment shall be full compensation for furnishing all material, equipment, tools, and labor to construct the driveway in accordance with the contract documents.

Section 2517

2517, Concrete Header Slabs.

Replace the title and entire section:

Section 2517. Railroad Approach Sections.

2517.01 DESCRIPTION.
This work shall consist of construction of pavement sections at junctures in accordance with the contract documents.

2517.02 MATERIALS.
Materials for construction of railroad approach sections shall meet requirements of Division 41 for the respective material.

A. PCC Paving Projects.
The PCC shall be Class C or the same class as specified for the pavement.

B. HMA Paving Projects.
The HMA mixture shall be one step above the adjoining surface course. The asphalt binder shall be PG 64-22.

2517.03 CONSTRUCTION.

A. PCC Paving Projects.
The PCC shall be formed, placed, finished, and cured in accordance with Section 2301.

The Engineer may require the railroad approach section to be placed one lane at a time for the convenience of the traveling public. When the header slab is constructed in two sections, a centerline joint shall be constructed as shown in the contract documents. When the joint is not provided for, 1/2 inch

(No. 15) tie bars shall be placed not more than 4 feet (1.2 m) apart and shall extend not less than 18 inches (450 mm) into each section.

B. HMA Paving Projects.
The HMA shall be placed in accordance with Article 2303.03, D, with maximum 2 inch (50 mm) lifts. Compaction shall be in accordance with Article 2303.03, E, Class 2.

2517.04 METHOD OF MEASUREMENT.

A. Railroad Approach Section, PCC.
The quantity of Railroad Approach Section, PCC, in square yards (square meters), will be the quantity shown in the contract documents.

B. Railroad Approach Section, HMA.
The quantity of Railroad Approach Section, HMA, in square yards (square meters), will be the quantity shown in the contract documents.

2517.05 BASIS OF PAYMENT.

A. Railroad Approach Section, PCC.
The Contractor will be paid the contract unit price for Railroad Approach Section, PCC, per square yard (square meter). This payment shall be full compensation for excavation for modified subbase and subdrain; furnishing and installing subdrain; furnishing and installing subdrain outlet; furnishing and placing porous backfill; furnishing and backfilling modified subbase; and furnishing and installing reinforcing steel, tie bars, and dowel assemblies.

B. Railroad Approach Section, HMA.
The Contractor will be paid the contract unit price for Railroad Approach Section, HMA, per square yard (square meter). This payment shall be full compensation for excavation for HMA, modified subbase, and subdrain; furnishing and installing subdrain; furnishing and installing subdrain outlet; furnishing and placing porous backfill; furnishing and backfilling modified subbase; and furnishing and installing fiber board barrier.

Section 2519

2519.04, Method of Measurement.

Replace the first paragraph:
The number of linear feet (meters) of Field Fence or Chain Link Fence constructed of the height and type specified, will be determined by measuring along the fence at the bottom of the fabric, excluding the length of gates or fence otherwise measured for payment.

Replace the third paragraph:
The number of linear feet (meters) of Channel Crossing Fence of the type specified and constructed according to the contract documents will be determined by measuring along the fence at the bottom of the fabric between end posts for the channel crossing fence.

Replace the fourth paragraph:
The number of linear feet (meters) of Flood Plain Fence constructed will be determined by measuring along the fence at the bottom of the fabric between end posts for the flood plain fence.

2519.05, Basis Payment.

Replace the first paragraph:
For the number of linear feet (meters) of the various types of fence constructed and measured, the Contractor will be paid the contract unit price per linear foot (meter).

Section 2521

2521.01, Description.

Delete the second paragraph:

~~Based on satisfactory correlation with the Contracting Authority's test results, in accordance with Materials I.M. 216, the Contractor's process control test results for aggregate gradation shall be the basis of acceptance. The minimum frequency for acceptance testing shall be in accordance with Materials I.M. 204.~~

2521.02, Requirements.

Replace "Materials I.M. 213 and 214" with "Materials I.M. 213".

Section 2522

2522.02, Shop Drawings.

Replace the first sentence of the first paragraph:

The Contractor shall submit drawings in accordance with Article 1105.03, along with a statement that methods and materials to be used in fabrication are in accordance with the contract documents.

Delete the fourth paragraph:

~~Article 1105.03 shall apply.~~

2522.04, D.

Replace the entire article:

Each anchor bolt shall be furnished with one leveling nut and two anchoring nuts. Anchor bolts shall meet the requirements of ASTM F 1554, Grade 105 (724 MPa), be full-length galvanized, and be high-strength low alloy steel. Unless otherwise specified, anchor bolts shall be the Unified Coarse Thread Series and have Class 2A tolerance. The end of each anchor bolt intended to project from the concrete shall be color coded in red to identify the grade. Washers shall be galvanized and shall meet the requirements of ASTM F 436. Nuts shall meet the requirements of ASTM A 563, DH, be heavy hex, and be galvanized. Nuts may be over-tapped in accordance with the allowance requirements of ASTM A 563. Galvanizing shall meet the requirements of ASTM A 153, Class C; or ASTM B 695, Class 50.

2522.08, Footings.

Replace the third sentence:

Placement of anchor bolts shall be in accordance with Article 2405.09, B. Placement of~~,~~ conduit~~,~~ and any other appurtenance or optional features of the footing shall be as shown in the contract documents.

2522.09, Erection.

Replace the first paragraph:

After testing has been accomplished to the satisfaction of the Engineer, the tower may be erected on the foundation. The precise aligning and erecting of all components of the tower lighting system shall be considered essential. The tower shall be plumbed and verified in at least two directions, 90 degrees apart, with a transit. All plumbing shall be done during full cloud cover, prior to sunrise, or after sunset as approved by the Engineer to prevent thermal expansion effects on the steel tower due to heat from sunshine. All towers shall be plumbed within a tolerance of 50% of the pole top diameter. The void between the base plate and top of the foundation shall be covered as shown on the plans.

Add as the third paragraph:

The procedure for tightening anchor bolt nuts on tower lighting, after tower has been plumbed, shall be as follows:

1) This work shall be performed only on days with winds less than 15 mph (25 km/h). All tightening of the nuts shall be done in the presence of the inspector. Once the tightening procedure is started it must be completed on all of the base plate nuts without pause or delay.

2) Properly sized wrenches and/or sockets designed for tightening nuts and/or bolts shall be used to avoid rounding or other damage to the nuts. Adjustable end or pipe wrenches will not be allowed.

3) Base plate, anchor rods and nuts shall be free of any dirt or debris.

4) Stick wax or bees wax shall be applied to the threads and bearing surfaces of the anchor bolt, nuts, and washers.

5) Top nuts shall be tightened so they fully contact the base plate. Leveling nuts shall be tightened to snug tight condition. Snug tight shall be 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 (460 mm). Full effort shall be applied as close to the end of the wrench as possible. Tightening shall be accomplished by leaning back and using entire body weight to pull firmly on the end of the wrench until the nut stops rotating. A minimum of two separate passes of tightening shall be used. Tightening shall be sequenced in each pass so that the nut on the opposite side, to the extent possible, is subsequently tightened until all of the nuts in that pass have been tightened.

6) Top nuts shall be tightened to snug tight as described for the leveling nuts.

7) The top nuts and base plate shall be match-marked using paint, crayon, or other approved means to provide a reference for determining the relative rotation of the nut and base plate during tightening. The top nuts shall be further tightened in two passes, as listed in the following table, using a striking or hydraulic wrench. A sequence of tightening in each pass shall be used so that the nut on the opposite side, to the extent possible, is subsequently tightened until all nuts in that pass have been turned. The leveling nut shall not be rotated during the top nut tightening.

Anchor Bolt Size	**First Pass**	**Second Pass**	**Total Rotation**
Less than or Equal to 1 1/2 inch (38 mm) diameter	1/6 turn	1/6 turn	1/3 turn
Greater than 1 1/2 inch (38 mm) diameter	1/12 turn	1/12 turn	1/6 turn

8) The jam nuts shall be lubricated, placed, and tightened to snug tight.

Section 2523

2523.02 Materials.

Replace the first sentence of the second paragraph:
Before any items are ordered or installation is started, the following list of shop drawings must be submitted for approval in accordance with Article 1105.03:

Replace the second sentence of the third paragraph:
They shall include catalog cuts, diagrams, drawings, brochures, or other descriptive data required by the Engineer.

2523.03, Footings.

Add as the third sentence to the fourth paragraph:
Anchor bolts shall be placed in accordance with Article 2405.09, B.

Section 2524

2524.02, Traffic Signs.

Replace the second paragraph:
Except as modified by the contract documents, signs shall be made according to the standards established in the Standard Highway Signs, 2004 edition, as published by the United States Department of Transportation.

Delete the third paragraph.

~~Letters and numerals shall conform with the current edition of "Standard Alphabets for Highway Signs," printed by the U.S. Department of Transportation, Federal Highway Administration. Numeral to numeral spaces and letter to letter spaces, including uppercase to lowercase letters, lowercase to lowercase letters, and capital to capital letters, shall also conform with this publication. Scale drawings of letters are available on request. Other legend spacing dimensions required to complete fabrication shall be as shown in the contract documents.~~

2524.02, A, Type A Signs.

Replace the first and second sentences of the first paragraph:

Type A signs shall be aluminum, galvanized steel, or when specifically specified, plywood sheet mounted on wood or steel breakaway posts. The sign face material shall be reflective sheeting.

2524.02, B, Type B Signs.

Replace the second sentence of the first paragraph:

The sign face material shall be reflective sheeting.

Replace the third sentence of the first paragraph:

Sign legends shall be accomplished through use of reflectorized or nonreflectorized letters, numerals, symbols, and borders that are direct applied.

Replace the first sentence of the third paragraph:

Prior to fabrication, the Contractor shall submit shop drawings for each Type B sign in accordance with Article 1105.03.

2524.07, Erection of Type A Signs.

Replace the title and the entire article:

2524.07, Intentionally Left Blank.

2524.08, Erection of Type B Signs.

Replace the title and first sentence of the first paragraph:

2524.08, Erection of Type A or B Signs.

All Type A or B Signs shall be accurately erected to conform to the dimensions and details shown in the contract documents.

Replace the second paragraph:

After installation, each 4 inch by 6 inch (100 mm by 150 mm) wood sign post shall be modified by field drilling holes as shown in the contract documents. All labor and equipment necessary for this modification shall be included in the price bid for the post and no separate payment will be made.

Add a new sixth paragraph:

For the breakaway base, tighten all bolts to maximum with 12 inch to 15 inch (305 mm to 308 mm) wrench to bed washers and shims, and to clean bolt threads. Loosen each bolt in turn and retighten in systematic order to the torque specified in the contract documents. For the fuse plate assembly, fuse bolts shall be tightened to obtain the torque specified in the contract documents.

2524.12, D, Steel Breakaway Posts for Type B Signs.

Replace the title, first paragraph, and first sentence of the second paragraph:

2524.12, D, Steel Breakaway Posts for Type A or B Signs.

Each steel breakaway post for Type A or B signs will be measured to the nearest 0.1 foot (30 mm) of the various post sizes installed.

Payment for steel breakaway posts for Type A or B signs will be made at the contract unit prices per linear foot (meter) for the various post sizes.

2524.12, E, Concrete Footings for Steel Breakaway Posts for Type B Signs.

Replace the title:

Concrete Footings for Steel Breakaway Posts for Type A or B Signs.

2524.12, F, Delineators, Milepost Markers, and 6 Inch by 6 Inch (150 mm By 150 mm) Route Markers.

Delete the fourth paragraph:

~~Excavation in unexpected rock for delineators, and milepost marker posts will be paid for as extra work. Unexpected rock will be considered as rock encountered during post erection, but neither visible from the roadway nor indicated in the contract documents.~~

2524.12, G, Excavation in Unexpected Rock.

Add new article:

G. Excavation in Unexpected Rock.
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, and milepost marker posts will be paid for as extra work. Unexpected rock will be considered as rock encountered during post erection, but neither visible from the roadway nor indicated in the contract documents.

Section 2525

2525.01, B, Equipment and Materials.

Replace the first indented paragraph:

Shop drawings will be required for the poles and mast arms, and these shall be submitted in accordance with Article 1105.03.

2525.01, B, 2, Concrete Bases for Poles.

Add as the fourth sentence:

Placement of anchor bolts shall be in accordance with Article 2405.09, B.

2525.03, A, 6, Uninterrupted Timing.

Replace “Article 2525.04, A, 11, and A, 12, a” with “Article 2525.03, A, 2, b, and Article 2525.03, A, 5” in the first sentence.

2525.03, C, Actuated Sign Controllers.

Replace the title:

Actuated Signal Controllers.

2525.03, C, 11, i, 1, Connecting Cables.

Delete “correlations shall be made with connecting cable plug and controller jack as described in Article 2525.05, A, 2, 6.” in the last sentence.

2525.03, C, 11, j, 1, Incoming AC Line.

Replace “Article 2525.05, A, 12, d, 2, a” with “Article 2525.03, C, 11, i, 2, a“.

2525.03, F, 4, d

Replace “Paragraph A, 10, of this Article” with “2525.03, C“.

2525.06, B, 2

Replace the entire article:

The anchor bolts shall meet the requirements of ASTM F 1554, Grade 105 (724 MPa), be full-length galvanized, and have a full-body diameter. Anchor bolts shall be the Unified Coarse Thread Series and have Class 2A tolerance. The end of each anchor bolt intended to project from the concrete shall be color coded in red to identify the grade. Washers shall be galvanized and shall meet the requirements of ASTM F 436. Nuts shall meet the requirements of ASTM A 563, DH, be heavy hex, and be galvanized. Nuts may be over-tapped in accordance with the allowance requirements of ASTM A 563. Galvanizing shall meet the requirements of ASTM A 153, Class C; or ASTM B 695, Class 50.

2525.06, C, 3

Replace “115 m” with “115 mm” in the article.

2525.07, Method of Measurement and Basis of Payment.

Replace the second and third sentence of the first paragraph:

Payment will be made at the lump sum contract price for Traffic Signalization.

Replace the second paragraph:

Removal of the existing traffic signal installation will be paid for at the lump sum price for Removal of Traffic Signalization. The lump sum price for Removal of Traffic Signalization will be full payment for the removal of all traffic signal poles, signal pole footings, overhead wires, handholes, and controllers. Removal of underground wire, cable, and conduit will not be required.

Section 2526

2526, Construction Survey.

Replace the entire article:

2526.01 DESCRIPTION.

This work involves survey for construction projects. The Contractor shall furnish all survey necessary for construction of the project before work begins in the area. The provisions of Article 1105.06 do not apply to this work, except that the original stakes set by the Engineer shall be preserved. If, in the opinion of the Engineer, any of the original survey stakes or benchmarks have been destroyed or disturbed by the Contractor, the cost of replacing shall be charged to the Contractor. Design errors discovered shall be brought to the Engineer's attention for review prior to staking. Construction survey shall include qualified personnel, equipment, and supplies required for, but not limited to, the following items:

A. Project Control.

1. Primary Control Monuments.

A primary control monument is a survey point established by the Department prior to project commencement and shown in the contract documents. The point will be established by placing a monument in the ground.

2. Secondary Control Monuments.

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

The Engineer will provide monuments, similar to those used for Global Positioning System (GPS) control by the Department.

Secondary permanent horizontal control monuments shall be placed, as directed by the Engineer, at locations likely to survive project construction and at intervals not to exceed 2,640 feet (0.8 km). The Contractor shall place the monuments in the ground along the project corridor. Monuments shall be placed at higher elevations along the corridor to provide a view of the immediate project topography and 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.

The monument shall by planted 1 to 4 inches (25 mm to 100 mm) below existing ground. A metal fence post shall be driven within 1 foot (0.3 m) to mark its location.

Project coordinates shall be carefully determined relative to the nearest primary project control monument using project coordinate values provided by the Engineer. The resulting error radius of the secondary monument shall not exceed 0.10 feet (30 mm) ±2 ppm relative to the primary control. Unedited printed and/or electronic formatted field data of the field survey shall be provided to the Engineer along with an ASCII comma delineated file of the coordinates formatted as (Point Number, Northing, Easting, Elevation, Point Description, Feature).

An independent traverse check between the secondary control monuments shall be performed by observing distance and angular measurements or by use of GPS. An unedited printed and/or electronic file of the field data for the traverse check shall be provided to the Engineer. A diagram shall be provided to the Engineer indicating horizontal ground distances to nearest 0.01 foot (3 mm) and angles to at least the nearest 10 seconds between each secondary control monument. Inverses between the coordinate pairs as determined in the previous paragraph shall not exceed 0.10 feet (30 mm) of the direct measurements.

Secondary control monuments that are disturbed during construction activities will be replaced using procedures outlined above at no additional expense to the Contracting Authority.

3. Durable Physical Objects.
Each control monument shall be referenced to at least three durable physical objects from 20 to 100 feet (6 m to 30 m) away from the monument with measurements to the nearest 0.10 foot (30 mm). Durable physical objects could include trees, poles, fence posts, station marks in new roadway pavement, or metal fence posts. A printed and/or electronic reference image (for example .JPG, TIFF, etc), including each reference and project coordinate, shall be provided to the Engineer.

4. Benchmarks.
Permanent vertical control benchmarks shall be established at all bridges and reinforced concrete box culverts within the project. An I.D.O.T. brass plug on bridge barrier rail or headwall of reinforced concrete box culvert shall be used to indicate the benchmark. The Contractor may use a sawn “X” on bridge barrier rail or headwall of reinforced concrete box culvert if approved by the Engineer.

All benchmark elevations shall be transferred from construction plan benchmarks to the permanent benchmarks using the three-wire method or by trigonometric leveling. Temporary benchmarks of reasonable stability shall be used to preserve the plan benchmarks.

All unedited printed and/or electronic formatted field benchmark elevation data shall be provided to the Engineer. The project x and y coordinates of all benchmarks shall be provided to the Engineer along with an ASCII comma delineated file of the coordinates formatted as (Point Number, Northing, Easting, Elevation, Point Description, Feature).

Benchmark level loops shall not exceed an error of 0.05 feet (15 mm) times the square root of the loop’s length in miles (kilometers) and the error shall be distributed equally along the loop on all intermediate traverse/benchmark points.

B. Grading.
Right-of-way line between permanent right-of-way corners at 100 foot (20 m) intervals, or less if needed, including borrows, temporary easements, and right of entry. These points shall be marked by placement of a metal pin or wood hub, flat, and lath at the same location as the slope stakes. The flat shall be clearly marked with the station number, distance from centerline, and elevation (cut or fill) to subgrade.

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

Grade check stakes at 100 feet (20 m) intervals for bottoms of subgrade treatments. Grade check stakes shall be set on centerline for two-lane roads and in the median for four-lane roads. Grade check stakes shall be marked with a lath. The lath shall be clearly marked with the station location and cut or fill information.

Finish grade stakes (blue tops) at 100 foot (20 m) intervals, or less if needed. The blue tops shall be set at each shoulder line and at each point where there is a change in cross slope. Blue tops shall be marked with a wood hub and a stake chaser or similar type tassel.

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

Bridge berm slope stakes to establish all transitions including the face of the berm. Finish grade stakes (blue tops) on all roadway shoulder lines and roadway centerlines project down the face of bridge berm at the top, midpoint, and toe.

When Class 12 excavation is an item, cross section elevations shall be taken at 100 foot (20 m) intervals, or less if needed, and cross sections plotted for use by the Engineer to calculate the excavation quantities.

Agricultural drain tile shown in the contract documents shall be located on each side of roadway at the right-of-way line with a lath. The lath shall be clearly marked to show station location, distance from centerline, tile size and type, and flowline elevation.

C. Bridges.
Locations and elevations shall be marked with metal pin or tack in a wood hub, flat, and lath. The flat shall be clearly marked with the pier/abutment station location, design number, and offset distance from the centerline of the approach roadway.

Minimum of three temporary benchmarks.

Location of test pile shall be marked with a wood hub.

Independent check of the above stakes.

Elevations of all completed substructure beam seats shall be submitted to the Engineer for review prior to installation of bearings and superstructure elements.

Elevations of beams as erected. Provide the elevations to the Engineer for computation of finish elevations for deck construction. Locations for determining beam elevations shall be in accordance with the plans.

A copy of the staking diagram shall be provided to the Engineer before work begins.

D. Reinforced Concrete Box Culverts.
Locations and elevations shall be marked with metal pin or tack in a wood hub, flat, and lath. The flat shall be clearly marked with the station location, design number, cut/fill elevation, and offset distance from the centerline of the culvert and back of parapet.

An independent check of the above stakes.

A copy of the staking diagram shall be provided to the Engineer before work begins.

Questionable flow lines and alignments that do not match existing drainage shall be reported to the Engineer.

E. Pipe Culverts.
Locations and elevations shall be marked with metal pin or a wood hub, flat, and lath. The flat shall be clearly marked with the station location, cut/fill elevation, and offset distance to both ends or centerline of pipe.

Questionable flow lines and alignments that do not match existing drainage shall be reported to the Engineer.

F. Sanitary and Storm Sewers.
Locations and elevations shall be marked with metal pin or tack in a wood hub, flat, and lath. The flat shall be clearly marked with the station location, pipe number, cut/fill elevation, and offset distance to centerline of pipe.

G. Water Mains.
Locations and elevations shall be marked with metal pin or tack in a wood hub, flat, and lath. The flat shall be clearly marked with the station location, pipe number, cut/fill elevation, and offset distance to centerline of pipe.

H. Intakes and Utility Accesses.
Locations and elevations shall be marked with metal pin or tack in a wood hub, flat, and lath. The flat shall be clearly marked 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.

I. Pavements (PCC & HMA).
Locations and elevations shall be marked with metal pin or tack in a wood hub (only tack one side), flat, and lath. Elevations on both sides of the pavement at 50 foot (10 m) intervals on straight and level sections and at 25 foot (10 m) intervals on horizontal and vertical curves. The flat shall be clearly marked with the station location, cut/fill information, and offset distance to the edge of pavement. Pavement cross slope information shall be included in superelevated curves.

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

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

1. Obtain elevations of the existing shoulders and/or pavement as stated in Article 2526.01, I.

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

J. Pavement Overlays (PCC and HMA)
Reference and preserve existing control points located at each Point of Intersection (P.I.).

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

Control Points shall be reset after the work is complete.

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

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

Noise Walls
Modular Block Retaining Walls
Segmental Retaining Walls

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

The method used by the Contractor to preserve project control shall be submitted to the Engineer for approval. Survey work documentation shall be in a format acceptable to the Contracting Authority. Survey work shall be done with a Professional Engineer licensed in the State of Iowa or a Professional Land Surveyor licensed in the State of Iowa in responsible charge, in accordance with provisions of Chapter 542 B, Code of Iowa. The Contractor shall submit to the Engineer a resume identifying the field survey personnel and their capabilities to perform the intended requirements.

The method of determining alignments and elevations and the method of preserving control points shall be subject to review and approval by the Engineer. This approval shall not act to relieve the Contractor of the responsibility for the correctness of the survey work. Plan cross-sections shall not be used for vertical or horizontal control.

The Engineer will provide benchmark 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

Tie-ins with existing roadways shall be checked for correctness of alignment prior to construction staking.

When survey work is done under traffic, detail sheets in the contract documents will establish the required signing.

The Engineer will locate and determine elevations of settlement plates.

The Contractor shall replace land corners and permanent reference markers unless otherwise stated in the contract documents.

All survey work documentation is to become property of the Contracting Authority. The work of this specification will be considered finished when the documentation is furnished to and accepted by the Engineer.

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

2526.02 METHOD OF MEASUREMENT AND BASIS OF PAYMENT.
Construction survey will be measured and paid for at the lump sum contract price. This payment shall be 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. Revisions after the letting will be paid for as extra work as described in Article 1109.03, B.

Section 2527

2527.02, B, 2, Epoxy.

Replace the title and entire article:

2. Durable Paint Pavement Markings.
Durable paint pavement markings shall meet requirements of Article 4183.04.

The Contractor shall supply the Engineer with a copy of the manufacturer's recommendations for applying the marking material. The marking material shall be installed according to the product manufacturer's recommendations. Binder thickness shall be the same as applied on the National Transportation Product Evaluation Program (NTPEP) deck with a tolerance of 10%. The bead application rate, bead gradation, and bead coating shall be at the discretion of the Contractor. An appropriate bead package shall be used to consistently meet or exceed the minimum retroreflectivity requirements.

The Contractor shall demonstrate to the Engineer at the start of the project the ability to meet the retroreflectivity requirements of these specifications when tested in accordance with Materials I.M. 483.04. The Engineer may also require the Contractor to demonstrate the ability to meet the initial retroreflectivity requirements if there is a change in equipment, materials, or a delay of more than 2 months in completing the project.

Final acceptance will be based on compliance with these specifications. The markings shall meet the following retroreflectivity requirements:

	Specific Luminance (mcd/sq. ft./ft.-cdl.) (lux•m^2)
White line, symbols and legends	300
Yellow line	200

2527.02, Articles F through I.

Renumber existing Articles F through I to G through J:

~~F~~G. Preformed Polymer Tape.
~~G~~H. Removable, Nonreflective, Preformed Tape.
~~H~~I. Profiled Pavement Marking Tape.
~~I~~J. Intersection Marking Tape.

Add new Article F:

F. Channelizer Markers.
Channelizer markers shall be in accordance with Materials I.M. 483.08.

2527.03, Construction.

Add as the second sentence to the second paragraph:
Other details of application shall be according to the paint manufacturer's written recommendations.

Replace the table after the second paragraph:

Type of Marking	Oct. 23 to Apr. 7	Apr. 8 to Apr. 22	Apr. 23 to Oct. 7	Oct. 8 to Oct. 22
Waterborne Paint	not allowed	45ºF (4 7ºC)	45ºF (4 7ºC)	45ºF (4 7ºC)
Low Temperature Waterborne Paint with Rohm & Haas XSR Resin	35ºF (2ºC)	35ºF (2ºC)	35ºF (2ºC)	35ºF (2ºC)
Solvent Based Paint	no restrictions	no restrictions	*	no restrictions

*Solvent based paint may be used if temperature requirements can not be met.

Replace "epoxy" with "durable paint" in the third paragraph.

Delete the last sentence of the fourth paragraph:
~~For tape products, the manufacturer's recommendations shall be followed for surface dryness and other surface preparation requirements.~~

Add a new sixth paragraph with subparagraphs:
For tape products, the manufacturer's recommendations shall be followed for surface dryness, primers, adhesives, and other surface preparation requirements. Unless otherwise specified by the tape manufacturer the following test shall be met for determining surface dryness before applying the tape.

1. In an area of direct sunlight where the tape will be applied, place an 18 inch x 18 inch (450 mm x 450 mm) piece of polyethylene (a green or black garbage bag may be used). There should not be any holes or tears in the polyethylene.

2. Tape down all the edges of the polyethylene sheet to seal all the edges and not allow any air movement to get under the polyethylene.
3. Firmly tamp the tape using the tamper cart or by foot tamping.
4. Allow 20-25 minutes for the polyethylene to be exposed to the direct sunlight.
5. Remove the polyethylene from the road surface. If no moisture is present on the under side of the polyethylene or on the road surface, the tape can be applied.
6. If any moisture is present, allow another hour to pass and repeat the test until no moisture is found.

2527.03, B, Removal of Pavement Markings.

Replace the second sentence of the third paragraph:

Tightly adhering markings may remain in the bottom of the tining and other depressions on the pavement surface but shall not be visible to the motorist during daytime or night time.

2527.03, D, Limitations.

Replace the entire article:

When pavement markings are required, the application shall be coordinated with other construction work and associated traffic control changes.

Removable tape shall be used for temporary pavement markings which extend diagonally across a final traffic lane.

When the installation of preformed polymer pavement marking material or profiled pavement marking tape is in conjunction with placement of HMA, the tape shall be inlaid by positioning on the HMA prior to the final rolling. The installation of the tape shall be in accordance with the manufacturer's recommendations. If grooving is specified, tape shall not be inlaid into hot HMA.

When pavement markings are placed on newly completed PCC pavements, the existing curing compound film shall be removed from horizontal surfaces in these locations. Curing compound film need not be removed from curbs or other vertical surfaces. Curing compound removal shall not damage the underlying PCC pavement.

Pavement markings shall be completed before the lane, road, on-site detour, or diversion is open to traffic.

If, due to unavoidable circumstances, the Contractor is not able to complete the pavement marking placement or removal specified for that day, the Contractor shall provide traffic control until the pavement marking placement or removal work is completed.

2527.03, F, 2, On Site Detours.

Delete the last sentence:

~~The markings are to be temporary unless otherwise designated.~~

2527.03, F, 5, Raised Pavement Markers.

Add as the third sentence:

For pavement crossovers, raised pavement markers, spaced at 10 feet (3 m) on center, shall be used to supplement the white and yellow edge lines from the beginning of the lane reduction taper through the reverse curves of the crossover.

2527.03, G, Markings Obliterated During Construction.

Replace the entire article:

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

Pavement markings shall be replaced before the lane or road is opened for traffic for the following situations:

1. Multi-Lane Roads:

a. Divided.

1) Lane lines obliterated for 50 feet (15 m) or more.
2) Edge lines obliterated for 50 feet (15 m) or more.

b. Undivided (four or more lanes) or road with continuous two-way left-turn lane (TWLTL).

1) Lane lines obliterated for 50 feet (15 m) or more.
2) Edge lines obliterated for 50 feet (15 m) or more.
3) Center lines obliterated for 50 feet (15 m) or more.

2. Two Lane Roads:

a. Paved Shoulder More Than 2 Feet (0.6 m).

1) Center lines obliterated for 50 feet (15 m) or more.
2) Edge lines obliterated for 50 feet (15 m) or more.
3) No Passing Zone lines obliterated.

b. Paved Shoulder 2 Feet (0.6 m) or Less.

1) Center lines obliterated for 50 feet (15 m) or more.
2) Edge lines obliterated on curves with a radius of 1,000 feet (300 m) or less.
3) Edge lines obliterated at bridge approaches, or other obstructions within 3 feet (1 m) of the roadway, for 300 feet (90 m) or more.
4) No Passing Zone lines obliterated.

Edge lines not required to be placed before the lane or road is opened for traffic shall be placed within 3 working days from the day the pavement and shoulder work are completed for the project.

Remaining pavement markings shall be placed within 3 working days from the day the road work is completed for the project.

Symbols and legends shall be placed within 5 working days from the day the road is open to traffic.

2527.03, H, Defective Epoxy Paint Pavement Markings.

Replace the title:

H. Defective Pavement Markings.

Replace the first unnumbered paragraph:

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

Delete “epoxy paint” from the third paragraph.

2527.03, H, 1, Insufficient Film Thickness, Line Width, or Low Retroreflectivity.

Delete the title and entire article:

~~**1. Insufficient Film Thickness, Line Width, or Low Retroreflectivity.**~~
~~Repair Method. Prepare the surface of the defective epoxy paint marking using methods found in Article 2527.03 in. Surface preparation shall be performed to the extent that a substantial amount of the retroreflective glass beads are removed and a roughened epoxy marking surface remains. Repair shall be made by restriping over the cleaned surface in accordance with the requirements of these specifications and at the full thickness.~~

2527.03, H, 2, Insufficient Bond.

Delete the title and entire article:

~~**2. Insufficient Bond.**~~
~~Repair Method. The defective epoxy paint marking shall be completely removed and cleaned to the underlying pavement surface in accordance with the requirements of Article 2527.03. The extent of removal shall be the defective area plus any adjacent epoxy paint pavement marking material extending 1 foot (300 mm) in any direction. After surface preparation work is complete, repair shall be made by reapplying epoxy paint over the cleaned pavement surface in accordance with the requirements of these specifications.~~

2527.03, I, Surface Preparation for Profiled Marking Tapes.

Replace the title:

I. Grooving for Pavement Markings.

Replace the first sentence of the first paragraph:
When specified, pavement markings shall be placed in a groove cut into the pavement surface.

2527.03, I, 2, Groove Depth.

Replace the entire article:
For profiled marking tape the grooved depth shall be 0.080 inches ± 0.010 inches (2.0 mm ± 0.03 mm).

For all other markings, the groove depth shall be as recommended by the pavement marking manufacturer.

2527.03, I, 6, Groove Cleaning.

Replace the last sentence:
The surface to receive the tape shall be free from dust, dirt, or other contaminates that may interfere with the tape properly bonding.

2527.03, I, 6, a, Moisture Test of Pavement Surface.

Delete the title and entire article.

2527.03, I, 7, Adhesive.

Delete the title and entire article:

~~**7. Adhesive.**~~
~~The Contractor shall apply adhesive according to the manufacturer's instructions.~~

2527.05, A, Painted Pavement Marking.

Disregard the following change made in GS-01004:
~~**Delete** "of the type specified" from the first sentence.~~

2527.05, D, Painted Symbols and Legend.

Disregard the following change made in GS-01004:
~~**Delete** "of the type specified" from the first sentence.~~

2527.05, K, Grooves Cut for Tape.

Replace the title and entire article:

K. Grooves Cut for Pavement Markings.

The Engineer will measure the number of stations (meters) of Grooves Cut for Pavement Markings. This quantity will be equivalent to the number of stations (meters) measured for the pavement markings. Additional width and transition length will be incidental.

2527.06, A, Painted Pavement Marking.

Disregard the following change made in GS-01004:
~~**Delete** "of the type specified," from the first sentence.~~

2527.06, D, Painted Symbols and Legend.

Disregard the following change made in GS-01004:
~~**Delete** "of the type specified," from the first sentence.~~

2527.06, K, Grooves Cut for Tape.

Replace the title and entire article:

K. Grooves Cut for Pavement Markings.
For the number of stations (meters) of Grooves Cut for Pavement Markings, the Contractor will be paid the unit price per station (meter).

Section 2528

2528.01, Description.

Replace the sixth and seventh paragraphs:
All Category I and Category II traffic control signs and devices used on Interstate and Primary Road projects shall meet National Cooperative Highway Research Program (NCHRP) Report 350. Category I devices are defined as low mass, single-piece traffic cones, tubular markers, single-piece drums, and delineators. No lights or signs may be attached to these devices in order for them to meet the Category I limitations. Category II devices are defined as vertical panels, Type I, II, and III barricades; and moveable skid mounted sign stands.

It shall be the responsibility of the Contractor to provide the vendor's self-certification for Category I devices and the FHWA NCHRP 350 approval memos for Category II signs and devices, to the Engineer to document crashworthiness of their Category I and II traffic control signs and devices. 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/fourthlevel/hardware/wzd.htm.

Delete the third sentence of the eighth paragraph:
Gender specific signs, such as FLAGMAN and MEN WORKING, will not be allowed. The signs shall either be neutral gender, as FLAGGER, or equivalent symbol signs.

2528.01, B, Traffic Quality Control.

Replace the entire article:
The Contractor shall have a Traffic Control Technician on staff, even though the traffic control portion of the contract may be subcontracted. The Traffic Control Technician shall have attended and passed the exam in an American Traffic Safety Services Association (ATSSA) Traffic Control Technician or IMSA Work Zone Traffic Control training class. This Traffic Control Technician shall be responsible for overall management of the Contractor's quality control program for traffic control.

The Contractor shall perform the following quality control work associated with monitoring and documenting traffic control conditions daily as the project is constructed.

1. Review all traffic control operations for compliance with contract documents and maintain a project traffic control daily diary, in a format provided by the Contracting Authority, which shall be submitted to the Engineer and will become a part of the Contracting Authority's permanent project records. The Engineer

may require submission of completed portions of the daily diary at routine intervals during construction of the project. The diary shall include:

a. listing and station location of traffic control used each day referenced to the appropriate Standard Road Plan, project plan sheet, etc.,
~~**a**~~**b**. all reviews of traffic control devices and operations, whether satisfactory or unsatisfactory, and corrections made,
~~**b**~~**c.** approved changes to the contract document's traffic control,
~~**c**~~**d.** incidentals affecting the efficiency and safety of traffic,
~~**d**~~**e.** a daily list of trained flaggers used, including hours worked ~~on the project~~.

2. Monitor traffic operations and submit proposed Traffic Control Plan changes to the Engineer for approval.

3. Coordinate all changes to the Traffic Control Plan.

4. Coordinate all traffic control operations, including those of subcontractors and suppliers.

~~The Contractor shall have a technician on staff that has attended and passed the exam in an ATSSA Traffic Control Technician or International Municipal Signal Association (IMSA) Work Zone Traffic Control training class even though the Traffic Control portion of the contract may be subcontracted. This Traffic Control Technician shall be responsible for the overall management of the Contractor's quality control program for traffic control.~~

2528.02, Signs.

Replace the first paragraph:
Signs shall be of the size and type shown in the contract documents and shall utilize retroreflective sheeting meeting requirements of Article 4186.03. For Interstate and Primary projects, diamond shaped warning signs shall be 48 inches (1200 mm) by 48 inches (1200 mm) unless otherwise specified in the contract documents. Signs for traffic control zones in duration for 4 calendar days or more shall be mounted on fixed posts. Signs for traffic control zones in duration for less than 4 calendar days may be mounted on moveable skids or fixed posts. Fixed post mounted signs shall have the sign sheeting applied to rigid wood or metal and shall be mounted at a height of at least 7 feet (2.2 m), measured from the bottom of the sign to the near edge of the pavement. A secondary sign on the same post may be mounted 1 foot (0.3 m) lower than specified above. Post-mounted signs shall have a clear distance 2 feet (0.6 m) behind a curb or beyond the edge of the shoulder. Moveable skid mounted signs shall use flexible roll-up sheeting or other skid mounted sign systems that meet NCHRP 350 requirements. Moveable skid mounted signs shall be mounted at a height of at least 1 foot (0.3 m) above the roadway.

Replace item 2 following the second paragraph:

2. 3.0 pounds per foot (4.5 kg/m) U-shaped rail steel posts.

Add as new item 3 in numbered list:

3. 2 1/4 or 2 1/2 inch (60 mm or 65 mm) square 12 gauge perforated steel tubing.

Add as the fifth, sixth, and seventh paragraphs:
When indicated in the contract documents, supplemental sign flags shall be used in conjunction with work zone signing. The sign flags shall be 16 inches (400 mm) square and sheeted with red Type III or Type IV retroreflective sheeting meeting requirements of Article 4186.03.

On projects where two new lanes are being constructed adjacent to an existing two lane highway, TWO WAY TRAFFIC (W6-3) signs shall be placed. The signs shall be placed off the right shoulder of mainline: 1) after each public side road for each direction of travel for traffic that may enter from all intersecting side roads; or 2) at 1/2 mile (0.8 km) intervals, whichever is less. These signs shall be installed when grading activities start and shall remain in place until the entire four lane divided highway is opened to traffic. If the pavement is constructed under a separate contract, these signs shall remain in place after the grading contract is completed and become the property of the Contracting Authority. The paving contractor shall then take over

these signs and remove them when the four lane divided highway is opened to traffic. Payment will be in accordance with Article 2528.13, A, 1.

Permanent signing that conveys a message contrary to the message of the temporary signing and not applicable to the working conditions shall be covered or removed by the Contractor when directed by the Engineer.

Add as the last paragraph:
The END ROAD WORK (G20-2) sign may be eliminated for mobile or short duration (less than 1 hour) temporary traffic control zones.

2528.03, Channelizing Devices.

Replace the word “Devises” with “Devices” in the first paragraph of the article.

Add as the second, third, and fourth paragraphs:
Channelizing devices may be placed up to 2 feet (0.6 m) beyond centerline or lane line at specific locations where actual work activity is taking place. Channelizing devices shall be returned to the original position when the work activity has passed.

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

Channelizing devices of different types shall not be intermixed.

2528.03, A, Barricades.

Replace the entire article:

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

Type III barricades shall have a minimum length of rail of 6 feet (1.8 m). When traffic is permitted in each direction around a Type III Barricade, the Type III Barricade used shall have fully reflectorized faces on both sides of the rails.

Barricades shall be erected in essentially a horizontal position perpendicular to the direction of approaching traffic. They shall be ballasted so as not to cover any striped rail.

2528.03, B, Cones, Vertical Panels, Drums, and Tubular Markers.

Replace the title and first paragraph:

B. Cones, Vertical Panels, 42 Inch (1050 mm) Channelizers, Drums, and Tubular Markers.
Cones, vertical panels, 42 inch (1050 mm) channelizers, drums, and tubular markers shall meet the current requirements of the MUTCD, and Section 4188.

Replace the first sentence of the third paragraph:
Tubular markers shall be between 28 inches (710 mm) and 34 inches (865 mm) in height with a diameter facing traffic at least 2 inches (50 mm) in width.

Add as the fourth paragraph:
Cones may be used as channelizing devices in tapers and along lane lines during daylight hours only.

2528.04, Pilot Cars.

Replace the entire article:

Pilot cars shall be pickup trucks or automobiles displaying the Contractor's company insignia, equipped with G20-4 signs reading: PILOT CAR - FOLLOW ME. Two signs shall be mounted on the vehicle so as to be clearly visible from both directions of traffic. The bottom of the signs shall be mounted at least 1 foot (0.3 m) above the top of the vehicle's roof.

Pilot cars shall be operated such that they maintain a uniform speed through the work area, no greater than 40 miles per hour (65 km/hr).

2528.06, Lighting Devices.

Add as the third sentence of the second paragraph:

All barricade warning lights shall be in accordance with the ITE Standard for Flashing and Steady Burn Barricade Warning Lights and shall be identified as specified therein. In addition, Type A barricade warning lights shall operate on a 12 volt battery system, unless the ITE identification specifically indicates that the rating is based on a different system. Type A lights shall be visible to both directions of traffic.

2528.07, Temporary Traffic Signals.

Replace the entire article:

A. General.

Temporary traffic signals shall be set up and operated as shown in the contract documents. The temporary traffic signal system shall meet the physical display and operational requirements of conventional traffic signals as specified in Part 4 of the MUTCD. Unless otherwise stated in the contract documents, the Contractor may provide either a span wire or trailer mounted temporary traffic signal system.

In the event any part of the temporary traffic signal system malfunctions or a continuous red flash mode is encountered, flaggers shall be furnished by the Contractor on a 24 hour-7 day a week basis until repairs are made and the signals are fully functional. For temporary traffic signals at intersections, the Contractor shall install stop signs on all approaches until the signals are fully operational. This shall be at no additional cost to the Contracting Authority.

B. Equipment.

1. Trailer Or Span Wire Mounted Systems.

The Contractor shall furnish actuated signal controllers complying with NEMA and ITE standards. The temporary traffic signal system shall include a solid state digital traffic signal controller capable of operating the signals in accordance with MUTCD requirements and NEMA Standard TS1 (a copy of the manufacturer's certificate of compliance shall be posted in the control cabinet (in a weatherproof folder) and made available to the Engineer upon request). Temporary traffic signal systems shall have conflict monitoring conforming to NEMA TS1 standard. The conflict monitor shall detect the presence of conflicting signal indications, absence of proper voltages, and proper operation of the controller. Upon detection of a conflict or loss of communication, all signals shall enter into flashing red mode.

Article 2525.03, D shall apply with the following exceptions for one lane two way traffic control:

a. Green Revert.

If during an All Red clearance interval a call occurs on the phase losing the right-of-way prior to a call on any other traffic phase, the right-of-way shall revert to the previous traffic phase, initiating the initial green interval. The transfer shall be immediate without completing the All Red clearance interval.

b. Rest in Absence of Actuation.

In the absence of detector actuation of assertion or recall switch(es), the right-of-way indication shall Dwell In All Red.

Clearance for overhead wiring shall be a minimum of 18 feet (5.5 m).

A detection area shall be located near the stop line with the downstream edge positioned 6 feet (2 m) from the stop line. A second detection area shall be located 100 to 150 feet (30 to 45 m) in advance of the

stop line. The size of the detection area shall be 6 feet by 10 feet (2 m by 3 m). A single above-ground detector may be used to provide detection for both areas.

Signal heads shall have 12 inch (300 mm) lenses and conform to ITE Specification “Vehicle Traffic Control Signal Heads”. All signal heads shall be equipped with visors and back plates. The backplate shall provide a minimum of 5 inches (125 mm) black field around the signal assembly and shall have a dull black finish.

There shall be a minimum of two traffic signal heads per approach. All signal heads mounted over the road surface shall be mounted a minimum of 15 feet (4.6 m) from the bottom of the signal head to the top of the road surface. One signal head shall be mounted over the center of the travel lane. All far right signal heads shall be mounted a minimum of 8 feet (2.45 m) from the bottom of the signal head to the top of the ground surface. Required signal heads for through traffic on any one approach shall be located not less than 8 feet (2.4 m) apart measured horizontally perpendicular to the approach between the centers of the signal faces.

2. Trailer Mounted Systems.
The system shall consist of two or more self-contained trailer mounted units each containing two signal heads.

3. Span-Wire Mounted Systems.
Posts shall meet requirements of Article 2528.02.

C. Operational Requirements.
The exact location of the signals, stop bars, and signs shall be as identified in the contract documents. Temporary traffic signal installations shall be set up securely and leveled in a manner approved by the Engineer.

All temporary traffic signals shall be programmed for red flash upon startup, conflict, or power failure. The temporary traffic signal system shall be programmed to dwell in all-red.

For one lane two way traffic control operations, when an additional phase is used for a side road movement, only one long all red interval shall be used between active phases on each side of the work area.

Signal timing shall be set as identified in the contract documents.

D. Equipment Crossings.
For equipment crossings, a signal operator shall be used to control the signal system. This operator shall be positioned with good sight distance for both the mainline and haul road.

The signal system shall be preprogrammed with fixed yellow and all red time periods so the operator can only activate the beginning of the yellow interval for mainline traffic.

When the equipment crossing is not in use, the signal shall be set to yellow flash mode. If hauling operations are suspended for more than one week, the signal heads shall be covered, or if portable trailer units are used, the trailers shall be removed.

2528.08, Temporary Floodlighting.

Delete the first and second sentence of the first paragraph:
~~Floodlighting may be required. Floodlights will be required at the approximate locations shown in the contract documents.~~

Replace the third paragraph:
Temporary floodlighting shall consist of either a pole-mounted luminaire or a luminaire mounted on portable equipment. The mounting height of luminaires shall be not less than 35 feet (11 m) above the roadway, and as shown in the contract documents. The Contractor shall determine pole length by field measurement to obtain specified mounting height. Poles shall be placed outside the normal shoulder line at the approximate locations shown in the contract documents.

Add as the fourth paragraph:

Clearance for overhead wiring shall be a minimum of 18 feet (5.5 m). Auxiliary poles used to furnish power to floodlighting shall be offset 30 feet (9 m) from the traveled way unless there are right-of-way restrictions.

Add as first and second sentence of fifth paragraph:

Above ground lighting circuits shall be aluminum or A.C.S.R. triplex. Underground lighting circuits shall be type U.S.E. or U.F.

2528.09, Temporary Attenuators.

Replace the title and the entire article:

2528.09, Temporary Crash Cushions.
Section 2509 shall apply.

2528.10, Flaggers.

Replace the third and fourth paragraphs:

Flagger operations, equipment, and apparel shall conform to the Iowa DOT Flagger's Handbook.

When nighttime flagging is required, auxiliary lighting shall be provided to illuminate the flagging stations according to the current Iowa DOT Flagger's Handbook. This lighting shall be set up in such a manner to minimize glare to motorists. The cost of furnishing nighttime flagging stations shall be included in the lump sum price bid for Traffic Control.

2528.11, Limitations.

Replace the third paragraph:

During non-working hours, traffic control devices intended for working hours only shall be removed, covered, or turned down unless a drop-off or physical obstruction remains within 15 feet (4.5 m) of a lane open to traffic. Signs or barricades are not required for work beyond 15 feet (4.5 m) of a lane open to traffic. When traffic control devices are no longer needed, they shall be removed.

Replace the fourth and fifth paragraphs:

~~At night, workers shall wear ANSI 107 Class 2 apparel if they are within 15 feet (4.6 m) of an open lane of traffic, unless they are shielded by temporary barrier rail or inside a vehicle cab. After November 24, 2008, a~~All personnel in the highway right-of-way shall wear ANSI 107 Class 2 apparel at all times when exposed to traffic or construction equipment.

Add as the eighth paragraph:

Modifications to the Traffic Control Plan shall be reviewed and approved by the Engineer prior to any changes being made. Sign spacing may be modified by the Engineer to meet existing field conditions or to prevent obstruction of the motorist's view of permanent signing.

2528.12, A, 3, Temporary Attenuators.

Replace the title and the entire article:

3. Temporary Crash Cushions.
Article 2509.04 shall apply.

2528.12, A, 6, a, Pilot Cars.

Replace the entire article:

a. The pilot car shall be needed and used as part of preplanned work that is started that day and is intended to proceed for a major part of the day. If used less than 4 hours in a calendar day, the operation will be counted as a half-day. If a pilot car is used for more than 16 hours in a calendar day, the pilot car will be counted as 2 days.

2528.12, A, 6, b, Pilot Cars.

Replace the entire article:

b. Other pilot cars shall be needed and used for at least 1 hour during the day, perhaps intermittently, and this shall be the primary duty of the employee. If used less than 4 hours in a calendar day, the pilot car will be counted as a half-day.

2528.12, A, 7, a, Flaggers.

Replace the entire article:

a. The flaggers shall be needed and used as part of preplanned work that is started that day and is intended to proceed for a major part of the day. If used less than 4 hours in a calendar day, the flagger will be counted as a half-day.

2528.12, A, 7, b, Flaggers.

Replace the entire article:

b. Other flaggers shall be needed and used for at least 1 hour during the day, perhaps intermittently, and this shall be the primary duty of the employee. If used less than 4 hours in a calendar day, the flagger will be counted as a half-day. If a flagger is used for more than 16 hours in a calendar day, the flagger will be counted as 2 days.

2528.12, A, 8, Monitoring With Incident Response.

Delete the second sentence of the first paragraph:
~~Additional personnel required by the Engineer to provide additional traffic monitoring of CMS operation will be measured in calendar days per person needed.~~

Add as the second paragraph:
Additional Incident Response Personnel required by the Engineer to provide CMS operation will be measured in calendar days per person needed.

2528.12, B, 3, Temporary Attenuators.

Replace the title and the entire article:

3. Temporary Crash Cushions.
Article 2509.04 shall apply.

2528.13, A, 2, Temporary Barrier Rail.

Add as the second paragraph:
Maintenance and repair of temporary barrier rail shall be incidental to Temporary Barrier Rail.

2528.13, A, 3, Temporary Attenuators.

Replace the title and the entire article:

3. Temporary Crash Cushions.
Article 2509.05, A, shall apply.

2528.13, A, 5, Temporary Floodlighting.

Add as second sentence of the article:
This payment shall be full compensation for furnishing, installing, maintaining and servicing the temporary floodlighting units, all costs for electrical energy, and the cost of removing all lighting materials from the construction site.

2528.13, A, 8, Monitoring With Incident Response.

Replace the first sentence of the second paragraph:
For the number of calendar days that Additional Incident Response Personnel, such as for CMS operation required by the Engineer, are used, the Contractor will be paid the contract unit price per person per calendar day.

2528.13, B, 3, Temporary Attenuators.

Replace the title and the entire article:

3. Temporary Crash Cushions.
Article 2509.05, A, shall apply.

Section 2529

2529.02, A, Hot Asphalt Mixture.

Add as the second sentence:
Unless stated elsewhere in the contract documents, the Performance Graded asphalt binder shall be PG 64-22.

2529.02, B, Portland Cement Concrete.

Delete the second paragraph:
~~Class M mixtures with a minimum 5 hour cure time shall not contain fly ash.~~

2529.02, B, 1, Slump.

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

2529.02, B, 3, Temperature.

Replace the first paragraph:
The temperature of Full Depth Portland Cement Concrete patching material, as delivered to the job site, shall be as required in Paragraph 4. Heating of water, aggregate, or both, may be necessary to meet this requirement. The cost of heating shall be considered incidental to patching.

2529.02, B, 4, Cement.

Replace the entire article:
Cement for Class M mixes shall meet requirements of Section 4101.

The cement types and maximum allowable substitution rates shall be as follows:

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 (24°C) 80°F (27°C)*
10 Hour	Type I, Type II Type IS	10% Fly Ash 0% Fly Ash	65°F (18°C) 70°F (21°C)*

* When a Type A Mid Range water reducing admixture is used, the minimum mix temperature shall be that required when Type I/II cement is used.

Add as the third paragraph:
The maximum substitution for Type IS shall not exceed 25%.

2529.02, B, 6, Water Reducer.

Replace the entire article:
A Type A Mid Range water reducing admixture may be used at the Contractor's option. It shall be one listed in Materials I.M. 403, and use shall be at the dosage recommended by the manufacturer.

2529.02, B, 7, Aggregate Durability.

Replace "Article 4115.04, C" with "Article 4115.04".

2529.02, B, 8, Transit Mix Concrete Containing Type I or Type II Cement.

Replace the title and the first sentence:

8. Transit Mix Concrete.
Transit Mix Concrete shall be from a plant from which the concrete can be delivered and placed within 60 minutes from the start of mixing.

Add as the last sentence:
The concrete shall be placed within 30 minutes after introduction of calcium chloride.

2529.02, B, 9, Concrete Mixtures.

Add as the last sentence:
The Engineer may waive the use of calcium chloride on patches cured longer than 10 hours.

2529.02, E, Subbase.

Replace "Article 4121.01, A" with "Section 4121".

2529.02, B, 10, Curing and Opening Time.

Replace the title and the entire article:

10. Dowel Bars and Tie Bars.
Dowel bars shall be epoxy coated, meeting the requirements of Article 4151.02, B. Tie bars shall be cut from reinforcing bars which are epoxy coated as specified in Article 4151.03, B.

2529.04, B, Full Depth PCC Finish Patches, With or Without Dowels.

Replace the entire article:
This applies to PCC finish patches for jointed PCC pavement, including composite sections of resurfaced PCC pavement.

1. Patches With Dowels.
The edges of proposed patches shall be sawed full depth with a blade saw.

2. Patches Without Dowels.
The transverse edges of proposed patches shall be sawed to a depth of 1 1/2 inches (40 mm) with a blade saw. The pavement shall be severed by a full depth cut with a saw or concrete cutter approximately 1 1/2 inches (40 mm) inside the original 1 1/2 inch (40 mm) transverse saw cut. Edges at centerlines shall be sawed with a blade saw.

After severance is made, pavement in removal areas may be broken by use of a drop hammer, hydrohammer, or other heavy equipment. This work shall be done in a manner to not damage concrete that is to remain. Heavy equipment shall not be used adjacent to new concrete until the specified curing is completed.

Preparation of the patch edges shall be completed using equipment no heavier than a 15 pound (7 kg) air chisel. A 30 pound (14 kg) air chisel may be used if its use does not result in significant undercutting of the pavement. The finished transverse edge is to be sawed to 1 1/2 inches (40 mm) as specified above. The ledge at the bottom of the 1 1/2 inch (40 mm) saw cut shall be removed to the bottom of the pavement at a uniform constant taper toward the patch interior. This removal shall be within 0 to 1 1/2 inches (0 mm to 40 mm) from vertical and shall have a roughened surface to promote interlock. Undercutting shall be avoided. If spalling at the top edge or undercutting continues, the Engineer may withdraw permission to use equipment heavier than a 15 pound (7 kg) air chisel.

2529.05, Restoring Subbase or Subgrade for Full Depth Finish Patches.

Replace the second and third paragraphs:

When the existing subgrade, base, or subbase is damaged during removal operations and subbase placement is not required, repairs shall be made at the Contractor's expense. Overdepth removal may be replaced with granular subbase material or the patching mixture. When the granular subbase material cannot be properly drained, the overdepth removal shall be replaced with the patching mixture.

2529.06, B, PCC Finish Patches with Dowels.

Delete the fourth and fifth sentences of the first paragraph:

~~The dowels shall be epoxy coated, meeting requirements of Article 4151.02, B. The tie bars shall be cut from reinforcing bars which are epoxy coated as specified in Article 4151.03, B.~~

2529.09, Placing Full Depth Portland Cement Concrete Finish Patches.

Replace the third unindented paragraph and the indented paragraph that follows it:

After the concrete has been finished and surface water has disappeared, the concrete shall be cured. Placement of curing materials shall occur no later than 20 minutes after completion of finishing operations. Concrete shall be cured by completely covering with an insulating blanket type cover. This cover shall consist of a layer of closed cell polystyrene foam protected by at least one layer of plastic film, rated by the manufacturer with a minimum R-value of 0.5 (0.08805 for metric units). The blanket-type cover shall be completely covered with insulation board. The board shall be cellulosic fiber sheathing with a nominal 3/4 inch (19 mm) thickness. The board may be wrapped with plastic film to protect it from rain. The board shall be placed over the patch and adjacent surface and held tightly in place with weights to retain all possible heat in the concrete.

Add as the fourth paragraph:

PCC patches placed on multi-lane sections shall be cured a minimum of 10 hours before opening to traffic. PCC patches placed on two-lane sections shall be cured a minimum of 5 hours before opening to traffic. These restrictions may be modified in the plans or by the Engineer for specific situations.

Replace the last paragraph:

For patches finished flush with the adjacent pavement, and not to be covered with HMA, C and CD joints and the edged reservoir formed by edging or sawing shall be sealed in accordance with Article 2301.25, except sand cleaning will not be required.

Delete the sixth and seventh paragraphs:

~~C and CD joints shall be sawed. Timing is critical for this operation. It shall be done as soon as possible without excessive raveling of the saw cut edges.~~

~~For patches finished flush with the adjacent pavement, and not to be covered with HMA, C and CD joints and the edged reservoir formed by edging or sawing shall be sealed in accordance with Article 2301.25, except sand cleaning will not be required.~~

2529.10, Smoothness.

Replace the third sentence of Article A:

For each patch added by the Engineer that is greater than 50 feet (15 m) long, the Contractor will be paid $500 in addition to the appropriate unit prices involved.

2529.12, Limitations of Operations.

Replace the first paragraph:

All operations shall be conducted with minimum inconvenience to traffic. Traffic shall be maintained during construction operations unless the road is closed.

On two-lane roads, patching shall be conducted on only one lane at a time when traffic is maintained.

For roads with multiple lanes in each direction, the work area may include one lane each direction or as allowed by the traffic control details. Where patching is required in adjacent lanes at the same location the median lane shall be completed first.

Add as the fourth paragraph:

The Contractor shall place Stop Sign Rumble Strips, when included in the plans, prior to opening roadway sections to traffic.

Replace the seventh paragraph:

When PCC patches without calcium chloride are constructed, two drums meeting the requirements of Article 2528.03, B shall be placed 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 (45 m).

2529.13, B, CD and CT Joints.

Replace the third sentence:

Each joint is for one lane width. Partial lane width joints will be counted as one lane width for payment purposes.

2529.14, A, 2, Full Depth Finish Patches, by Area.

Replace the second paragraph:

When the average thickness of the existing pavement at any one patch location varies from the thickness shown in the plans, the square yard (square meter) patching quantity will be adjusted per the following chart. Quantities will be increased when pavement thickness is greater than shown in the plans and decreased when less than shown in the plans.

% Change of Thickness	% Change of Quantity
0 to 10	0
> 10 to 20	10
> 20 to 30	15
> 30	20

2529.14, E, Removal of Anchor Lugs.

Replace “$400” with “$600” in the third sentence.

Section 2530

2530.03, B, 2, Class B Patching Material.

Replace the third sentence of the first indented paragraph:

When calcium chloride is used in a mixture, the concrete shall be placed within 30 minutes after the introduction of the calcium chloride.

Replace the fourth sentence of the indented paragraph:

Coarse aggregate shall meet the requirements of Section 4115 and Section 4109, Gradation No. 5.

2530.03, B, 4, a, Slump.

Replace “(100 m)” with “(100 mm)” in the last sentence of the first paragraph.

Add as the second paragraph:

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

2530.03, B, 4, c, Temperature.

Replace the first sentence of the paragraph:

The temperature of Class B patching material, as delivered to the job site, shall be as required in paragraph d.

2530.03, B, 4, d, Cement.

Replace the entire article:

Cement for Class M concrete mixtures shall meet the requirements of Section 4101.

The cement types and maximum allowable substitution rates shall be as follows:

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 (24°C) 80°F (27°C)*
C	Type I, Type II Type IS	10% Fly ash 0% Fly Ash	65°F (18°C) 70°F (21°C)*

* When a Type A Mid Range water reducing admixture is used, the minimum mix temperature shall be that required when Type I/II cement is used.

Add as the third paragraph:

The maximum substitution for Type IS shall not exceed 25%.

2530.03, B, 4, e, Calcium Chloride.

Replace the two tables following the first paragraph:

PROPORTIONS FOR 32% CALCIUM CHLORIDE SOUTIONS (ENGLISH)		
Type of Solid Calcium Chloride	Pounds Solid per gallon of water	Solution produced per gallon of water
Type 1 - Regular Flake (77% material) Type 2 - Concrete Flake or pellets (94% material)	~~7~~ 6 ~~5~~ 4.5	~~1.35~~ 1.3 ~~1.18~~ 1.2

PROPORTIONS FOR 32% CALCIUM CHLORIDE SOUTIONS (METRIC)		
Type of Solid Calcium Chloride	Grams Solid per liter of water	Solution produced per liter of water
Type 1 - Regular Flake (77% material) Type 2 - Concrete Flake or pellets (94% material)	~~840~~ 720 g/L ~~600~~ 540 g/L	~~1.35~~ 1.3 ~~1.18~~ 1.2

Replace the second paragraph:

The solution concentration will be checked by the Engineer with a hydrometer according to Materials I.M. 373. The solution shall be added at the rate of ~~2.75~~ 3.0 gallons per cubic yard (~~13.6~~ 14.8 L/m^3) of concrete. Calcium chloride solutions of different concentrations may be approved by the Engineer, provided appropriate adjustments in the total concrete composition are made.

Delete the second sentence of the third paragraph:

~~The calcium chloride will crystallize out of a 32% solution at 20°F (7°C), so the solution must be maintained at a higher temperature at all times.~~

2530.03, B, 4, f, Water Reducer.

Replace the entire article:

A Type A Mid Range water reducing admixture may be used at the Contractor's option. It shall be one listed in Materials I.M. 403, and use shall be at the dosage recommended by the manufacturer.

2530.03, B, 4, g, Aggregate Durability.

Replace “Article 4115.04, C” with “Article 4115.04”.

2530.03, B, 4, h, Transit Mix Concrete Containing Type I Cement.

Replace the title and the first sentence:

h. Transit Mix Concrete.
Transit Mix Concrete shall be from a plant from which the concrete can be delivered and placed within 60 minutes from the start of mixing.

2530.03, B, 4, i, Prepackaged Mixture.

Replace “Article 4115.06” with “Article 4115.05” in the second sentence of the paragraph.

2530.05, A, 2, Placing HMA Patch Material.

Replace the second sentence of the second paragraph:
If the patch becomes distorted beyond the smoothness requirements for any reason, the Contractor shall smooth the surface within 1 working day, by blading, scraping, filling, or by other means.

2530.05, B, 3, b, Protecting and Curing.

Replace the first paragraph:
Class B patching material shall be cured as specified in Article 2529.09.

Replace “Article 2529.01” with “Article 2529.02” in the second paragraph.

2530.05, B, 3, c, Protection and Curing.

Replace the first sentence of the first paragraph:
Class C patching material shall be cured according to Article 2529.09.

2530.09, A, Partial Depth PCC Finish Patches.

Replace the second paragraph:
When parts of PCC partial depth finish patches are constructed to full depth at the direction of the Engineer, the Contractor will be paid for the areas of those parts a 2.0 times the contract price per square foot (square meter) for partial depth PCC patches.

Section 2531

2531.03, Construction.

Add as the fourth paragraph:
In order to match the outside edge of the pavement, adjacent paved areas (for example, shoulders, curb and gutter, turn lanes, tapers, paved crossovers, and so forth) shall be milled to minimize vertical projections.

2531.07, Method of Measurement.

Replace the second paragraph:
Adjacent paved areas milled to minimize vertical projections will not be measured for payment.

Section 2532

2532, Pavement Surface Repair (Diamond Grinding).

Replace the entire section:

2532.01 DESCRIPTION.
This work involves grinding an existing PCC pavement surface for profile improvement, for use as a traffic surface, using a diamond grinder. Grinding and texturing shall be performed at the locations shown in the contract documents except for bridge decks, in which case the complete deck shall be ground according to Article 2532.03, B.

The existing surface and the coarse aggregate will be described in the contract documents.

This work may involve grinding a newly constructed deck surface for providing temporary surface texture, using a diamond grinder. Grinding shall be performed prior to opening the deck segment to traffic.

2532.02 EQUIPMENT.
Grinding and texturing shall be done utilizing diamond blades, mounted on a self propelled machine that has been designed for grinding and texturing of concrete surfaces. The equipment shall be such that it will not cause strain or damage to the underlying pavement or bridge deck. Grinding and texturing equipment that causes excessive ravels, aggregate fractures, spalls, or disturbance of the transverse and/or longitudinal joints will not be permitted.

Grinding equipment shall have a minimum effective head width of 36 inches (900 mm).

2532.03 CONSTRUCTION.
Pavement surface repair (diamond grinding) shall consist of grinding and texturing the concrete surface in a longitudinal direction.

The ground surface shall be of uniform texture. When more than one grinding machine is used in the same travel lane, the blade segment thicknesses, blade spacings, and blade diameter shall be similar so that the texture of the ground surface is reasonably uniform across the lane.

Both the land area and the texture depth shall be within the specified ranges to be in compliance. It may be necessary to adjust the blade spacing during a project to stay within specified ranges.

For multiple passes, the equipment shall be carefully controlled to minimize the overlap. Overlaps shall not exceed 1 inch (25 mm).

The transverse slope of the ground concrete surface shall be uniform to a degree that there are no depressions or misalignment of slope greater than 1/4 inch in 12 feet (6 mm in 3.6 m) when tested by stringline or straightedge placed perpendicular to the center line.

In order to match the outside edge of the pavement, adjacent paved areas (for example, shoulders, curb and gutter, turn lanes, tapers, paved crossovers, and so forth) shall be ground to minimize vertical projections.

The Contractor shall be responsible for quality control of the texture. The Engineer will conduct random Quality Assurance inspections.

A. PCC Pavement.
Substantially the entire surface area of the pavement shall be ground and textured until the pavement surface on both sides of the transverse joints and all cracks are in the same plane and meet the smoothness required. In each lane, at least 95% of the area in each 100 foot (30 m) section shall have a newly ground surface.

Grinding shall be performed in a longitudinal direction. All construction traffic entering or leaving the work area shall move in the direction of traffic of the open lane. Grinding shall begin and end at lines normal to the pavement center line within any one ground area and at the project limits. This will not be required at the end of each shift. Good transverse drainage shall be maintained at all times.

The grinding head shall be assembled to produce the following tolerances on pavements with the indicated coarse aggregates:

(ENGLISH)	Limestone	Gravel
Blade segment thickness Land area between grooves*	0.130" maximum 0.100" to 0.135"	0.130" maximum 0.080" to 0.110"
Texture depth**	Target of 1/16" with average between 1/32" to 3/32"	
(METRIC)	**Limestone**	**Gravel**
Blade segment thickness Land area between grooves*	3.30 mm maximum 2.5 mm to 3.4 mm	3.30 mm maximum 2 mm to 2.75 mm
Texture depth**	Target of 2 mm with average between 1 mm to 2.5 mm	
* Based on an average of a minimum of ten measurements across the ground width for one pass. ** Based on an average of a minimum of six measurements across the ground width for one pass.		

A test area 500 feet (150 m) in length and the width of the grinding head will be allowed for each new or restacked head, provided a surface texture in reasonable conformance with the specification is being produced.

B. Bridge Deck.
The entire surface of the bridge deck shall be ground and longitudinally grooved in accordance with Article 2412.06, A.

The grinding head shall be assembled to produce the following tolerances on bridge decks:

(ENGLISH)	Limestone
Blade segment thickness Land area between grooves*	0.130" maximum 0.100" to 0.125"
Texture depth**	Target: 1/8" ± 1/32"
(METRIC)	**Limestone**
Blade segment thickness Land area between grooves*	3.30 mm maximum 2.5 mm to 3.4 mm
Texture depth**	Target: 3 mm ± 1 mm
* Based on an average of a minimum of ten measurements across the ground width for one pass. ** Based on an average of a minimum of six measurements across the ground width for one pass.	

2532.04 SMOOTHNESS.

A. PCC Pavement.
The pavement will be partly profiled on the initial trace by the Engineer using the procedure described in Article 2316.02. The average profile index for each area will be shown in the contract documents. The bidder is also advised that all profilograph information is available for inspection at the Office of Contracts, by a request to the Contracts Engineer. After the contract is awarded, the profilograph information will be available from the Engineer. This information represents a summary of conditions found to exist at the time the survey was made. The availability of this information will not constitute a guarantee that a profile other than that indicated will not be encountered at the time of grinding.

The Contractor shall provide a control profilograph trace as described in Article 2316.02 prior to performing any grinding work. This control trace will be used to identify the required smoothness for the project. Each segment of the finished ground surface shall have a final profile index of 10 inches per mile (160 mm/km) or less, and shall not include any bumps exceeding 0.5 inches in 25 feet (13 mm in 8 m). Prior to diamond grinding, the Contractor shall identify depressed pavement areas and localized areas with excess faulting greater than 1 inch (25 mm). The Contractor and Engineer shall review those areas to determine the limits for exclusion from the profile index calculation.

The ground surface shall be tested and evaluated in accordance with Section 2316. Incentives for pavement smoothness will not apply.

B. Bridge Deck.
For bridge decks the smoothness requirements of Section 2428 shall be met prior to performing the texturing. After texturing, the bridge deck shall be tested again in accordance with Article 2428.03 and the resulting profile index shall not exceed the corrected profile index prior to the texturing.

2532.05 LIMITATIONS.
When nighttime work is required, lighting shall be included at each work area. Lighting shall not glare into oncoming motorists.

Removal of all slurry or residue resulting from the grinding operations shall be continuous and shall not be deposited on the slab or shoulder. Pavement and paved shoulders shall be left in a clean condition. Residue from grinding operations shall not be permitted to flow across lanes occupied by public traffic or to flow into gutters or other drainage facilities. This residue may be spread on the foreslope or removed in accordance with Article 1104.08.

A. PCC Pavement.
Uncompleted sections may be opened to traffic without completion of grinding across an entire lane.

During nighttime operations, grinding shall progress in the direction with normal traffic in the lane being ground.

When the following work is included in the contract, the operations shall be sequenced in the following order:

1. undersealing
2. longitudinal subdrains
3. patching
4. installation of retrofit load transfer
5. diamond grinding
6. crack and joint sealing

B. Bridge Deck.
Work under this specification shall be completed and smoothness requirements met prior to opening to traffic.

2532.06 METHOD OF MEASUREMENT.

A. PCC Pavement.
The quantity of pavement ground, in square yards (square meters), will be the quantity of Pavement Surface Repair, of the type specified, shown in the contract documents.

Adjacent paved areas ground to minimize vertical projections will not be measured for payment.

B. Bridge Deck.
The quantity of bridge deck ground and textured, in square yards (square meters), will be the quantity of Pavement Surface Repair, of the type specified, shown in the contract documents.

2532.07 BASIS OF PAYMENT.
For the number of square yards (square meters) of Pavement Surface Repair, (Grinding Limestone) or (Grinding Gravel), completed and measured as provided above, the Contractor will be paid the contract unit price per square yard (square meter). This payment shall be full compensation for furnishing all equipment, materials, and labor to grind the concrete surface and test for smoothness according to the contract documents, including removal of slurry and residue from this operation.

Section 2533

2533.01, Description.

Replace the first sentence of the first paragraph:

Mobilization shall consist of preparatory work and operations for all items under the contract, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, buildings, and other facilities necessary for work on the projects; and for all other work or operations which must be performed or costs incurred prior to beginning work on the various items on the project site.

Section 2535

2535.06, B, Backfill.

Replace the first paragraph:

Granular backfill furnished will be measured in cubic yards (cubic meters) or in tons (megagrams), as indicated in the contract documents and as provided in Article 2402.12, D.

Section 2536

2536.01, Description.

Replace the first sentence:

This work is for removal, transportation, and disposal of asbestos from buildings and structures scheduled for demolition or renovation.

2536.02, Bidding.

Replace the entire article:

Bids will be received for this project from bidders who hold a valid permit for this type of work issued by the Iowa Workforce Development, Labor Services Division, and from bidders who can provide documentation the work will be subcontracted to a contractor holding a valid permit.

2536.03, Identification of Work.

Replace the first sentence of the first paragraph and the first sentence of the second paragraph:

The buildings and structures will have been inspected by the Contracting Authority for the presence of asbestos.

Access to the buildings and structures by prospective bidders will be allowed.

2536.05, Asbestos Removal.

Replace the entire article:

The Contractor shall remove, transport, and dispose of all asbestos specified in the contract documents. This work shall be in compliance with current applicable local laws, rules, regulations, and ordinances and requirements of the U.S. EPA, the Iowa DNR, and the Iowa Workforce Development. The Contractor is expected to be fully knowledgeable of these requirements.

The Contractor shall provide workers licensed and trained in asbestos abatement in accordance with 875 Iowa Administrative Code, Chapter 155. These workers shall be on site during the asbestos removal work and evidence that the required training has been accomplished by these persons shall be available for inspection during normal business hours.

This work shall be limited to asbestos removal. Salvage will not be permitted. Removal of pipes, ducts, or other items as units will be permitted only if future demolition is intended and the removal of these items is necessary for asbestos removal.

Some of the asbestos may not be friable. It may be possible to remove and dispose of this material in a manner to maintain its non-friable condition.

The Contractor shall monitor and test for air borne asbestos particles, during working hours, in accordance with the current EPA and Iowa Labor Services Division regulations. The Contractor shall conduct the operations to keep air borne particles within the established regulation limits. The Contractor shall furnish the

Engineer copies of correspondence, test results, recommendations, and other information to document the Contractor's compliance with these requirements.

When asbestos removal is completed, all work will be inspected for the presence of asbestos debris. Removal and cleaning shall continue until air monitoring clearance testing indicates a level of air borne fibers is equal to or less than the requirements in the current EPA and Iowa Labor Services Division regulations. The Engineer shall be notified when this sampling is started. The Contractor shall provide documentation to the Engineer that the level of air borne fibers, after the work is completed, is equal or less than the requirements in the current EPA and Iowa Labor Services Division regulations.

Test results for all air monitoring tests shall be furnished to the Engineer within 24 hours after the sampling has been completed.

The Contractor shall comply with current EPA, State, and Federal regulations and shall at all times take necessary precautions and provide necessary equipment to all persons employed on the project.

2536.06, Reporting.

Replace the first sentence of the first paragraph:
The Contractor shall give a minimum of 14 calendar days advance notification of the work to the Iowa DNR and the Iowa Labor Services Division in accordance with 40 CFR Part 61, Subpart M and other applicable regulations concerning asbestos removal work.

Section 2537

2537.01, B, 2, Remediation of Petroleum Contaminated Soil.

Replace the entire item:
2. Transport, spread, incorporate and turn contaminated soil at remediation areas designated or approved by the Engineer, or transport and dispose of contaminated soil at an approved solid waste landfill.

2537.01, Scope of Work.

Replace “Chapters 121 and 135” with “Chapters 120 and 135” in the last unindented paragraph.

2537.02, A, Contamination.

Replace the article:
Contamination or contaminated shall mean the presence of petroleum hydrocarbon constituents at concentration levels at or above those listed in Iowa DNR’s Tier 1 Look-Up Table in 567 IAC, Chapter 135. Soils with constituent concentrations below these levels will be classified “non-contaminated”.”

2537.02, C, Land Application.

Replace the first sentence:
Land application shall mean the act or process of placing, leveling to a uniform thickness and application rate, incorporation, and remediation of petroleum contaminated soil to a level of constituent concentration less than those listed in the Tier 1 Look-Up Table in 567 IAC, Chapter 135.

2537.02, D, Mixing.

Replace the title and the first sentence:

D. Incorporation.
Incorporation means the process of mixing the contaminated soil after placement to provide a loose and divided soil texture and leveling at the remediation site.

2537.02, E, Remediation of Contaminated Soil.

Replace the second sentence:

Once contaminated soil has been land applied, it must remain in place until the levels of contamination are below those listed in the Tier 1 Look-Up Table in 567 IAC, Chapter 135.

2537.02, F, Tank System.

Replace the second sentence:
A tank system includes, but is not limited to: fill and vent piping, product delivery piping, product pumps, product dispensers, leak detection piping, and leak detection wells.

2537.03, Notification.

Replace the first sentence:
Based on the Contractor's work schedule, the Engineer will complete necessary Iowa DNR regulatory notifications for tank removals and additional excavation for petroleum contaminated soil.

2537.03, B, Remediation of Petroleum Contaminated Soil.

Replace the entire article:
The Contractor shall provide and submit the Iowa DNR's "Land Application Notification" form to the Iowa DNR with a copy sent to the Engineer at least 30 calendar days prior to beginning excavation activities.

The Engineer will waive this notification if:

1. Petroleum contaminated soil will be taken to an approved solid waste landfill.

2. The remediation notification was separately identified and included with the 45 calendar day notification for removal of underground tanks.

3. The excavated material will be stockpiled, pending further remediation activities. In this case, submission of the Iowa DNR notification will be required at least 30 calendar days prior to removing the soil from the stockpile for land application.

2537.04, B, Remediation of Petroleum Contaminated Soil.

Replace the article:
The location for an excavation and any Engineer-designated remediation area, or approved solid waste landfill will be designated in the contract documents. The Contractor may propose an alternate remediation area, subject to the requirements of 567 IAC, Chapter 120 and the Engineer's approval. Contaminated soil shall be stored, applied, incorporated, and turned in accordance with the landfarm operating requirements in 567 IAC, Chapter 120. If a remediation area is located within a designated borrow or staged construction area, the Contractor shall coordinate with the other project contractors and be prepared to stage land application operations so the remediation area remains available for construction project requirements. The contract documents may contain other specific containment requirements.

2537.06, B, Remediation of Petroleum Contaminated Soil.

Replace the third sentence:
Excavation shall continue until Organic Vapor Monitoring (OVM) readings and laboratory tests indicate remaining soil is at, or below, Iowa DNR's Tier 1 Look-Up Table levels published in 567 IAC, Chapter 135, or when directed by the Engineer to stop.

2537.07, Sampling and Testing for Petroleum Contamination.

Replace the article:
All sampling and environmental site work shall be supervised by a Groundwater Professional certified by the Iowa DNR in accordance with 567 IAC, Chapter 134. The Groundwater Professional shall obtain, prepare, and submit samples for laboratory analysis. This work shall be in a manner consistent with standard practices for sampling and testing of petroleum contamination and 567 IAC, Chapter 135. Analysis of samples shall be by a laboratory certified by Iowa DNR pursuant to 567 IAC, Chapter 83.

2537.07, A, Removal of Underground Tanks, Sampling and Testing.

Replace the first paragraph:
After a tank has been removed, the Groundwater Professional shall obtain soil and groundwater samples and submit them for laboratory analysis as required by 567 AIC, Chapter 135.

2537.07, A, 1, Soil Samples.

Replace the first paragraph:
The locations for sampling in the areas where the tanks and the associated piping have been removed shall be as defined in 567 IAC, Chapter 135.

2537.07, A, 2, Ground Water Sample.

Replace the article:
Sampling locations shall be as outlined in 567 IAC, Chapter 135. Groundwater sampling wells shall be:

a. Installed and closed by a Certified Water Well contractor registered in the State of Iowa pursuant to 567 IAC, Chapter 82.

b. Cased wells constructed in accordance with 567 IAC 110.11.

2537,07, B, Remediation of Petroleum Contaminated Soil, Sampling and Testing.

Replace paragraph 1:

1. In the judgment of the Groundwater Professional, remaining soil contamination is below Iowa DNR's Tier 1 Look-Up Table levels, or

2537.08, A, Removal of Underground Tanks.

Replace the article:
The Contractor shall submit a completed Tank Closure Report to the Engineer within 30 calendar days of completion of the tank removal. This report shall comply with the requirements of 567 IAC, Chapter 135. In addition, the report shall include the location of all tanks, piping, sampling locations, and excavation limits referenced to station and offset distance from mainline or side road survey center line on the tank closure site map. The use of a Professional Land Surveyor licensed in the State of Iowa is not required for the development of a tank closure site map.

The Contractor shall complete and return to the Engineer a written certification of destruction for all tanks which have been removed. "Certificate of Destruction" forms are available from the Engineer.

2537.10, A, 1, Sampling and Testing for Petroleum Contamination.

Replace the second sentence:
This payment shall be full compensation for all labor, equipment, sample preparation, transportation, testing to comply with applicable Iowa DNR regulations, and disposal of all contaminated soil from sampling events.

2537.10, B, Remediation of Petroleum Contaminated Soil.

Replace the second sentence of the first paragraph:
This payment shall be full compensation for all labor, equipment, and materials required to excavate, transport, spread, incorporate and turn petroleum contaminated soil in compliance with Federal, state, and local regulations; Contractor's employee health and safety requirements; furnishing, placing, and removing safety fence; final grading and seeding of the excavated area; and providing the services of a Groundwater Professional.

Replace the third paragraph:
The contract unit price for Remediation of Petroleum Contaminated Soil shall include turning the petroleum contaminated soil once a month for the first three months during landfarm season as defined in 567 IAC,

Chapter 120. Additional turning directed by the Engineer will be paid for in accordance with Article 119.03, B. Field sampling and testing using OVM equipment will be considered incidental to this item.

Section 2540

2540.01, Description.

Replace the second and third sentences:
The width to be milled will be designated in the contract documents.

2540.06, Method of Measurement.

Replace the entire article:
Longitudinal Joint Repair will be measured to the nearest 0.1 foot (0.1 m) on the basis of 6 inch (150 mm) width of repair.

Section 2541

2541.01, Description.

Add as the second paragraph:

Crack and joint cleaning and sealing is intended to address transverse (thermal) cracking, longitudinal cracking, joint reflective cracking, low severity fatigue cracking, and low severity block cracking. Crack and joint cleaning and sealing is not intended to clean or seal moderate or high severity block cracking, moderate or high severity fatigue cracking, edge cracking, alligator cracking, or mat slippage cracking. Definitions for these pavement distress types can be found in the 'Distress Identification Manual for the Long-Term Pavement Performance Program' (Publication No. FHWA-RD-03-031, dated June 2003, web address: http://www.tfhrc.gov/pavement/ltpp/reports/03031/03031.pdf).

2541.04, A, Class I Cracks.

Replace the entire article:
Cracks and joints which have an average opening of 3/8 inch (10 mm) or less shall be routed or sawed to provide a minimum sealant reservoir of 3/8 inch (10 mm) in width by a nominal 1/2 inch (13 mm) in depth. Backer rod or clean dry sand shall be used for cracks and joints with an existing width greater than 3/8 inch (10 mm). Cracks and joints shall be cleaned of all foreign material to a depth necessary to accommodate the sealer material and the backer rod, or sand, to be used. The backer rod shall be dry when placed.

2541.06, A, Crack and Joint Cleaning and Sealing (HMA Surfaces).

Replace the first sentence:
The Engineer will calculate the number of miles (kilometers) of main line pavement and shoulders on which cracks and joints were cleaned and sealed to the nearest 0.1 mile (0.1 kilometer).

Add as the second paragraph:
Shoulders 4 feet (1.2 meters) or less in width will not be measured separately for payment.

2541.07, A, Crack and Joint Cleaning and Sealing (HMA Surfaces).

Replace the second sentence:
This payment shall be considered full compensation for all labor, equipment, and materials (except for sealer, but including backer rod or sand) for cleaning and sealing cracks and joints.

Add as the third sentence:
Shoulders 4 feet (1.2 meters) or less in width shall be considered incidental to the price bid for Crack and Joint Cleaning and Sealing (HMA Surfaces).

2541.07, B, Sealer Material (HMA Surfaces).

Replace the first sentence:

For the number of pounds (kilograms) measured, the Contractor will be paid the predetermined contract unit price per pound (kilogram).

Section 2542

2542.01, Description.

Add as the second paragraph:

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

2542.06, Limitations.

Replace the first sentence of the first paragraph:

When other work is included in the contract, the operations shall be sequenced so that undersealing, longitudinal subdrains, patching, ~~grinding or milling,~~ installation of retrofit load transfer, grinding or milling, and crack and joint sealing are done in the area in that order.

2542.07, A, Crack and Joint Cleaning and Sealing (PCC Pavement).

Replace the first sentence**:**

The Engineer will calculate the number of miles (kilometers) of main line pavement and shoulders on which cracks and joints were cleaned and sealed to the nearest 0.1 mile (0.1 km).

Add as the second paragraph**:**

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

2542.08, A, Crack and Joint Cleaning and Sealing (PCC Pavement).

Add as the third sentence:

Shoulders 4 feet (1.2 meters) or less in width shall be considered incidental to the price bid for Crack and Joint Cleaning and Sealing (PCC Pavement).

2542.08, B, Sealer Material (PCC Pavement)

Replace the first sentence:

For the number of pounds (kilograms) measured, the Contractor will be paid the predetermined contract unit price per pound (kilogram).

Section 2544

2544.02, Materials.

Replace "Section 4125" with "Section 4124" and "Section 4112" with "Section 4125" in the first paragraph following the lettered paragraphs.

2544.05, Limitations.

Replace the second sentence of the first paragraph:

Except when this work is in preparation for a seal coat or slurry seal, crack filling will not be allowed on pavements from May 15 to September 30.

Section 2546

2546, Gabions and Mattresses.

Replace the title of the section:
Gabions and Revet Mattresses.

2546.01, Description.

Replace the first paragraph:
This specification covers materials and construction of baskets for Gabions and Revet Mattresses. The baskets shall be rectangular, variable in size, and manufactured either from:

A. Welded wire fabric meeting the requirements of ASTM A 974, Style 2, fabricated using uncoated steel wire conforming to ASTM A 853, with the fabric subsequently zinc-coated by the hot-dip process.

B. Double twisted hexagonal wire mesh meeting the requirements of ASTM A 975, Style 1 or Style 3, fabricated using soft temper galvanized steel wire, Class 3 coating, in accordance with ASTM A 641.

Gabions are intended for high strength installations in both horizontal and vertical structures. Revet Mattresses are intended for lower strength, horizontal or nearly horizontal structures. The work shall be done as shown in the contract documents and as specified herein. When specified, concrete grout shall be furnished, transported, and placed within the voids to the full width of the gabion basket.

2546.02, A, Baskets.

Replace the first and second sentences of the first paragraph:
Baskets shall be made by twisting or welding a mesh from galvanized steel wire. For gabions, the mesh opening shall not exceed 4 1/2 inches (115 mm), and its area shall not exceed 10 square inches (6450 mm^2).

Add as the second paragraph:
Twisted wire mesh for gabion baskets and revet mattresses shall be formed in a uniform hexagonal pattern with double twists so bound as to prevent unraveling. Welded wire mesh for gabion baskets shall have each connection welded to obtain a minimum average shear strength of 585 pounds (2600 N), with a minimum shear strength of 450 pounds (2000N). For revet mattresses, the minimum average shear strength of welded connections shall be 292 pounds (1300 N), with a minimum shear strength of 225 pounds (1000 N).

2546.02, A, 1, Wire.

Replace the second paragraph:
Wire for twisted wire mesh gabion baskets shall have a tensile strength of 60,000 psi to 75,000 psi (413.7 MPa to 517.1 MPa). Wire for twisted wire mesh revet mattresses shall have a tensile strength of 60,000 psi to 70,000 psi (413.7 MPa to 482.7 MPa). Wire for welded wire baskets and mattresses shall have a minimum tensile strength of 80,000 psi (550.0 MPa). Galvanizing shall be according to ASTM A 641, Class 3. Edge and selvage wire shall be made from the same material used for the wire mesh.

2546.02, A, 3, Basket Fabrication.

Replace the table after the first paragraph.

GABIONS

Dimensions, ft. (m)*			Number of Cells	Capacity
Length	Width	Height	or Compartments	yd^3 (m^3)
6 (1.8)	3 (0.9)	3 (0.9)	2	2.0 (1.5)
9 (2.7)	3 (0.9)	3 (0.9)	3	3.0 (2.3)
12 (3.6)	3 (0.9)	3 (0.9)	4	4.0 (3.1)
6 (1.8)	3 (0.9)	1.5 (0.5)	2	1.0 (0.8)
9 (2.7)	3 (0.9)	1.5 (0.5)	3	1.5 (1.1)
12 (3.6)	3 (0.9)	1.5 (0.5)	4	2.0 (1.5)
6 (1.8)	3 (0.9)	1 (0.3)	2	0.66 (0.5)
9 (2.7)	3 (0.9)	1 (0.3)	3	1.0 (0.8)
12 (3.6)	3 (0.9)	1 (0.3)	4	1.33 (1.0)

REVET MATTRESSES

Dimensions, ft. (m)*			Number of Cells	Capacity
Length	Width	Height	or Compartments	yd^3 (m^3)
9 (2.7)	6 (1.8)	0.50 (0.17)	3	6 (5.2)
12 (3.6)	6 (1.8)	0.50 (0.17)	4	8 (6.69)
9 (2.7)	6 (1.8)	0.75 (0.23)	3	6 (5.2)
12 (3.6)	6 (1.8)	0.75 (0.23)	4	8 (6.69)
9 (2.7)	6 (1.8)	1.0 (0.3)	3	6 (5.2)
12 (3.6)	6 (1.8)	1.0 (0.3)	4	8 (6.69)

*Dimensions are subject to a tolerance of ±5%

2546.02, D, Revetment Stone.

Replace the title and entire article:

~~**Revetment Stone.**~~
~~Revetment stone for filling baskets shall be broken stone or gravel boulders meeting the following requirements. All stone and boulders for the project shall be from one source or from sources similar in geological origin.~~

~~**1. Durability.**~~
~~Unless otherwise specified, the stone shall be taken from a source which does not exceed 10%, when subjected to the freezing and thawing test, Laboratory Test Method 211, Method A.~~

~~**2. Abrasion.**~~
~~The stone shall be taken from a source which does not exceed 45%, when tested in accord with AASHTO T 96, Grading A or B.~~

~~**3. Size.**~~
~~Unless otherwise specified, the stone or boulders for gabions and mattresses shall be processed so that the sizes range from 4 inches to 8 inches (100 mm to 200 mm) in nominal dimensions, and 3 inches to 5 inches (76.0 mm to 127 mm) is recommended for mattresses.~~

~~Stone sizes shall be inspected visually by a certified aggregate technician.~~

Gabion Stone.
Gabion stone shall meet the requirements of Article 4130.06.

2546.04, B, Concrete Grout for Gabions.

Replace “Article 2507.04, B” with “Article 2507.04”.

2546.05, B, Concrete Grout for Gabions.

Replace “Article 2507.05, B” with “Article 2507.05”.

Section 2547

2547, Temporary Stream Access.

Add as a new section:

2547. Temporary Stream Access

2547.01 DESCRIPTION.
This work shall consist of the construction, use, maintenance and removal of temporary structures used to provide construction access across along or into waters of the United States. Temporary structures are any features not a part of the completed project that are constructed or installed to provide access to the project site including stream crossings, causeways, pads and temporary bridges or barges. The type of structure used, if any, is at the Contractor’s discretion provided it complies with Article 1105.14.

Unless indicated otherwise in the contract documents, the Contracting Authority will obtain approval for temporary stream crossings, constructed in accordance with Standard Road Plan RL-16 or as shown in the contract documents, in the Section 404 permit. The Contractor shall obtain a Section 404 permit for temporary stream crossings not to be constructed in accordance with RL-16 or the contract documents.

2547.02 MATERIALS.
Fill materials shall be furnished by the Contractor and shall not be obtained from the stream unless specifically allowed elsewhere in the contract documents.

2547.03 CONSTRUCTION.
Temporary structures shall not restrict expected high flows or disrupt the movement of aquatic life native to the stream or water body, and shall not extend over 100 feet (30 m) into any swamp, bog, marsh, or similar area that is adjacent to the stream or water body. Expected high flows are those flows which the Contractor expects to experience during the period of time that the crossing is in place. Pre-construction downstream flow conditions shall be maintained. Temporary structures shall be maintained to prevent unnecessary erosion and other non-point sources of pollution.

Within 30 calendar days of when no longer being needed, these features shall be completely removed. Revetment that has been removed may be incorporated elsewhere in the project provided it meets the specification for the intended final use. All other fill material shall be removed to an upland area. All disturbed areas shall be reshaped and stabilized.

~~**2547.04 METHOD OF MEASUREMENT.**~~
~~Temporary stream access will not be measured separately but will be considered as a lump sum.~~

2547.0~~54~~ METHOD OF MEASUREMENT AND BASIS OF PAYMENT.
~~For Temporary Stream Access, the Contractor will be paid the lump sum contract price. This payment shall be considered full compensation for furnishing all material, labor, and equipment and for the performance of all work necessary for the construction, maintenance, use and removal of temporary stream access, reshaping, and stabilizing; all in accordance with the contract documents.~~

Temporary Stream Accesses ~~installed by the Contractor but not included in the contract documents for payment~~ shall be considered incidental to Mobilization.

~~Seventy-five percent of the lump sum contract price will be paid when the Contractor has installed the Temporary Stream Access. The remaining 25% will be paid when the Temporary Stream Access has been removed, and the area reshaped and stabilized.~~

Division 26. Roadside Development.

Section 2601

2601.01, Description.

Replace “Section 2525” with “Section 2602” and **delete** “jute mesh” in the sentence.

2601.04, B, Application of Fertilizer.

Replace the second sentence of the first paragraph:
When not otherwise specified in the contract documents, the rate to be used shall be 750 pounds per acre (840 kg/ha) of 13-13-13 (or equivalent) commercial fertilizer.

2601.04, C, Application of Seed.

Replace the first line of the list:
Fescue, Fawn 25 lb. per acre (28 kg/ha)

Replace the third line of the list:

Sideoats Grama (Butte or Trailway) 5 lbs. PLA per acre (6 kg PLS/ha)

2601.04, K, Spring Overseeding.

Replace the first sentence:
Seedbed preparation will not be required, provided the overseeding is applied when the ground is friable from frost action after February 1 and before April 1 or as directed by the Engineer.

2601.04, L, Native Grass Seeding and Wetland Grass Seeding.

Replace the entire table for wetland grasses:

SEEDS COMMON NAMES, SCIENTIFIC NAMES, PLS			
Common Name	**Scientific Name**	**PLS lbs. per ac**	**PLS kg per ha**
WETLAND GRASSES:			
Blue vervain	Verbena hastata	0.31	0.35
Boneset	Eupatorium perfoliatum	0.25	0.28
Nodding bur marigold	Bidens cernua	0.31	0.35
Swamp milkweed	Asclepias incarnata	0.50	0.56
Sneezeweed	Helenium autumnale	0.44	0.49
Water plantain	Alisma plantago-aquatica	1.00	1.12
Arrowhead	Sagittaria latifolia	0.50	0.56
New England aster	Aster novae-angliae	0.50	0.56
Big bluestem	Andropogon gerardii	2.00	2.24
Switchgrass	Panicum virgatum	1.00	1.12
Barnyard grass	Echinochloa crus-galli	1.00	1.12
Bluejoint grass	Calamagrostis canadensis	1.00	1.12
Rice cutgrass	Leersia oryzoides	1.00	1.12
Dark green bulrush	Scirpus atrovirens	0.50	0.56
Fox sedge	Carex vulpinoidea	0.50	0.56
Softstem bulrush	Schoenoplectus tabernaemontani	0.69	0.77
Spike rush	Eleocharis palustris	0.50	0.56
Seeding rate (PLS)		12.00 lbs./ac	13.44 kg/ha

2601.05, A, Stabilizing Crop Seed Mixtures.

Replace the second line under “Summer -- May 21 to July 20”:
Annual Rye 35 lbs. per acre (39 kg/ha)

2601.05, B, Fertilizing for Stabilizing Crop Seeding.

Replace the first sentence:
A commercial fertilizer shall be applied to all seeded areas at the rate of 450 pounds per acre (500 kg/ha) of 13-13-13 (or equivalent) unless otherwise specified in the contract documents.

2601.06, B, Application of Mulch.

Replace the second sentence:
The application rate for reasonably dry material shall be approximately 1 1/2 tons per acre (3.5 Mg/ha) of dry cereal straw, 2 tons per acre (4.5 Mg/ha) of wood excelsior, or 2 tons per acre (4.5 Mg/ha) of prairie hay, or other approved material, depending on the type of material furnished.

2601.08, B, Fertilizer for Sod.

Replace the fifth sentence:

In either case, if the type of fertilizer is not specified, 13-13-13 (or equivalent) commercial fertilizer shall be applied.

2601.08, D, Finishing Sod.

Replace the first line of the indented paragraph following the second paragraph.
Fescue, Fawn 80%

2601.10, Special Ditch Control and Slope Protection.

Add as the second paragraph:
Materials shall meet the requirements of Article 4169.10.

2601.10, B, Special Ditch Control and Slope Protection.

Replace the entire article:
Special ditch control over sod shall include furnishing and applying the specified material, including staples, over the sodded areas.

2601.12, A, Special Ditch Control in Depressed Medians and Other Ditch Areas.

Replace the first line of the indented paragraph following the first paragraph.
Fescue, Fawn 70%

2601.13, Fertilizer for Special Ditch Control and Slope Protection.

Replace the first sentence of the second paragraph:
If the type of fertilizer is not specified for the project, 10 pounds per 1,000 square feet (5 kg per 100 m^2) of 13-13-13 (or equivalent) commercial fertilizer shall be applied.

2601.15, A, Wood Excelsior Mat.

Delete the first sentence and **replace** the second sentence of the fifth paragraph:
Staples shall meet the requirements of Article 4169.10, A.

2601.15, B, Jute Mesh.

Delete the title and entire article.

2601.15, C, Other Materials.

Renumber as 2601.15, B.

2601.16, Special Ditch Control over Sod.

Replace the first sentence:
When shown in the contract documents, the Contractor shall place plastic netting or other approved material over sod and staple it in place.

2601.21, Method of Measurement.

Replace the first paragraph and the first indented paragraph:
The various items of work involving erosion control will be determined on satisfactory completion as follows:

The Engineer will compute in acres to the nearest 0.1 acre (hectares to the nearest 0.1 hectare) the surface areas of Overseeding and Fertilizing, Seeding and Fertilizing, Mulching, Native Grass Seeding, Wetland Grass Seeding, Wildflower Seeding, Stabilizing Crop Seeding and Fertilizing, Seeding Special Areas, and Crownvetch Seeding.

Add as the sixth indented paragraph:

Mobilization for watering will be paid for by count for each mobilization. Mobilization for the initial watering required at installation of the plant material will not be measured for payment.

Replace the seventh indented paragraph:
Mowing described in Article 2601.04, N, will be measured in acres to the nearest 0.1 acre (hectares to the nearest 0.1 hectare) of surface area.

2601.22, Basis of Payment.

Delete “Mulching,” from the first indented paragraph.

Replace the first sentence of the first indented paragraph:
For the number of acres to the nearest 0.1 acre (hectares to the nearest 0.1 hectare) of Overseeding and Fertilizing, Seeding and Fertilizing, Native Grass Seeding, Wetland Grass Seeding, Wildflower Seeding, Stabilizing Crop Seeding and Fertilizing, and Crownvetch Seeding, the Contractor will be paid the contract unit price per acre (hectare).

Replace the first sentence of the second indented paragraph:
For the number of acres to the nearest 0.1 acre (hectares to the nearest 0.1 hectare) of Seeding Special Area, the Contractor will be paid the contract unit price per acre (hectare).

Replace the twelfth indented paragraph:
For the number of acres to the nearest 0.1 acre (hectares to the nearest 0.1 hectare) of mowing, as described in Article 2601.04, the Contractor will be paid the contract unit price per acre (hectare).

Add a new sixth indented paragraph:
For the quantity of mulch furnished and placed, the Contractor will be paid the predetermined contract unit price per acre (hectare).

Add as the eleventh indented paragraph:
Mobilization for watering will be paid for by count for each required watering at the pre-determined price of $350.00 each.

Delete “or jute mesh” from the thirteenth indented paragraph.

Section 2602

2602.01, Description.

Replace the first sentence of the second paragraph:
Projects that are regulated by the requirements of Iowa DNR National Pollutant Discharge Elimination System (NPDES), General Permit No. 2, for Storm Water Discharge Associated with Industrial Activity for Construction Activities, will be identified in the contract documents.

2602.03, Construction.

Replace the first sentence of the second paragraph:
The Contractor shall provide immediate, permanent, or temporary water pollution control measures to prevent contamination of adjacent watercourses and property.

Delete the third sentence of the second paragraph:
~~Disturbed areas shall be seeded and/or mulched as the excavation proceeds, to the extent considered desirable and practicable.~~

Replace “as directed by the Engineer” with “as determined by the Contractor” in the second sentence of the third paragraph.

Delete “as soon as conditions permit or as directed by the Engineer” in the last sentence of the fourth paragraph.

Replace “directed” with “approved” in the last sentence of the fifth paragraph.

Delete the sixth paragraph:

~~Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing, excavation, borrow, or fill within the right of way exceed 750,000 square feet (70,000 m^2), without approval by the Engineer.~~

Replace the sixth paragraph:

The Contractor shall limit clearing and grubbing, excavation, borrow, and embankment operations in progress to an area commensurate with their capability and progress in keeping the finish grading, mulching, seeding, and other pollution control measures current in accordance with the accepted work schedule. The Engineer may suspend operations if the Contractor fails to provide adequate erosion control measures in a timely manner.

2602.04, K, Removal and Reinstallation of Silt Fence.

Add as a new article:

Silt fence repaired through removal and reinstallation will be measured in linear feet (meters) to the nearest foot (meter).

2602.05, Basis of Payment.

Replace the second paragraph:

When it is necessary for the Contractor to clean out, repair, or reconstruct a silt ditch, dike, or basin, the additional payment will be 100% of the contract unit price for construction of that item. When applicable bid items are not in the contract documents, payment for clean out, repair, or reconstruction will be in accordance with Article 1109.03, B.

Add as the last paragraph:

Payment for construction of water pollution control items shall be full compensation for all labor, equipment, and materials necessary to construct the items in accordance with the contract documents.

2602.05, H, Removal of Silt Basins.

Delete the second paragraph:

~~Payment for construction of water pollution control items shall be full compensation for all labor, equipment, and materials necessary to construct the items in accordance with the contract documents.~~

2602.05, K, Removal and Reinstallation of Silt Fence.

Add as a new article:

K. Removal and Reinstallation of Silt Fence.

Silt fence that must be repaired by removal and reinstallation, through no fault of the Contractor, will be paid at two times the contract unit price for the type of silt fence properly repaired.

Section 2610

2610.03, E, 4, Backfilling Balled and Burlapped Plant Material.

Replace “Paragraph F” with “Paragraph E, 6” in the third paragraph.

2610.03, I, Plant Establishment Period and Replacement.

Replace “Article 2610.07” with “Article 2610.03, E” in the fourth and seventh paragraphs.

2610.05, Basis of Payment.

Delete the last sentence:

~~If the substitute is not a contract item, payment will be made as extra work in accordance with Article 1109.03, B.~~

Section 2611

2611.01, Description.

Replace “Articles 2610.03, 2610.06, 2610.07, or 2610.08” with “Articles 2610.03, A; 2610.03, D; 2610.03, E; or 2610.03, F”.

2611.05, A, After Initial Installation is Complete.

Replace “75%” with “65%” in the first sentence.

Replace the first sentence:
Sixty-five percent of the placed quantity will be paid for all live plants of each size and variety installed with the specified mulch, and meeting the staking and guying requirements.

2611.05, B, End of the First Growing Season.

Replace the second paragraph:
A percent of the placed quantity shall be paid for each tree and shrub correctly installed according to the following schedule:

Total Project Survival Rate	% of Placed Quantity
85 - 100%	10%
60 - 84%	5%
Below 60%	0%

2611.05, C, After First Year Replacement Installation.

Replace the entire article:
After replacement plants have been installed, 5% of the placed quantity will be paid for all plants considered alive at the end of the previous growing season including all plants replaced.

2611.05, D, End of Second Growing Season.

Replace the second paragraph:
A percent of the placed quantity shall be paid for each tree and shrub correctly installed according to the following schedule. Plants requiring replacement shall receive this payment after replacement is complete. Payment shall be in accord with the following schedule:

Total Project Survival Rate	% of Placed Quantity
85 - 100%	20%
60 - 84%	10%
Below 60%	0%

Division 41. Construction Materials.

Section 4101

4101.01, General Requirements.

Replace the entire article:

A. ASTM C 150 Cements.
Unless otherwise specified, Portland cement shall meet the requirements of ASTM C 150.

The alkali content expressed as total equivalent sodium oxide shall not be more than 0.60% for all cements.

B. ASTM C 595 Cements.
Unless otherwise specified, blended hydraulic cement shall meet requirements of ASTM C 595 and the following requirements:

1. The pozzolan constituent of Type IP cement shall not be more than 25 weight (mass) percent of the Portland-pozzolan cement.

2. The slag constituent of Type IS cement shall not be more than 35 weight (mass) percent of the Portland blast-furnace slag cement.

3. Type IP cement shall not contain Class C fly ash.

4. The Portland cement used to produce the blended cement shall meet the requirements of Article 4101.01, Paragraph A, except the alkali content expressed as total equivalent sodium oxide shall not be more than 0.75%.

C. Cement Type Usage.
Unless otherwise specified, cement type and usage in various pavements, structures, and other elements shall be as follows:

1. Type I or Type II cement may be used for pavements, structures, and other applications. Type III cement may be used in precast and prestressed concrete only.

2. Type IP or Type IS cement may be furnished at the Contractor's option when Type I or Type II cement is specified. The limitations of Articles 2301.04, 2403.03, or 2412.02 shall apply.

3. The unit volume of Type IP or Type IS cement in the concrete shall be that specified for Type I or Type II cement, unless otherwise specified.

Cement which contains 5.0% or more of lumps retained on a No. 20 (850 µm) sieve will be rejected. Cement which contains less than 1.0% of lumps may be used without adjustment in the batch. For each 1.0% or fraction thereof from 1.0% to 5.0% of lumps found by test, batch weights (mass) of cement used in either concrete pavement or structural concrete shall be increased by 2.0% of the original value.

Air entrainment of the concrete is to be accomplished by the addition, at the time of mixing, of as approved air entraining admixture specified in Section 4103. Air entraining cement shall not be used.

Section 4104

4104.01, Description.

Replace the first sentence:
Burlap used for curing concrete shall meet requirements of AASHTO M 182 (10 ounces (~~284~~ 310 g)) except as modified below.

Section 4105

4105.07, Clear Compounds.

Replace the indented paragraph:
Clear liquid membrane curing compounds shall comply with requirements of AASHTO M 148, Type 1-D, Class A. Only one type of material shall be used on a structure.

Add as the second unindented paragraph:
Inspection and acceptance of clear compounds for curing will be in accordance with Materials I.M. 405.07.

Section 4108

4108.01, Description.

Replace the first two sentences of the first paragraph:
Fly ash to be substituted for Portland cement in concrete shall comply with AASHTO M 295, either Class F or Class C, except value of available alkalies shall not exceed 1.50% as determined by Materials I.M. 491.17. Sources with fly ash between 1.5% and 2.5% available alkalies may be approved based on satisfactory results of the mortar bar expansion test specified in Materials I.M. 491.17.

Add as the second paragraph:
When Class F is required, a Class C fly ash with minimum total oxides (SiO_2 + Al_2O_3 + Fe_2O_3) of 66% and minimum SiO_2 of 38% may be used.

Section 4109

4109.01, Description.

Replace the entire article:

4109.01 DESCRIPTION.

A. Coarse Aggregate.
Particles retained on the No. 4 (4.75 mm) or larger sieve.

B. Fine Aggregate.
Particles passing the No. 4 (4.75 mm) sieve.

4109.02, Testing Sieves.

Replace the title:
4109.02 GRADATION.

Delete the three paragraphs.

Note: Refer to the attached English and Metric Aggregate Gradation Tables which contain all revisions to the tables in the Standard Specification Book.

4109.03, Unacceptable Materials.

Add as a new article 4109.03:
Article 1106.04 shall apply. Stockpiles contaminated with organic or other foreign materials may be cause for rejection of the aggregate. The Engineer will determine acceptability by visual examination or other methods.

The Engineer may reject the use of material from ledges or beds that individually do not pass the quality requirements for the intended aggregate product. Specific production methods may be required to permit the use of material from marginal ledges or beds.

Section 4110

4110, Fine Aggregate for Concrete.

Replace the title and the entire section:

4110, Fine Aggregate for Portland Cement Concrete.

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

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

4110.03 QUALITY.

TABLE 4110.03		
Fine Aggregate Quality	**Test Limits**	**Test Method**
Shale and Coal	2.0% (maximum)	Materials I.M. 344
Mortar Strength [a]	~~1.5~~ 6000 psi (minimum)	Iowa DOT Materials Laboratory Test Method 212
~~Fineness Modulus~~	~~2.75 (minimum)~~	~~Materials I.M. 302~~
~~[a] An annual mortar strength test result of 1.5 or greater is required for continued approval of a source with a fineness modulus less than 2.75.~~		

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

Section 4111

4111, Class L Fine Aggregate for Portland Cement Concrete.

Replace the entire section:

4111.01 DESCRIPTION.
Natural sands resulting from disintegration of rock through erosional processes. Acquire mineral aggregate from an approved source as described in Materials I.M. 409. Use Class L fine aggregate in Class L concrete mixtures as specified in Materials I.M. 529.

4111.02 GRADATION.
Meet the requirements for Gradation No. 1 of the Aggregate Gradation Table, Article 4109.02. When the fine aggregate is sieved through the following sieves: No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100 (4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm, and 150 µm), not more than 45% shall pass one sieve and be retained on the sieve with the next higher number.

4111.03 QUALITY.

TABLE 4111.03		
Fine Aggregate Quality	**Test Limits**	**Test Method**
Shale and Coal	2.0% (maximum)	Materials I.M. 344
Mortar Strength	1.3 (minimum)	Iowa DOT Materials Laboratory Test Method 212

Section 4112

4112, Fine Aggregate for Mortar.

Delete the entire section.

Section 4115

4115, Coarse Aggregate for Concrete.

Replace the title and the entire article:

Section 4115. Coarse Aggregate for Portland Cement Concrete.

4115.01 DESCRIPTION.
Gravel or crushed stone particles meeting one of the following Aggregate Durability Classes:

A. Class 2 Durability.
No deterioration of pavements of non-Interstate segments of the road system after 15 years and only minimal deterioration in pavements after 20 years of age.

B. Class 3 Durability.
No deterioration of pavements of non-Interstate segments of the road system after 20 years of age and less than 5% deterioration of the joints after 25 years.

C. Class 3i Durability.
No deterioration of pavements of the Interstate Road System after 30 years of service and less than 5% deterioration of the joints after 35 years.

Acquire aggregates from an approved source meeting the requirements of Materials I.M. 409.

4115.02 QUALITY.

TABLE 4115.02 - 1		
Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion (Cr. Stone)	50	AASHTO T 96
Abrasion (Gravel)	35 (may be increased by 0.1% for each 1% of particles with at least one fractured face)	AASHTO T 96
Alumina [(a)]	0.5	Iowa DOT Materials Laboratory Test Method 222
A Freeze	6	Iowa DOT Materials Laboratory Test Method 211, Method A
Clay Lumps and Friable Particles	0.5	Materials I.M. 368
[(a)] If the Alumina value fails, the A Freeze value shall be determined for specification compliance. Iowa DOT Materials Laboratory Test Method 222 does not apply to gravel.		

TABLE 4115.02 - 2		
Maximum Permissible Amounts of Objectionable Materials	**Maximum Percent Allowed**	**Test Method**
Coal and carbonaceous shale	0.5	Materials I.M. 372
Total of all shale, similar objectionable materials, and coal combined.	1.0	Materials I.M. 372
Organic Materials, except coal	0.01	Iowa DOT Materials Laboratory Test Method 215
Unsound chert particles retained on 3/8 inch (9.5 mm) sieve (Nonstructural concrete)	3.0	Materials I.M. 372
Unsound chert particles retained on 3/8 inch (9.5 mm) sieve (Structural concrete)	2.0	Materials I.M. 372
Note: Chert particles which break into three or more pieces when subjected to the freezing and thawing test will be considered unsound. Chert in aggregate produced from limestone sources is defined as unsound when any of the fractions of the crushed or uncrushed chert do not meet the soundness requirements.		

4115.03 GRADATION.
Meet the requirements of Article 4109.02.

TABLE 4115.03		
Mix Class (Materials I.M. 529)	**Mix Number (Materials I.M. 529)**	**Gradation Numbers (Article 4109.02)**
D	57, 57-6	3 or 5
A, B, C	2 to 8, V47B	3, 4, or 5
M	4	3, 4, or 5
A, B, C, M	V	7

4115.04 AGGREGATE USE DURABILITY REQUIREMENTS. (note - first two items are now combined)

TABLE 4115.04

Specification Section Number	Minimum Durability Class Required			Use
	3i	3	2	
2122, 2201 2212, 2213, 2301, 2302, 2310, 2529, 2530 Interstate System Primary System Other*	X*	X*	X	PCC Paved Shoulders, Base, Base Repair, Base Widening PCC Pavement, Widening, PCC Overlay, Finish Patches, and Bridge Approaches
2403			X	Structural Concrete, Concrete Structures
2406 (See 2403)			X	Concrete Structures
2407			X	Precast Units
2407, 2501		X		Prestressed Units, Concrete Piles
2412 (See 2403)			X	Concrete Bridge Floors
2413 (See 2413.02A)			X	Surfacing, Repair & Overlay of Bridge Floors
2414 (See 2403)			X	Concrete Railings
2415 (See 2403)			X	Concrete Box, Arch & Circular Culverts
2416 (See 4145)			X	Rigid Pipe Culverts
2424			X	Shotcrete
2503 (See 2403)			X	Storm Sewers (Catch Basins, Intakes & Utility Access)
2504 (See 2403)			X	Sanitary Sewers (Utility Access)
2505 (See 2403)			X	Guardrails (Concrete End Anchorage)
2511, 2515 (See 2403)			X	PCC Sidewalks, Paved Driveways
2512 (See 2403)			X	PCC Curb & Gutter
2513 (See 2403)			X	Concrete Barrier
2516 (See 2403)			X	Concrete Walls and Steps
2517 Primary Other		X	X	Railroad Approach Sections
2522 (See 2403)			X	Tower Lighting (Concrete Footings & Foundations)
2523 (See 2403)			X	Highway Lighting (Concrete Footings & Foundations)
2524 (See 2403)			X	Highway Signing (Concrete Footings & Foundations)
2525 (See 2403)			X	Traffic Signals (Concrete Footings & Foundations

Notes:
* For patches and PCC base repair, Class 2 durability or better aggregate will be required if the existing pavement was constructed of Class 2 or lower durability aggregate. If the existing pavement was constructed of Class 3 or Class 3i durability aggregate, the aggregate used in the repair shall be Class 3 or better and Class 3i respectively.

Use crushed stone coarse aggregate for:

- Aesthetic concrete cast with from liners or rustication. This includes Mechanically Stabilized Earth (MSE) walls and noise walls.
- Concrete receiving color sealer or texture treatments.
- Concrete for precast box culverts that are to receive color sealer.

4115.05 COARSE AGGREGATE FOR BRIDGE DECK SURFACING AND REPAIR AND OVERLAY.

Acquire from a Class 2 durability or better source meeting the following requirements:

A. Quality.

TABLE 4115.05 - 1

Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion	40	AASHTO T 96
Alumina [(a)]	0.4	Iowa DOT Materials Laboratory Test Method 222
A Freeze	4	Iowa DOT Materials Laboratory Test Method 211, Method A
Absorption	2.5	Iowa DOT Materials Laboratory Test Method 201

[(a)] If the Alumina value fails, the A Freeze value shall be determined for specification compliance. Iowa DOT Materials Laboratory Test Method 222 does not apply to gravels.

TABLE 4115.05 - 2		
Objectionable Materials	**Maximum Percent Allowed**	**Test Method**
Unsound chert particles retained on No. 4 (4.75 mm) sieve	0.5%	Materials I.M. 372
Total of all unsound chert, shale, coal, and iron combined.	1.0%	Materials I.M. 372
Organic material except coal	0.01%	Iowa DOT Materials Laboratory Test Method 215
Note: Unsound chert particles are defined in Article 4115.02.		

B. Gradation.
Meet the gradation requirements for Gradation No. 6 of the Aggregate Gradation Table, Article 4109.02.

Section 4117

4117, Class V Aggregate for Concrete.

Replace title and entire article:

Section 4117. Class V Aggregate for Portland Cement Concrete.

4117.01 DESCRIPTION.
A mixture of fine and coarse particles of feldspathic rocks from an approved source as described in Materials I.M. 409.

4117.02 GRADATION.
Meet the gradation requirements for Gradation No. 7 of the Aggregate Gradation Table, Article 4109.02.

4117.03 QUALITY.
The portion retained on the No. 4 (4.75 mm) sieve shall meet the following requirements for fine aggregate for concrete.

TABLE 4117.03 - 1		
Aggregate Quality	**Maximum % Allowed**	**Test Method**
Abrasion	40	AASHTO T 96
A Freeze	6	Iowa DOT Materials Laboratory Test Method 211, Method A
Clay Lumps	0.5	Materials I.M. 368

The portion of Class V aggregate passing the No. 4 (4.75 mm) sieve shall meet the following requirements for fine aggregate for concrete:

TABLE 4117.03 - 2		
Fine Aggregate Quality	**Test Limits**	**Test Method**
Shale and Coal	2.0% (maximum)	Materials I.M. 344
Mortar Strength [(a)]	1.5 (minimum)	Iowa DOT Materials Laboratory Test Method 212
Fineness Modulus	2.75 (minimum)	Materials I.M. 302
[(a)] An annual mortar strength test result of 1.5 or greater is required for continued approval of a source with a fineness modulus of less than 2.75.		

4117.04 COMBINATIONS.
Use Class V aggregate for PC concrete only in combination with limestone as specified in Materials I.M. 529. Acquire limestone from sources meeting the specified coarse aggregate durability for PC concrete.

A. Fine Limestone.
Meet the gradation requirements for Gradation No. 8 of the Aggregate Gradation Table, Article 4109.02.

B. Coarse Limestone.
Meet the requirements of Section 4115.

4117.05 CEMENT REQUIREMENTS.
For Interstate and Primary projects, use the cement types and substitutions of Table 4117.05 when Class V aggregate is used.

TABLE 4117.05		
Cement Type	**Min. Required Substitution**	**Max. Allowable Substitution**
Type I, Type II	20% Class F Fly Ash	25% Class F Fly Ash
Type I, Type II	25% GGBFS	35% GGBFS
Type IS, IP	---	20% Class C Fly Ash

Section 4120

4120, Granular Surfacing Material.

Replace the title and the entire section:

Section 4120. Granular Surfacing and Granular Shoulder Aggregate.

4120.01 DESCRIPTION.
Uniform mixture of fine and coarse particles of crushed stone, gravel, or a combination of these materials with sand. Crushed recycled materials shall total no more than 30% of the shoulder aggregate for new construction and no more than 50% of the total for existing granular shoulders.

4120.02 GRANULAR MATERIAL.

A. Granular Surfacing.
Furnish material meeting the requirements of Article 4120.04, or when specified in the contract documents, meet the requirements of Article 4120.03, 4120.05, or 4120.06.

B. Granular Shoulders.
Furnish material meeting the requirements of Article 4120.04 or recycled materials, or when specified in the contract documents, meet the requirements of Article 4120.05 or 4120.06.

For recycled materials, meet the following requirements:
- Recycle PCC, RAP, or Composite pavements to meet the requirements of Materials I.M. 210.
- Crush PCC or composite pavements to meet the requirements for Gradation No. 11 of the Aggregate Gradation Table, Article 4109.02.
- Process RAP to pass the 1.5 inch (37.5 mm) sieve.

The contract documents may allow a Class C gravel and crushed aggregate mixture for granular shoulders meeting the following:
- 30% to 50% crushed stone meeting soundness and abrasion requirements of Article 4120.05. Meet the requirements for Gradation No. 10 of the Aggregate Gradation Table, Article 4109.02 with the exception of 8% to 16% passing the No. 200 (75 µm) sieve.
- 30% to 50% recycled crushed PCC or composite materials meeting the above requirements for Granular Shoulders. Meet the requirements for Gradation No. 10 of the Aggregate Gradation Table, Article 4109.02 with the exception of 8% to 16% percent passing the No. 200 (75 µm) sieve.
- 30% to 50% RAP processed to pass the 1.5 inch (37.5 mm) sieve.

4120.03 CLASS C GRAVEL.
Meet the requirements for Gradation No. 10 of the Aggregate Gradation Table, Article 4109.02 and the following:

TABLE 4120.03		
Coarse Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
C Freeze	15	Iowa DOT Materials Laboratory Test Method 211, Method C
Shale (+ No. 4 (4.75 mm) sieve)	10	Materials I.M. 372
Total of Clay Lumps and Friable Particles, plus % passing No. 200 (75 µm) sieve	15	Materials I.M.s 368, and 306
Total of Shale, Clay Lumps and Friable Particles, plus % passing No. 200 (75 µm) sieve	20	Materials I.M.s 372, 368, and 306

4120.04 CLASS A CRUSHED STONE.
Meet the requirements for Gradation No. 11 of the Aggregate Gradation Table, Article 4109.02 and the following:

TABLE 4120.04		
Coarse Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	45	AASHTO T 96
C Freeze	15	Iowa DOT Materials Laboratory Test Method 211, Method C
Clay Lumps and Friable Particles	4	Materials I.M. 368
Note: For shoulders only, abrasion limits may be raised to 55 if Alumina does not exceed 0.7 or A Freeze does not exceed 10.		

4120.05 CLASS B CRUSHED STONE.
Meet the requirements for Gradation No. 11 of the Aggregate Gradation Table, Article 4109.02 and the following:

TABLE 4120.05		
Coarse Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	55	AASHTO T 96
C Freeze	20	Iowa DOT Materials Laboratory Test Method 211, Method C
Total of Abrasion & C Freeze	65	
Clay Lumps and Friable Particles	4	Materials I.M. 368

4120.06 CLASS D CRUSHED STONE.
Refer to the contract documents for gradation and quality requirements.

4120.07 AGGREGATE FOR PAVED SHOULDER FILLETS.
Crushed stone or recycled materials meeting the requirements for Gradation No. 11 of the Aggregate Gradation Table, Article 4109.02 and meeting the quality requirement of Article 4120.04. For recycled materials, meet the requirements of Article 4120.02, B.

Section 4121

4121, Granular Subbase Material.

Replace the entire section:

4121.01 DESCRIPTION.

- Crushed stone,
- Gravels of which 30% or more of the particles retained on the 3/8 inch (9.5 mm) sieve have at least one fractured face as defined in Materials I.M. 305,
- Crushed PCC pavement meeting the requirements of Materials I.M. 210, or
- Uniformly blended combinations of these materials.

4121.02 GRADATION.

A. Crushed material: meet the requirements for Gradation No. 12a of the Aggregate Gradation Table, Article 4109.02.

B. Gravel: meet the requirements for Gradation No. 12b of the Aggregate Gradation Table, Article 4109.02.

4121.03 QUALITY.
The following requirements apply to the individual virgin aggregates before combining:

TABLE 4121.03		
Coarse Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	50	AASHTO T 96

Alumina [(a)]	1.5	Iowa DOT Materials Laboratory Test Method 222
A Freeze	25	Iowa DOT Materials Laboratory Test Method 211, Method A
[(a)] If the Alumina value fails, the A Freeze value shall be determined for specification compliance. Iowa DOT Materials Laboratory Test Method 222 does not apply to gravel.		

Section 4122

4122, Crushed Stone Base Material.

Replace the entire section:

Section 4122. Crushed Stone Base Material.

4122.01 DESCRIPTION.
Crushed stone meeting the following requirements:

4122.02 GRADATION.
Produce Macadam Crushed Stone with a nominal maximum size of 3 inches (75 mm). Screen over a 3/4 inch (19 mm) screen, or when specified in the contract documents, a 1 inch (25 mm) screen. This is identified as Gradation No. 13 of the Aggregate Gradation Table, Article 4109.02.

The aggregate passing the 3/4 inch (19 mm) or 1 inch (25 mm) screen may be furnished as the Choke Stone material; however, 6% to 16% of the material must pass the No. 200 (75 µm) sieve.

4122.03 QUALITY.
For Macadam Stone Base and Choke Stone, meet the following requirements ~~as detailed in Section 4109~~ when crushed to a 3/4 inch (19 mm) or 1 inch (25 mm) nominal size for testing:

TABLE 4122.03 - 1		
Macadam Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	50	AASHTO T 96
C Freeze	10	Iowa DOT Materials Laboratory Test Method 211, Method C

Choke Stone that is a byproduct of the Macadam production need not be tested. For Choke Stone that is not a byproduct of Macadam production, meet the following requirements:

TABLE 4122.03 - 2		
Choke Stone Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	45	AASHTO T 96
C Freeze	15	Iowa DOT Materials Laboratory Test Method 211, Method C

Section 4123

4123, Modified Subbase Material

Replace the entire section:

Section 4123. Modified Subbase Material

4123.01 DESCRIPTION.
- Crushed stone,
- Gravels for which 75% or more of the particles retained on the 3/8 inch (9.5 mm) sieve have at least one fractured face as defined in Materials I.M. 305,
- Recycled pavements meeting Materials I.M. 210, or
- Uniformly blended combinations of these materials with a maximum of 50% RAP.

4123.02 GRADATION.
Meet the requirements for Gradation No. 14 of the Aggregate Gradation Table in Article 4109.02.

Process RAP to pass the 2 inch (50 mm) sieve.

Uncrushed gravel and/or sand may be uniformly blended with crushed recycled pavement or crushed stone at a maximum rate of 50% to meet gradation requirements.

4123.03 QUALITY.
The following requirements apply to blended and non-blended virgin materials:

TABLE 4123.03		
Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	45	AASHTO T 96
C Freeze	15	Iowa DOT Materials Laboratory Test Method 211, Method C
Alumina [(a)]	0.7 (Abrasion loss 46% to 55%)	Iowa DOT Materials Laboratory Test Method 222
A Freeze	10 (Abrasion loss 46% to 55%)	Iowa DOT Materials Laboratory Test Method 211, Method A
Alumina (No. 40 (425 µm) material)	4.7	Iowa DOT Materials Laboratory Test Method 222
[(a)] If the Alumina value fails, the A Freeze value shall be determined for specification compliance. Iowa DOT Materials Laboratory Test Method 222 does not apply to gravel.		

Acquire gravel or gravel/non-gravel blend products from a gravel source with a plasticity index not exceeding 7.

Section 4124

4124, Aggregate for Slurry Mixtures.

Add a new section:

4124.01 DESCRIPTION.
Crushed stone.

4124.02 GRADATION.
Meet requirements for Gradation No. 22 or No. 23 (as specified in the contract documents) of the Aggregate Gradation Table in Section 4109.

4124.03 QUALITY.
Type 4 or better friction classification aggregate as shown in Materials I.M. T203.

Meet the following requirements based on aggregate crushed to 3/4 inch nominal size:

TABLE 4124.03		
Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	40	AASHTO T 96
A Freeze	10	Iowa DOT Materials Laboratory Test Method 211, Method A
Alumina [(a)]	0.7	Iowa DOT Materials Laboratory Test Method 222
Sand Equivalence	45 (Minimum)	AASHTO T 176
Organic Materials	0.01	Iowa DOT Materials Laboratory Test Method 215
[(a)] If the Alumina value fails, the A Freeze value shall be determined for specification compliance.		

Section 4125

4125, Cover Aggregate and Aggregate for Slurry Mixtures.

Replace the title and the entire section:

4125, Aggregate for Bituminous Sealcoat.

4125.01 DESCRIPTION.
Crushed stone, gravel, or sand.

- Must be washed.
- Crushed aggregate is required for primary and interstate roadways and may be specified for other projects.
- Produce crushed gravel as a separate operation by crushing the gravel particles retained on a screen at least 1/4 inch (6 mm) larger than the aggregate size specified.

4125.02 GRADATION.
Meet aggregate gradation requirements for the gradation number specified. Unless otherwise specified, use the 1/2 inch (12.5 mm) sieve size.

TABLE 4125.02	
Size	**Gradation No.**
1/2 inch (12.5 mm) Crushed Gravel or Stone	19
Screened Gravel	20
3/8 inch (9.5 mm) Crushed Gravel or Stone	21 [(a)]
Sand Cover Aggregate	1[(b)]
[(a)] 1/2 inch (12.5 mm) size may be used when 3/8 inch (9.5 mm) size is specified except for Primary Road applications [(b)] For a crushed stone product allow up to 4% passing the #200 (75 µm) sieve.	

4125.03 QUALITY.

- Free from objectionable clay coatings that prevent emulsions from fully coating the aggregate when determined using Materials I.M. 349.
- Type 4 or better frictional classification as shown in Materials I.M. T203.
- For cover aggregate for bituminous sealcoat, meet the following requirements:

TABLE 4125.03		
Aggregate Quality	**Maximum Percent Allowed**	**Test Method**
Abrasion	40	AASHTO T 96
C Freeze	10	Iowa DOT Materials Laboratory Test Method 211, Method C
Shale (+ No. 4 (4.75 mm) sieve)	5.0	Materials I.M. 372
Shale (+ No. 16 (1.18 mm) sieve) (Sand cover aggregate	2.0	Materials I.M. 344

Section 4126

4126, Type B Aggregate for Hot Mix Asphalt.

Delete the entire section.

Section 4127

4127, Type A Aggregate for Hot Mix Asphalt.

Replace the title and the entire section:

4127, Aggregate for Hot Mix Asphalt.

4127.01 DESCRIPTION.

Crushed stone, gravel, slag, sand, and filler from an approved source. Crushed gravel may be used to satisfy crushed particle and ~~F~~friction ~~Type 3~~ 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 (6 mm) larger than the sieve size that 100% of the gravel will pass after crushing.

If a gravel aggregate has less than 5% retained on the No. 4 sieve (6 mm), the Engineer may replace the requirements of Table 4127.02 with the requirements of Article 4127.03.

4127.02 COARSE AGGREGATE.
Meet the following requirements:

TABLE 4127.02

Coarse Aggregate Quality	Type A Maximum %	Type B Maximum %		Test Method
		Primary	Other	
Abrasion	45	45	45	AASHTO T 96
Absorption	6.0	6.0	6.0	Iowa DOT Materials Laboratory Test Method 201
Alumina [(a)]	0.7	1.5	2.5	Iowa DOT Materials Laboratory Test Method 222
A Freeze	10	25	45	Iowa DOT Materials Laboratory Test Method 211, Method A
C Freeze	N/A	10	10	Iowa DOT Materials Laboratory Test Method 211, Method C
Clay Lumps/Friable Particles	0.5	N/A	N/A	Materials I.M. 368
Organic Material	0.01	0.01	0.01	Iowa DOT Materials Laboratory Test Method 215

[(a)] If the Alumina value fails, the A Freeze value shall be determined for specification compliance. Iowa DOT Materials Laboratory Test Method 222 does not apply to gravel.

4127.03 FINE AGGREGATE.
Use:

A. Natural sand. A gradation for wearing course mixtures shall not have more than 50% retained between two consecutive standard sieves below the No. 4 (4.75 mm).

B. Crushed gravel or stone processed from coarse aggregate meeting the requirements of Article 4127.02.

Fine aggregate shall contain no more than 0.01% organic matter when tested using Iowa Test Method 215.

4127.04 COMBINED AGGREGATES.
Use aggregate, which does not contain adherent films of clay or other matter, which will prevent coating of particles with asphalt binder. Meet gradations of Materials I.M. 510.

Maximum shale allowed in the fine portion of the combined materials:

TABLE 4127.04

Aggregate Type	Maximum Percent Allowed	Test Method
Type A	2.0	Materials I.M. 344
Type B	5.0	Materials I.M. 344

4127.05 MINERAL FILLER.
For fine material added to the mixture, separate from cold feed, meet the requirements for mineral filler in AASHTO M 17, except determine the gradation according to AASHTO T 11.

Section 4130

4130, Revetment Stone and Erosion Stone.

Replace title and entire section:

Revetment Stone, ~~and~~ Erosion Stone, and Gabion Stone.

4130.01 REVETMENT DESCRIPTION.

A. Broken limestone, dolomite, quartzite, or granite from an approved source as described in Materials I.M. 409.

- A minimum of 50% of the stone shall be composed of beds or slabs more than 5 inches (125 mm) thick.
- A minimum of 10% of the beds or slabs shall be thick enough to produce the required weight (mass) of either the stone or concrete with the greatest dimension not more than two times the smallest dimension.

B. When the source test plot or service history is not available, meet the following requirements for virgin stone crushed to 3/4 inch to 1 1/2 inch (19 mm to 37.5 mm) nominal maximum sizes:

REVETMENT TYPE	REVETMENT QUALITY	TEST LIMITS (MAX)	TEST METHOD
Primary projects; Class A & B revetment All projects; Class E revetment	Alumina A Freeze Secondary Pore Index	0.7 10 25	Iowa 222 Iowa 211, Method A Iowa 219
Non-Primary projects; Class A & B revetment	C Freeze	5	Iowa 211, Method C
All projects; Class D revetment	C Freeze	10	Iowa 211, Method C
~~Erosion Stone~~	~~C Freeze~~	~~15~~	~~Iowa 211, Method C~~
Note: Revetment may pass either Alumina or A-Freeze for compliance.			

Abrasion loss for all revetment and erosion stone not to exceed 50% when tested according to AASHTO T 96.

C. Recycled PCC pavement or broken concrete meeting the requirements of Materials I.M. 210 may be used as revetment with the approval of the Engineer.

- All reinforcement material shall be cut flush with the flat surface of the concrete.
- A minimum of 50% of the broken concrete revetment shall be composed of slabs more than 5 inches (125 mm) thick.
- A minimum of 10% of the slabs shall be thick enough to produce the required weight (mass) of the concrete with the greatest dimension not more than two times the smallest dimension.
- No petroleum based or HMA material shall be included in revetment material.

4130.02 REVETMENT GRADATION.
Gradation compliance is determined by visual inspection, monitored by the Engineer. The Engineer may designate material as too fine or too coarse.

A. Class A Revetment.

- Nominal top size of 400 pounds (180 kg).
- At least 75% of the stones shall weigh more than 75 pounds (35 kg).
- None less than 50 pounds (25 kg).
- Stones shall have at least one flat face with one dimension at least 15 inches (375 mm).

B. Class B Revetment.

- Nominal top size of 650 pounds (300 kg).
- At least 20% of the stones shall weigh more than 500 pounds (225 kg).
- At least 50% of the stones shall weigh more than 275 pounds (125 kg).
- At least 90% of the stones shall weigh more than 25 pounds (10 kg).

C. Class D and Class E Revetment.

- Nominal top size of 250 pounds (115 kg).

- At least 50% of the stones shall weigh more than 90 pounds (40 kg).
- At least 90% of the stones shall weigh more than 5 pounds (2 kg).
- The Engineer may approve using riprap containing material larger than 250 pounds (115 kg).

Additional processing is not required for Class D material. After visual inspection and prior to loading, the Engineer may designate material as too fine or too coarse. Mechanically process Class E material to remove material 3 inches (75 mm) and less.

4130.03 EROSION STONE DESCRIPTION.
Broken limestone, dolomite, quartzite, granite, or broken concrete with steel removed.

4130.04 EROSION STONE GRADATION.
Gradation compliance is determined by visual inspection, monitored by the Engineer. The Engineer may designate material as too fine or too coarse.

- Nominal 6 inch (150 mm) size.
- 100% passing the 9 inch (225 mm) screen.
- 100% retained on the 3 inch (75 mm) screen.

4130.05 EROSION STONE QUALITY.

TABLE 4130.05		
Aggregate Quality	**Maximum Allowed Percent**	**Test Method**
C Freeze	15	Iowa DOT Materials Laboratory Test Method 211, Method C
Abrasion	50	AASHTO T 96
Clay Lumps and Friable Particles	5	Materials I.M. 368
Note: Tests are performed on product crushed to 3/4 inch (19 mm) or 1 inch (25 mm) top size.		

There are no quality requirements for recycled concrete.

4130.06 GABION STONE DESCRIPTION.
Broken stone or gravel boulders meeting the requirements below. Use stone and boulders from sources similar in geological origin.

4130.07 GABION STONE AND MATTRESS GRADATION.
Process stone or boulders for gabions and mattresses to sizes ranging from 4 inches to 8 inches (100 mm to 200 mm) in nominal dimensions. Three inches to 5 inches (76.0 mm to 127 mm) is recommended for mattresses.

4130.08 GABION STONE QUALITY.
Meet requirements of Table 4130.08. Sources with Revetment A, B, or E approvals need not meet these requirements.

TABLE 4130.08		
Aggregate Quality	**Maximum Allowed Percent**	**Test Method**
Alumina A Freeze	0.7 10	Iowa DOT Materials Laboratory Test Method 211, Method A
Abrasion	50	AASHTO T 96
Note: Pass either Alumina or A Freeze for compliance (alumina does not apply to gravel). Perform tests on product crushed to 3/4 inch (19 mm) or 1 inch (25 mm) maximum size.		

Section 4131

4131, Porous Backfill Material

Replace the entire section:

4131.01 DESCRIPTION.
Gravel or crushed stone.

4131.02 GRADATION.
Meet the requirements of Gradation No. 29 of the Aggregate Gradation Table, Article 4109.02.

4131.03 QUALITY.
No visible clay lumps, friable particles, and clay coatings. Meet the following requirements:

TABLE 4131.03		
Aggregate Quality	**Maximum Allowed Percent**	**Test Method**
Abrasion	50	AASHTO T 96
Alumina [(a)]	0.7	Iowa DOT Materials Laboratory Test Method 222
A Freeze	10	Iowa DOT Materials Laboratory Test Method 211, Method A
Shale	5	Materials I.M. 345
[(a)] If the Alumina value fails, the A Freeze value shall be determined for specification compliance. Iowa DOT Materials Laboratory Test Method 222 does not apply to gravel.		

Section 4132

4132, Special Backfill Material.

Replace the entire section:

Section 4132. Special Backfill Material.

4132.01 DESCRIPTION.
- Crushed stone, crushed PCC, crushed composite pavement, or reclaimed HMA,
- Mixtures of gravel, sand, and soil, or
- Uniformly blended combinations of the above.

4132.02 GRADATION.
Meet the following gradations:

TABLE 4132.02 - 1	
Material	**Gradation (Aggregate Gradation Table, Article 4109.02)**
Crushed Stone Crushed PCC Crushed Composite Pavement	#30
Gravel or Gravel Blends with Crushed Stone, PCC, or Composite	#31

TABLE 4132.02 - 2	
Material	**Gradation**
Reclaimed HMA	Nominal top size of 2 inches (50 mm)

4132.03 QUALITY.
For gravel mixture, do not exceed the following:

TABLE 4132.03		
Maximum Permissible Amounts of Objectionable Materials	**Maximum Percent Allowed**	**Test Method**
Plasticity Index	10	Iowa DOT Materials Laboratory Test Method 109
Carbon	1.0	Iowa DOT Materials Laboratory Test Method 111

Section 4133

4133, Granular Backfill Material.

Replace the entire section:

Section 4133. Granular Backfill Material

4133.01 DESCRIPTION.
Crushed stone or natural sand and gravel.

4133.02 GRADATION.
Meet the requirements for Gradation No. 32 of the Aggregate Gradation Table, Article 4109.02, except when used as backfill under flowable mortar or as floodable backfill.

4133.03 QUALITY.
For crushed stone, meet the following requirements:

TABLE 4133.03

Coarse Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion	55	AASHTO T 96
C Freeze	20	Iowa DOT Materials Laboratory Test Method 211, Method C
Total of Abrasion & C Freeze	65	--
Clay lumps and friable particles	4	Materials I.M. 368

4133.04 BACKFILL UNDER FLOWABLE MORTAR.
Use one of the following:

A. Natural sand complying with the requirements for Gradation No.1 of the Aggregate Gradation Table, Article 4109.02, with a maximum of 4% passing the No. 200 (75 µm) sieve.

B. Material complying with the requirements for Gradation No.12 of the Aggregate Gradation Table, Article 4109.02.

C. Material complying with Article 4133.05.

4133.05 FLOODABLE BACKFILL.

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. 36 of the Aggregate Gradation Table, Article 4109.02.

Section 4136

4136.02, A, Poured Joint Sealer.

Replace the first paragraph:
Hot poured joint sealer shall be composed of petropolymers and be supplied in solid form. The sealer shall meet requirements of ASTM D 6690, Type IV.

4136.03, Preformed Expansion Joint Filler and Sealer.

Replace the title and entire article:

4136.03 Expansion Joint filler and Sealer.
Material for filling expansion joints shall be one of the following types. When the type is not specified, resilient filler shall be used.

A. Resilient Filler.
Resilient filler shall meet requirements of AASHTO M 213 and shall be furnished in strips of dimensions shown in the contract documents. When the self expanding type is specifically required, the material shall meet requirements of AASHTO M 153, Type III. Sealer used with these fillers shall meet requirements of

Article 4136.02, A. Other resilient fillers may be approved by the Engineer. Approved sources of resilient expansion joint fillers are listed in Materials I.M. 436.03, Appendix A.

B. Flexible Foam Expansion Joint Filler.
Flexible foam expansion joint filler shall be of the size designated in the contract documents and shall be resistant to petroleum derivatives. The joint filler shall comply with the requirements of ASTM D 1752, Sections 5.1 to 5.4; with Section 5.3 modified to 10 psi (0.069 MPa) minimum and 25 psi (0.173 MPa) maximum when tested in accordance with AASHTO T 42. Approved sources for flexible foam expansion joint fillers are listed in Materials I.M. 436.05, Appendix A.

Sealer used with this filler shall meet the requirements of Article 4136.02, A.

C. Tire Buffings Expansion Joint Filler.
When designated in the contract documents tire buffings shall be used to fill expansion joints. Tire buffings shall consist of buffings from the tire retreading industry. Approved sources for tire buffings for expansion joints are listed in Materials I.M. 436.06, Appendix A. The tire buffings shall be clean, dry, and without any contamination. Tire buffings shall be placed loose and struck off level. Any compacted material shall be removed and replaced with loose material. Sealer shall meet the requirements of Article 4136.02, A. Approved sources for sealers are listed in Materials I.M. 436.01, Appendix A.

D. Elastomeric Joint Seals.
Elastomeric joint seals shall be of the size designated in the contract documents and of a shape approved by the Engineer. The seal and the lubricant adhesive shall meet requirements of AASHTO M 220.

Seals with splices will be acceptable only when splices are made using factory type methods approved by the Engineer. A splice shall not occur within 1 foot (0.3 m) of a sharp bend, when placed in final position, and no piece shall have more than one splice.

Section 4137

4137.02, Asphalt Binder.

Replace “AASHTO MP1” with “AASHTO M 320” in the article.

Add as the second paragraph:
Modification of asphalt binders by addition of acids will not be allowed.

Section 4145

4145.02, Classification.

Replace the first sentence of the first paragraph:
Concrete pipe ~~will~~ shall be furnished in classes according to their strengths.

4145.06, F, Lift Holes.

Add as the second paragraph:
Cutting of circumferential wire in lift hole locations will be permitted if the pipe satisfies the 0.01 inch (0.3 mm) crack test requirements of AASHTO M 170/170 M for the specified class of pipe.

Section 4149

4149.03, Pipe for Storm Sewers.

Replace the first sentence:
Pipe for storm sewers shall meet requirements for one of the types specified in Article 4149.02, except clay pipe shall not be used.

4149.04, Precast Concrete Utility Access Units and Intakes.

Add a new third sentence:

The Contractor shall be responsible for any additional reinforcement necessary to prevent cracking during transportation and installation.

4149.07, Mortar.

Replace “Section 4112” with “AASHTO M 45-04, Aggregate for Masonry Mortar” in the first sentence.

Section 4151

4151.02, Pavement Reinforcement.

Delete the second paragraph:

~~Reinforcement for bridge approach sections shall be deformed bars meeting the requirements of ASTM A 615/A 615M, Grade 40 or 60 (300 or 400).~~

4151.02, A, Pavement Tie Bars.

Delete the seventh sentence:

~~All damage to epoxy coating during rebending shall be repaired by an approved patching material~~

4151.02, B, Pavement Dowel Bars.

Replace “powers” with “powders” in the third sentence of the second paragraph.

4151.02, C, Reinforcement For Bridge Approach Sections, Reinforced Paved Shoulders, and Full-Width Reinforcement of Pavements.

Add a new article C:

Reinforcement for bridge approach sections, reinforced paved shoulders, and full-width reinforcement of pavements shall be deformed bars meeting the requirements of ASTM A 615/A 615M, Grade 40 0r 60 (300 or 400). Reinforcement shall be epoxy coated and shall meet the requirements of Article 4151.03, except that cut or sheared ends need not be recoated.

Section 4152

4152.02, Structural Steel.

Replace “(20 at 4” with “(20 at 4)” in the third line of Minimum Average Energy column of Table A.

Section 4153

4153.04, Iron Castings.

Replace the second sentence of the first paragraph:

Unless otherwise specified, gray iron castings, bridge rockers, and shoes shall meet requirements of Class 35B, and ductile iron castings shall meet requirements of Grade 65-45-12.

4153.06, B, High Strength Fasteners.

Replace the first sentence:

High strength bolts, nuts, and washers shall meet the requirements of the appropriate ASTM Specifications as follows: bolts - A 325, nuts - A 563 Grade DH3, and washers - F 436.

4153.06, B, 2, a

Replace entire article:

a. Intentionally left blank.

Section 4154

4154.02, Field Fence.

Replace the third and fourth sentences:

For Type 47 fence, the fabric design is ASTM Design Number 1047-6-22 grade 60 wire or 1047-6-12 1/2 grade 125 wire; and for Type 39 fence, the fabric design is ASTM Design Number 939-6-11 grade 60 wire or 939-6-12 1/2 grade 125 wire. When the type is not designated, one of the above 1047 fabrics shall be furnished.

Section 4155

4155.01, Description.

Add as the second sentence:

Guardrail posts shall be wood or steel as specified in the contract documents.

4155.02, Formed Steel Beam Guardrail.

Delete the fourth sentence:

~~Anchor cable shall meet requirements of AASHTO M 30, Type II, Class A.~~

Replace the 5th, 6th, and 7th sentences:

Anchor bolts used to attach beam rail to bridge barrier rail shall meet requirements of ASTM F 1554, Grade105, and shall be full-length galvanized. Washers shall meet the requirements of ASTM F 436. Nuts shall meet the requirements of ASTM A 563, DH, and be heavy hex, Class 2B. All other bolts, nuts, and washers shall meet the requirements of ASTM A 307, Grade A; ASTM A 563, Grade A, hex; and ASTM F 844; respectively. Galvanizing shall meet the requirements of ASTM A 153, Class C.

4155.03, Cable.

Replace the entire article:

A. Cable Rail.

Cable shall meet the requirements of AASHTO M 30, Type I, Class A.

Wire rope safety barrier shall meet the manufacturer's requirements.

B. Anchor Cable.

Cable shall meet the requirements of AASHTO M 30, Type II, Class A.

4155.04, Wood Posts.

Replace the entire article:

Wood posts shall be sawed to the dimensions shown in the contract documents and meet requirements of Section 4164.

4155.05, Steel Posts.

Replace the entire article:

Steel posts and blocks shall meet the requirements of ASTM A 36/A 36 M structural steel of the dimensions shown in the contract documents. Steel posts and blocks shall be galvanized in accordance with the requirements of ASTM A 123. Bolt holes shall be provided in accordance with Article 2408.39, B. Galvanizing shall be done after fabrication and after all bolt holes have been drilled.

4155.06, Miscellaneous Items.

Change the article number 4155.~~06~~07.

Add title and new article 4155.06:

4155.06 Spacer Blocks.
Wood spacer blocks shall meet requirements for wood posts. Steel spacers shall meet requirements for steel posts. Spacer blocks manufactured from alternate materials that have received FHWA approval for use on the National Highway System may be substituted for wood or steel spacer blocks. A list of approved spacer blocks is found on the World Wide Web at the following URL:
http://safety.fhwa.dot.gov/fourthlevel/pro_res_road_nchrp350.htm.

Section 4160

4160.01, D, Ammoniacal Copper Arsenate.

Delete the entire article:

~~**D. Ammoniacal Coper Arsenate.**~~
~~Ammoniacal copper arsenate (ACA) shall conform to the requirements of AASHTO M 133 (AWPA P5).~~

4160.01, E, Ammoniacal Copper Zinc Arsenate.

Replace the entire article:

D. Ammoniacal Copper Zinc Arsenate.
Ammoniacal Copper Zinc Arsenate (ACZA) shall conform to the requirements of AASHTO M 133 (AWPA P5).

4160.01, F, Copper Naphthenate.

Add a new article:

E. Copper Naphthenate.
Copper Naphthenate shall meet the requirements of AASHTO M 133 (AWPA P8). Petroleum solvent shall meet the requirements of AWPA P9 for Hydrocarbon solvent Type A.

Section 4161

4161.02, Preservatives.

Replace the entire article:
Preservatives used for treatment shall meet the requirements of Section 4160. Unless otherwise specified, treatment may be with creosote, pentachlorphenol, copper naphthenate, chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), or Copper Naphthenate.

4161.03, Treatment.

Replace the entire article:
Except as provided herein, preservative treatment shall be in accordance with requirements and recommendations of AWPA Standard C1 and the applicable AWPA Commodity Specifications listed in the following tables for various materials and usages:

TABLE 1: MINIMUM PRESERVATIVE RETENTION REQUIREMENTS
(lb./cu.ft. of wood)
(kg/m^3 of wood)

	Retention					
Material and Usage	**Creosote** (2)	**Penta-chloro-phenol** (2)	**Copper Napthenate**(2)	**ACZA** (3)	**CCA** (1, 3)	**AWPA UC-Section-Special Req.**
Lumber and Timber for Structures(4)	AWPA U1	AWPA U1	AWPA U1	AWPA U1	AWPA U1	AWPA U1

Piles for Foundation:						
Douglas Fir	17 (272)	-	0.14 (2.2)	-	-	UC4C-E
Southern Pine	12 (192)	-	0.10 (1.6)	-	-	
Post, Guardrail, and Spacer Blocks: Sawed Four Sides		0.6 (9.6)	0.075 (1.2)	0.5 (8.0)	0.5 (8.0)	UC4A-A-4.3
Posts, Fence Guide, and Sign:						
Round		0.4 (6.4)	0.055 (0.88)	0.4 (6.4)	0.4 (6.4)	UC4A-B
Sawed Four Sides		0.5 (8.0)	0.060 (0.96)	0.4 (6.4)	0.4 (6.4)	UC4A-A-4.3

Note: (1) CCA shall not be used for the treatment of Douglas Fir.
(2) Oil type preservatives
(3) CCA, ACA, and ACZA are waterborne preservatives.
(4) Retentions based on AWPA. Use Category and Commodity Specification for different applications.

TABLE 2: MINIMUM PRESERVATIVE PENETRATION REQUIREMENTS
inches (mm) of wood and/or % of sapwood penetration

	Penetration		
Material and Usage	**Southern Pine**	**Douglas Fir**	**AWPA Material Standard Section**
Lumber and Timber for Structures(1)	APWA U1, T1	APWA U1, T1	APWA U1, T1
Piles for Foundation	2.5 in. (63 mm) or 85%	0.75 in. (19 mm) and 85% up to 1.6 in. (40 mm) and 85%	T1-8.5
Post, guardrail, and Spacer Blocks:			
Sawed Four Sides	2.5 in. (63 mm) or 85%	**Under 5 in. (125 mm) thick:** 0.4 in. (10 mm) and 90% **5 in. (125 mm) and thicker:** 0.5 in. (13 mm) and 90%	T1-8.1
Posts, Fence, Guide, and Sign:			
Round	2.0 in. (50 mm) or 85%	3/8 in. (9 mm) and 100% up to 1 in. (25 mm) or 85%	T1-8.2
Sawed Four Sides	2.5 in. (63 mm) or 85%	**Under 5 in. (125 mm) thick:** 0.4 in (10 mm) and 90% **5 in. (125 mm) and thicker:** 0.5 in. (13 mm) and 90%	T1-8.1

Note: (1) Penetrations based on AWPA. Use Category and Commodity Specification for different applications.

Other aspects of the treatment shall meet the following requirements:

A. Incising.
Coastal Douglas Fir lumber shall be incised.

B. Seasoning.
When sawed material is treated with waterborne preservatives (CCA, ACZA), the moisture content prior to treatment, as determined by resistance type moisture meter, shall not be more than 20% if kiln dried or not more than 23% if air dried. The moisture content shall be measured at a depth equivalent to the required penetration up to a maximum of 1.5 inches (38 mm). Unless otherwise specified, lumber 2 inches (50 mm) or less in nominal thickness that is treated with a waterborne preservative shall be dried after treatment to a moisture content of not more than 20% if kiln dried or not more than 23% if air dried.

C. Special Treatment for Guardrail and Sign Posts Treated With Oil Type Preservative.
Before being removed from the treatment cylinder, sign and guardrail posts shall be further subjected to live steam at a maximum pressure of 13 psi (90 kPa), and following that, to an additional period of vacuum to insure that the surface of the wood is free from accumulation of oil type preservative.

D. Method of Treatment.
The preservative used shall be the same for all the product furnished for each contract item or order. Unless otherwise specified, treatment with creosote oil, pentachlorophenol, or copper naphthenate solution shall be made by the empty cell process with initial air pressure. Treatment with waterborne preservative shall be made by the full cell process.

E. Results of Treatment.
Unless otherwise specified, retention and penetration of preservatives shall be in conformance with the above tables. Preservative retentions shall be determined by assay method. Other treatment

requirements shall be in accordance with AWPA Standards U1 and T1 and the applicable AWPA Specifications listed in the above tables.

F. Handling Treated Products.
Care and handling of preservative treated wood products shall be in accordance with AWPA Standard M4.

G. Product Marking.
The individual pieces of inspected, treated material shall bear a legible identification mark either hammer or heat branded, die stamped, or metal tagged. For material treated with waterborne preservatives, the identification mark may be ink stamped provided the information is clearly visible and legible. As a minimum, the identification mark shall indicate the treater, the species of wood, the preservative treatment type, and the retention level. Acceptable brands or marks shall be similar to the general guidelines for brands listed in AWPA M1 and M6. All treated wood material that requires a grade, with the exception of 45 inch (1145 mm) Terminal Posts[1], shall contain a quality grade mark of an accredited grade monitoring and inspection agency approved under the American Lumber Standards Committee (ALSC).

[1] In the event that Terminal Posts that are 45 inches (1145 mm) in length to be used for Guardrails can not be stamped with a quality grade mark due to sizing of material, Terminal Posts shall then be stamped “MFG No. 1” to indicate that the Terminal Posts were cut from an original piece graded as a No. 1. Wane requirements will be waived.

Material less than 3 feet (1 m) in length does not require a grade mark; however, a certification statement from the mill/processor certifying the grade of the material shall be provided. See Documentation Section of Materials I.M. 462. Round wood posts, round wood piles, and round wood poles do not require a grade, since the grading rules apply only to sawn material.

In addition, each bundle of treated wood products shall have at least one plastic tag identifying the charge number for the bundle.

H. Inspection.
White and treatment inspections, certifications, and test reports for each shipment shall be furnished in accordance with Materials I.M. 462.

Section 4162

4162.03, Minimum Acceptable Sizes.

Replace the first sentence of the first paragraph:
All material furnished shall conform to the dimensions specified for rough or surfaced stock.

4162.03, A, Manufacture.

Replace the first sentence:
All pieces shall be fully milled and processed, and unless otherwise specified, all ends shall be neatly cut at right angles to the length specified.

4162.03, B, Dimensions.

Replace the second sentence:
Unless otherwise specified, the dimensions of all other material shall be in accordance with the industry standards approved by the Board of Review of the American Lumber Standards Committee for rough or surfaced stock for the species furnished.

4162.04, Species of Wood.

Replace the second sentence:

Construction parts less than a nominal thickness of 2 inches (50 mm) including all boards, strips, and sheathing; may be Douglas Fir (coast region), Southern Pine, West Coast Hemlock, Ponderosa Pine, Idaho White Pine, Sugar Pine, or White Fir.

4162.06, Stress Grade Timber and Lumber.

Replace the entire article:

Material furnished under this specification shall be either Douglas Fir (coast region) or Southern Pine. The material shall be graded as provided in ASTM D 245 and by rules of associations as approved by the American Lumber Standards Committee.

Material shall be of the grade specified for each species. Douglas Fir (Coastal Region) shall be graded according to the grading rules published by the Western Wood Products Association or the West Coast Lumber Inspection Bureau. Southern Pine shall be graded according to the grading rules published by the Southern Pine Inspection Bureau. When a stress grade is identified as structural, Table 4162.06 A shall apply. When a stress grade is identified as common class, Table 4162.06 B shall apply. Unless otherwise specified, the material may be either Douglas Fir or Southern Pine.

Table 4162.06 A

Structural Class*	Grade
Light Framing:	
Douglas Fir	Dense No. 2
Southern Pine	No. 2 Dense
Joists and Plank:	
Douglas Fir	Select Structural or Dense No. 1
Southern Pine	Dense Structural 72
Beams and Stringers:	
Douglas Fir	Dense Select Structural
Southern Pine	Dense Structural 86
Posts and Timbers:	
Douglas Fir	Dense Select Structural
Southern Pine	Dense Structural 72

* Structural class is based on a nominal extreme fiber stress in bending of 1,900 psi (13 MPa) (minimum 1,850 psi (12.8 MPa)) for light framing, joists, and plank in a repetitive member use; and for beams and stringers in a single member use. Structural class for posts and timbers is based on a compression stress parallel to the grain of 1,100 psi (7.6 MPa) when used as a column. When used as a beam in a single member use, the minimum extreme fiber stress in bending is 1,750 psi (12 MPa). Use is assumed in a location where the moisture content will not exceed 19% for an extended period of time. Treatment for durability (Section 4161) is also assumed, where specified.

Table 4162.06 B	
Common Class*	**Grade**
Light Framing:	
Douglas Fir	No. 2
Southern Pine	No. 2 Dense
Joists and Plank:	
Douglas Fir	No. 1
Southern Pine	Dense Structural 65
Posts and Timbers:	
Douglas Fir	Select Structural
Southern Pine	Dense Structural 65
* Common class is based on a nominal extreme fiber stress in bending of 1,500 psi (10.3MPa) (minimum 1,450 psi (10 MPa)) for light framing, joists, and plank in a repetitive member use. Common class for posts and timbers is based on a compression stress parallel to the grain of 1,000 psi (7 MPa) when used as a column. When used as a beam in single member use, the minimum extreme fiber stress in bending is 1,450 psi (10 MPa). Use is assumed in a location where the moisture content will not exceed 19% for an extended period of time. Treatment for durability (Section 4161) is also assumed, where specified.	

Untreated wood material that requires a grade, with the exception of 45 inch (1145 mm) Terminal Posts, shall be stamped with the identifying quality grade mark of an accredited grade monitoring and inspection agency approved by the American Lumber Standards Committee (ALSC) under the Untreated Wood Program. If, due to sizing of material, 45 inch (1145 mm) Terminal Posts to be used for guardrail cannot be stamped with a quality grade mark, they shall be stamped “MFG No. 1” to indicate that the posts were cut from an original piece graded as a No. 1. Wane requirements will be waived.

Material less than 3 feet (1 m) in length does not require a grade mark; however, the grade of the material shall be certified by the certification statement from the mill/processor in accordance with Materials I.M. 462. Round wood posts, round wood piles, and round wood poles do not require a grade, since the grading rules apply only to sawn material.

Section 4164

4164.01, General Requirement.

Add new first paragraph:

When dried, either kiln dried or air dried, all posts shall be free from bends in more than one plane and free from short or reverse bends, and a straight line from the centers of the ends of a spot shall not deviate from the longitudinal axis of the post at any point more than 0.5% of the length of the post.

4164.02, Round Wood Posts.

Replace the first sentence of the first paragraph:

All round wood posts shall be cut from live, sound, solid trees.

4164.03, Sawed Wood Posts.

Replace the entire article:

Sawed wood posts shall conform to the shape and nominal dimensions for rough stock and shall meet the applicable requirements of Section 4162. The minimum grade for treated sawed wood guardrail posts, 5 inches by 5 inches (125 mm by 125 mm) and larger shall be No. 1 or better Douglas Fir (coast region), or No. 1 or better Southern Pine in accordance with the minimum strength requirements of AASHTO M 168.

4164.04, Wood Sign Posts.

Replace the fourth paragraph:

Nominal 4 inch by 4 inch (100 mm by 100 mm) sign posts in lengths up to 14 feet (4.3 m) may be furnished in species Northern Pine (Norway, Red Pine), Grad No. 1, in accordance with the Northeastern Lumber Manufacturer’s Association Rules.

Delete the last paragraph:

~~All posts shall be kiln dried or air dried prior to treatment to a moisture content of not more than 20%. When dried, all posts shall be free from bends in more than one plane and free from short or reverse bends, and a straight line from the centers of the ends of a post shall not deviate from the longitudinal axis of the post at any point more than 0.5% of the length of the post.~~

4164.06, Inspection.

Delete the word “sign” from the second sentence.

Section 4165

4165.04, D, Preservative Treatment.

Replace the first sentence:

Piles shall be given pressure preservative creosote or copper naphthenate treatment in accordance with Section 4161.

Section 4167

4167.01, Description.

Replace the first sentence of the first paragraph:

Steel H-piles shall be rolled from steel meeting requirements of ASTM A 572/A 572M Grade 50 (345) and shall have cross section dimensions meeting requirements of ASTM A 6/A 6M for the section number designated.

Section 4169

4169.02, Seeds.

Delete the sixth line of Table 4169.02.

~~Fescue, tall, KY. 31 Festuca arundinacea KY. 31 98 85~~

4169.03, Fertilizer.

Replace the fourth indented paragraph:

Fertilizer shall be of a type that can be uniformly distributed by the application equipment. Fertilizer may be chemically combined or may be furnished as separate ingredients. Fertilizer supplied as chemically combined shall have each unit of fertilizer chemically combined, and the manufacturer’s guarantee shall indicate compliance with this requirement. Fertilizer supplied as separate ingredients shall be of uniform size, and the analysis shall be guaranteed by the manufacturer. Fertilizer supplied as separate ingredients shall be mixed using a drum mixer, grinder mixer, or other approved mechanical mixers. Fertilizer shall be mixed only by the fertilizer dealer.

Add as the fifth indented paragraph:

When a 6-24-24 chemically combined commercial fertilizer has been specified, a combination of ammoniated phosphate, muriate of potash (granular form), and urea (granular form) may be used.

Add as the sixth indented paragraph:

When a 13-13-13 chemically combined commercial fertilizer has been specified, a combination of ammoniated phosphate, muriate of potash (granular form), and urea (granular form) may be used.

Add as the seventh indented paragraph:

Ammoniated phosphate shall consist of either monoammonium phosphate (11-52-0) or diammonium phosphate (18-46-0).

4169.08, Mulch.

Replace the first sentence of the first paragraph:

Material used as mulch may consist of threshed or unthreshed prairie hay, threshed cereal straw, wood excelsior, wood cellulose, or other material, as specified.

4169.10, Special Ditch Control and Slope Protection.

Replace the entire article:

Plastic netting, wood excelsior mat, coconut fiber mat, straw-coconut mat, straw mat, and wire staples shall comply with the following and meet the requirements of Materials I.M. 469.10.

A. Wire Staples.

Wire staples for holding special ditch control and slope protection mat shall meet the following requirements:

- Wire staples shall be U-shaped.
- The length of each leg shall be a minimum of 6 inches (150 mm). In sandy soil conditions the Engineer may require the length of each leg to be a minimum of 12 inches (300 mm).
- Wire diameter shall be No. 11 (3.06 mm) wire.
- Staples shall be of sufficient hardness to facilitate installation without bending.

B. Special Ditch Control.

1. Wood Excelsior Mat.

Wood excelsior mat shall be a mat of interlocking wood fibers with plastic netting applied to both sides for holding the excelsior in place. These mats shall meet the following requirements:

- The mat shall be non toxic to growth of plants and germination of seeds.
- The mat shall be furnished in rolls with a uniform width of 48 inches (1.2 m) with a tolerance of minus 1 inch (25 mm) and a minimum length of 80 feet (24 m).
- The mat shall have a minimum dry weight (mass) of 0.68 pounds per square yard (334 g/m^2) according to ASTM D 6475.
- The mat shall be furnished in plastic bags or otherwise protected to prevent damage from weather and handling.

2. Coconut Fiber Mat.

At the Contractor's option, coconut fiber mat may be substituted for wood excelsior mat for special ditch control. These mats shall meet the following requirements:

- The mat shall be of uniform thickness with the coconut fiber evenly distributed over the entire area of the mat.
- Both sides of the mat shall be covered with polypropylene netting attached with cotton thread.
- The mat shall be furnished in rolls with a uniform width of 48 inches (1.2 m) with a tolerance of minus 1 inch (25 mm) and a minimum length of 80 feet (24 m).
- The mat shall have a minimum dry weight (mass) of 0.40 pounds per square yard (182 g/m^2) according to ASTM D 6475.
- The mat shall be furnished in plastic bags or otherwise protected to prevent damage from weather and handling.

C. Slope Protection.

Wood excelsior mat, coconut fiber mat, straw mat, or straw coconut mat may be used for slope protection.

1. Wood Excelsior Mats.

Wood excelsior mat shall be a mat of interlocking wood fibers and shall meet the following requirements:

- Plastic netting shall be applied to one or both sides for holding the excelsior in place. Mats without netting where the excelsior is mechanically stitched together to hold it in place may be allowed.
- The mat shall be nontoxic to growth of plants and germination of seeds.
- The mat shall be furnished in rolls with a uniform width of 48 inches (1.2 m), with a tolerance of minus 1 inch (25 mm) and a minimum length of 80 feet (24 m).

- The mat shall have a minimum dry weight (mass) of 0.50 pounds per square yard (246 g/m^2) according to ASTM D 6475.
- The mat shall be furnished in plastic bags or otherwise protected to prevent damage from weather and handling.

2. Straw Mat, Straw-Coconut Fiber Mat, or Coconut Fiber Mat.
At the Contractor's option; straw mat, straw-coconut fiber mat, or coconut fiber mat may be substituted for wood excelsior mat for slope protection. These mats shall meet the following requirements:

- The mat shall be of consistent thickness with the straw, straw-coconut fiber, or coconut fiber evenly distributed over the entire area of the mat.
- The top side of the mat shall be covered with polypropylene netting attached with cotton thread.
- The mat shall be furnished in rolls with a uniform width of 48 inches (1.2 m), with a tolerance of minus 1 inch (25 mm) and a minimum length of 80 feet (24 m).
- The mat shall have a minimum dry weight (mass) of 0.40 pounds per square yard (182 g/m^2) according to ASTM D 6475.
- The mat shall be furnished in plastic bags or otherwise protected to prevent damage from weather or handling.

D. Netting Size.
The mesh size of netting applied on wood excelsior mats shall be not more than 1 inch by 2 inches (25 mm by 50 mm).

The mesh size of netting applied on coconut fiber only mats for channel and slope shall be not more than 3/4 inch by 3/4 inch (19 mm by 19 mm).

The mesh size of netting applied on the top side of straw and straw-coconut fiber mats for slopes only shall be not more than 1/2 inch by 1/2 inch (13 mm by 13 mm).

The weight of netting for special ditch control or slope protection shall be not less than 9 pounds per 1000 square yards (44 g/m^2).

A tolerance of plus or minus 0.10 inch (2.5 mm) shall be applicable to netting size.

Section 4183

4183.01, Description.

Replace “Article 2527.02”, B with “Article 2527.03” in the second sentence.

4183.03, B, 1, b, Resin Solids.

Replace the second sentence:
Acrylic emulsion polymer shall be Rohm & Haas E 3427, Dow Chemical DT 250, or an approved equal.

Add as the third sentence:
For Low Temperature Paint, Rohm & Haas XSR Resin shall be used.

4183.03, B, 4, Packaging and Marking.

Replace “(2.5°C)” with “(25°C)” in the last paragraph.

4183.04, Epoxy Traffic Paint.

Replace the title:
Durable Paint Pavement Markings.

Replace the first paragraph:

Durable paint pavement markings shall meet the requirements of Materials I.M. 483.04.

Delete the second paragraph:

~~Final acceptance will be based on compliance with these specifications and also retroreflective readings which will be taken in 1 to 2 weeks after installation of the markings. The retroreflectivity will be measured, by the Engineer, with a 30 m geometry retroreflectometer. This instrument has an 88.76 degree entrance angle, and a 1.05 degree observation angle. The markings shall meet the following retroreflectivity requirements:~~

	~~**Specific Luminance (mcd/sq. ft./ft. cdl.) (lux•m^2)**~~
~~White line, symbols and legends~~	~~300~~
~~Yellow line~~	~~200~~

Section 4184

4184.02, A, Gradation.

Add a new first row to the table and replace the second row:

Sieve Size	Percent Passing
16 (1180 µm)	100
20 (850 µm)	95-100

Section 4185

4185.02, A, Anchor Bolt and Slip-Base Plate Fasteners for Lighting Poles.

Replace the second paragraph:

The anchor bolts shall meet the requirements of ASTM F 1554, Grade 105 (724 MPa), and be full-length galvanized. Anchor bolts shall be the Unified Coarse Thread Series and have Class 2A tolerance. The end of each anchor bolt intended to project from the concrete shall be color coded in red to identify the grade. Slip base plate 1 inch by 4 1/2 inch (25 mm by 112 mm) bolts shall meet the requirements of ASTM A 325, be high-strength bolts, and be fully galvanized. Washers shall be galvanized and shall meet the requirements of ASTM F 436. Nuts shall meet the requirements of ASTM A 563, DH, be heavy hex, and be galvanized. Nuts may be over-tapped in accordance with the allowance requirements of ASTM A 563. Galvanizing shall meet the requirements of ASTM A 153, Class C; or ASTM B 695, Class 50.

Section 4186

4186.01, Description.

Delete the first paragraph:

~~Except as modified by contract documents, signs shall be made according to the standards established in the 1979 Standard Highway Signs Manual as published by the United States Department of Transportation.~~

4186.02, C, Plywood.

Replace the entire article:

~~All softwood plywood shall conform to the latest edition of Production Standard One PS1-83 Group 1, and each panel shall be APA Grade-Trademark of the American Plywood Association. The panel shall be BB exterior (Douglas Fir) B grade, plugged core (Douglas Fir). The core gaps shall not exceed 1/2 inch (12.5 mm). This material must be suitable for sign manufacture and the overlay must be compatible with the adhesive of the sheeting. The overlay on both faces must be prepared at the time of manufacture prior to application of sheeting. No marks, blemishes or damage of any kind will be allowed. The 5/8 inch (15.6 mm) thick plywood shall be a high density overlay (HDO) such as Simpson "Highway HDO: or comparable. The 1/2 inch (12.5 mm) thick plywood shall be a medium density overlay (MDO).~~

All softwood plywood shall conform to the latest edition of the National Institute of Standards and Technology Voluntary Product Standard PS 1 for Structural Plywood. Plywood shall be 1/2 inch (12.5 mm) thick and be either medium density overlay (MDO) or high density overlay (HDO). The panels' grades are:

1. Exterior HDO-Industrial B-B, overlaid both sides with a two step lay-up, sanded prior to overlay to reduce wood grain and repair show-through, and the overlay suitable for sign manufacture and compatible with the reflective sheeting adhesive. The overlay shall have no marks, blemishes, or damage of any kind.

The panel faced veneers shall be a certified hardwood, (tested and certified in accordance to Section 5.8.7 of PS 1 by an International Accreditation Service (IAS) recognized inspection/testing agency) or Douglas fir from Group 1 classification of species. The inner plies shall be Douglas fir and the grade shall be C plugged or better.

2. Exterior MDO-General B-B, overlaid both sides with a two step lay-up, sanded prior to overlay to reduce wood grain and repair show-through, and the overlay suitable for sign manufacture and compatible with the reflective sheeting adhesive. The overlay shall have no marks, blemishes, or damage of any kind.

The panel faced veneers shall be from a Group 1 classification of species or equivalent, (tested and certified in accordance to Section 5.8.7 of PS 1 by an IAS recognized inspection/testing agency). The inner plies shall be from either Group 1 or Group 2 classification of species and the grade shall be C grade or better.

4186.03, Reflective Sheeting.

Replace the 4th, 5th, and 6th paragraph:
Type VI (Iowa) and Type VII (Iowa) sheeting shall meet the requirements of Materials I.M. 486.03.

4186.03, A, Utilization of Reflective Sheeting.

Add a sentence:
Unless otherwise specified, all signs with white background shall use Type III or IV retroreflective sheeting.

4186.03, A, 1, Permanent Signs and Devices.

Replace the entire article:

1. Permanent Signs and Devices.
Unless otherwise specified, all signs with yellow, green, red, blue, or brown background shall use Type III or IV retroreflective sheeting. The legend on white and yellow signs shall be accomplished with black nonreflective sheeting that is direct applied, or silk screened with black opaque ink. The legend on green signs shall be accomplished with white Type III or IV retroreflective sheeting that is direct applied. The legend on red signs shall be accomplished using either transparent red ink that is reverse silk screened on white Type III or IV sheeting, or with white type III or IV retroreflective sheeting that is direct applied on a red Type III or IV retroreflective sheeting background. The legend on blue or brown signs shall be accomplished using either transparent ink that is reverse silk screened on white Type III or IV sheeting, with whiteType III or IV retroreflective sheeting that is direct applied.

Type III or IV retroreflective sheeting shall be used for permanent road closure barricades.

4186.03, A, 2, Work Zone Signs and Devices.

Replace the entire article:

2. Work Zone Signs and Devices.

a. Interstate and Primary Highways.
All rigid signs with orange backgrounds shall use Type VII (Iowa) retroreflective sheeting. The legend shall be accomplished with black nonreflective sheeting that is direct applied or silk screened with black opaque ink. All flexible roll-up signs with orange backgrounds shall use Type VI (Iowa) retroreflective sheeting. The legend shall be accomplished by silk screening with black opaque ink.

STOP/SLOW paddles shall use Type VII (Iowa) retroreflective sheeting. The black legend shall be accomplished with black nonreflective sheeting that is direct applied or silk screened with black opaque ink on orange Type VII (Iowa) retroreflective sheeting. The white legend shall be accomplished with transparent red ink that is reverse silk screened on white Type VII (Iowa) retroreflective sheeting.

Type VII (Iowa) non-fluorescent retroreflective sheeting shall be used for barricades, vertical panels, and all other work zone traffic control devices that use premanufactured barricade sheeting. Type VII (Iowa) fluorescent orange and Type III or IV white retroreflective sheeting shall be used for drums, 42 inch (1050 mm) channelizers, tubular markers, and all other work zone traffic control devices that use horizontal sheeting. Reboundable traffic control devices shall use Type III or IV or Type VII (Iowa) sheeting that is designed for such devices.

b. Other Highways.
Unless otherwise specified, all rigid post mounted signs with orange backgrounds shall use Type III or IV retroreflective sheeting. Unless otherwise specified, all skid mounted signs with orange backgrounds shall use Type I or II retroreflective sheeting. The legend shall be accomplished with black nonreflective sheeting that is direct applied or silk screened with black opaque ink.

STOP/SLOW paddles shall use Type I or II retroreflective sheeting. The black legend shall be accomplished with black nonreflective sheeting that is direct applied or silk screened with black opaque ink. The white legend shall be accomplished with transparent red ink that is reverse silk screened on white retroreflective sheeting.

Type III or IV retroreflective sheeting shall be used for barricades and vertical panels. Reboundable drums, tubular markers, and other reboundable markers shall use Type III or IV retroreflective sheeting that is designed for reboundable devices.

At the Contractor's option, work zone signs and devices using retroreflective sheeting in accordance with Article 4186.03, A, 2, a above, may be used on all other highways.

4186.04, Nonreflective Sheeting.

Replace the reference to "ASTM D 4965" in the last sentence with "ASTM D 4956".

4186.06, Sign Fabrication.

Delete the third sentence of the first paragraph:
~~Hole drilling for detachable copy may be done after the application of sheeting.~~

4186.06, B, Legend.

Delete the entire article.

4186.06, C, Detachable Letters, Numerals, Symbols, and Borders.

Replace the title and entire article:

C. Letters, Numerals, Symbols, and Borders.
Letters, numerals, symbols, and borders shall be in accordance with the details shown in the contract documents

The border strip on the left and right edges of each sign shall be set in far enough from the edge to accommodate installation of the required trim molding without reducing the border width.

4186.06, D, Other Details.

Delete the second paragraph:
~~Hole locations and corner radii are shown on sign drawings available from the Highway Division.~~

4186.09, A, Type A Signs.

Replace entire article:

A. Type A Signs
Type A sign fasteners shall be as follows:

1. Bolts.
Bolts shall be 3/8 inch (9.5 mm) in diameter with a hexagonal head. Thread fit shall conform to ANSI Class 2A. The length required shall be dependent upon the type of post supplied by the Contractor (wood, steel or aluminum). The minor thread diameter shall be used in determining stress area.

2. Nuts.
Nuts shall be finished, finished thick, regular, or heavy, hexagonal, self locking nuts for 3/8 inch (9.6 mm) bolts, but all nuts shall be of the same type. The axial tensile strength at room temperature shall be not less than 4,730 pounds (21 kN).

3. Self Locking Nuts.
Self locking nuts shall be approved by the Engineer. Thread fit shall be as recommended by the manufacturer.

4. Washers.
Washers shall be made of a quality of material approved by the Engineer. The washers shall be 3/8 inch (9.5 mm) I.D. x 1 3/8 inch (35 mm) O.D. x 0.125 inch (3 mm). A thickness tolerance of ± 0.006 inch (0.15 mm) will be allowed.

Neoprene washers shall be 3/8 inch (9.5 mm) I.D. x 15/16 inch (24 mm) O.D. x 1/8 inch (3 mm) thickness. (Neoprene washers are required when treated wood posts are used). Durometer hardness shall be 60 to 70 with a tolerance of ± 5.

5. Other Details.
Other details, including post clips on I-beams posts, etc., are shown in the contract documents.

Hardware may be furnished in stainless steel or galvanized steel as approved by the Engineer. Galvanizing shall meet requirements of ASTM A 153, Class D, or ASTM B 633, Class Fe/Zn 12, Type 1.

4186.09, D, Detachable Message Fasteners.

Delete the entire article.

4186.10, B, Steel Breakaway Posts for Type B Signs.

Replace the title and first sentence of the first paragraph:

B. Steel Breakaway Posts for Type A or B signs.
Steel breakaway posts for Type A or B signs shall be of the size and type shown in the contract documents.

Replace the fifth sentence of the first paragraph:
The coating shall be applied by the hot dip process in compliance with ASTM A 123, Grade 85.

Replace the fifth paragraph:
Bolts (including the entire length of the anchor bolts), nuts, and washers, shall be galvanized according to ASTM A 153, Class A coating.

Add as new sixth and seventh paragraphs:
Holes in the fuse plates and splice plates shall be drilled. Notches in the base plates and fuse plates shall be provided so that no metal projects beyond any face of the plate and the edges of the notches are smooth and true. All bearing surfaces of base plate and fuse plate assembly shall be smooth and free of beads or runs.

For the fuse plate assembly, the post cut shall be accomplished by either sawing or flame cutting, and may be made either before or after galvanizing of the post. If the cut is made after galvanizing, the damaged area shall be repaired by painting or smoldering.

Replace the eighth paragraph:

Before fabrication, shop drawings for the steel breakaway sign posts shall be submitted in accordance with Article 1105.03 for review.

Section 4187

4187.01, Description.

Replace the first paragraph:

Materials for aluminum alloy or galvanized overhead sign support structures shall meet the following requirements:

4187.01, B, Reserved.

Replace the title and paragraph:

B. Materials for Galvanized Steel Superstructures.

Materials for galvanized steel superstructure shall be of the type and quality specified in the contract documents.

4187.01, C, Fasteners for Aluminum Alloy.

Replace the title:

C. Fasteners for Aluminum Alloy and Galvanized Steel Superstructures and Anchor Bolts.

4187.01, C, 2, Anchor Bolts, Nuts, and Washers.

Replace all paragraphs of item 2:

Welding of anchor bolts will not be allowed. The anchor bolts shall meet the requirements of ASTM F 1554, Grade 105 (724 MPa), and be full-length galvanized. Anchor bolts shall be the Unified Coarse Thread Series and have Class 2A tolerance. The end of each anchor bolt intended to project from the concrete shall be color coded in red to identify the grade. Washers shall be galvanized and shall meet the requirements of ASTM F 436. Nuts shall meet the requirements of ASTM A 563, DH, be heavy hex, and be galvanized. Nuts may be over-tapped in accordance with the allowance requirements of ASTM A 563. Galvanizing shall meet the requirements of ASTM A 153, Class C; or ASTM B 695, Class 50.

Section 4188

4188.04, 42 Inch (1050 mm) Channelizers.

Add title and article:

4188.04 42 Inch (1050 mm) Channelizers.

Channelizers shall be reboundable channelizing devices which are used in a traffic control zone. They shall meet the requirements of the MUTCD and the following requirements:

A. Properties.

The channelizer body shall be made from an impact resistant, flexible, and reboundable material that is highway orange meeting Federal Color Standards. The material shall be specifically formulated with ultraviolet stabilizers to provide satisfactory weatherability characteristics and resist fading. The body shall also have an anti-roll feature to provide roll resistance after an impact.

B. Visibility.
The channelizer shall have a minimum of two orange 6 inch (150 mm) bands of Type VII Iowa sheeting according to Article 4186.03 and two white 6 inch (150 mm) bands of Type III or IV sheeting according to Article 4186.03, with the top band being orange. Any nonreflective spaces between the orange and white bands shall not exceed 2 inches (50 mm).

The retroreflective sheeting for the bands shall meet the requirements of Article 4186.03 and recommended by the manufacturer for use on drums.

C. Stability.
The channelizer, when properly ballasted, shall not move, overturn, or separate due to air turbulence created by passing vehicles or moderate winds. The ballast shall be supplied by the manufacturer and shall weigh no less than 30 pounds (13.6 kg) and shall not make a hazard to motorists, workers, or pedestrians. If impacted or overturned, the anti-roll feature shall prevent a channelizer from rolling freely.

D. Acceptance.
Inspection and acceptance of channelizers shall be in accordance with Materials I.M. 488.04.

Section 4195

4195.02, Neoprene Bearing Pads.

Replace the second item of Table B:

D 412	Tensile Strength, minimum psi (MPa)	2250 (15.5)	2250 (15.5)	2250 (15.5)
	Ultimate elongation, minimum %	400	350	300

Replace the note at the bottom of Table B:
Laminates shall be rolled mild steel sheets conforming to ASTM A 1011/A 1011M, Grade 33; Grade 36, Type 1 and 2; or Grade 40, unless otherwise specified by the Engineer.

AGGREGATE GRADATION TABLE - ENGLISH														
Grad. No.	**Section No.**	**Std. Sieve Sz.**	**1 1/2”**	**1.00”**	**3/4”**	**1/2”**	**3/8”**	**4**	**8**	**30**	**50**	**100**	**200**	
		Intended Use	**Percent Passing**											**Notes**
1	4110, 4125, 4133	PCC FA, Cover Agg.					100	90-100	70-100	10-60			0-1.5	1
3	4115 (57, 2-8)	PCC CA	100	95-100		25-60		0-10	0-5				0-1.5	2, 11
4	4115 (2-8)	PCC CA	100	50-100	30-100	20-75	5-55	0-10	0-5				0-1.5	11
5	4115 (67, 2-8)	PCC CA		100	90-100		20-55	0-10	0-5				0-1.5	11
6	4115.06 (Repair & Overlay)	PCC CA			100	97-100	40-90	0-30					0-1.5	11
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	4120.02, 4120.03 (C gravel)	Granular Surface			100			50-80	25-60					3, 12
11	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, 12
12a	4121 (Cr. St.)	Granular Subbase	100			40-80			5-25				0-6	6, 12
12b	4121 (Cr. Gravel)	Granular Subbase	100			50-80			10-30		5-15		3-7	7, 12
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, 12
19	4125 (1/2”) Cr. Gr. or Cr. St.)	Cover Aggregate			100	97-100	40-90	0-30	0-15				0-2	12
20	4125 (1/2” Scr. Gr.)	Cover Aggregate			100	95-100	40-80	0-15	0-7				0-1.5	12
21	4125 (3/8”)	Cover Aggregate				100	90-100	10-55	0-20	0-7			0-1.5	12
22	4124.02B	Fine Slurry Mixture					100	85-100	40-95	20-60	14-35	10-25	5-25	10, 12
23	4124.02B (Cr. St.)	Coarse Slurry Mixture					100	70-90	~~45-70~~ 40-70	~~19-34~~ 19-42	~~12-25~~	~~7-18~~	5-15	12
29	4131	Porous Backfill			100	95-100	50-100	0-50	0-8					12
30	4132.02 (Cr. St.)	Special Backfill	100						10-40				0-10	5, 12
31	4132.03 (Gravel)	Special Backfill		100	90-100	75-100			30-55				3-7	12
32	4133 (Sand/Gr./Cr. St.)	Granular Backfill	100% passing the 3” screen						20-100				0-10	8, 9, 12
35	4133.05 (Natural Sand/Gr.)	Floodable Backfill	100						20-90				0-4	12
36	4133.05 (Natural Sand)	Floodable Backfill							100				0-2	12

Notes: (Gradations No. 2, 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 - not 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.

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 1.0" sieve.

9. When granular backfill is used in floodable applications, use gradation 35 or 36. When granular backfill is used under flowable mortar, one of the following alternative materials shall be used: natural sand compliant with Section 4110, except the % passing the No. 200 sieve shall not exceed 4%; gravel, crushed stone, or crushed concrete meeting the gradation requirements of Section 4121.

10. 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.

11. Maximum of 2.5% passing the No. 200 sieve allowed if generated from the parent material when documented production is 1% or less as determined by the Office of Materials.

12. 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.

AGGREGATE GRADATION TABLE - METRIC

Grad. No.	Section No.	Std. Sieve Sz.	37.5mm	25mm	19mm	12.5mm	9.5mm	4.75mm	2.36mm	600µm	300µm	150µm	75µm	
		Intended Use	Percent Passing											Notes
1	4110, 4125, 4133	PCC FA, Cover Agg.					100	90-100	70-100	10-60			0-1.5	1
3	4115 (57, 2-8)	PCC CA	100	95-100		25-60		0-10	0-5				0-1.5	2, 11
4	4115 (2-8)	PCC CA	100	50-100	30-100	20-75	5-55	0-10	0-5				0-1.5	11
5	4115 (67, 2-8)	PCC CA		100	90-100		20-55	0-10	0-5				0-1.5	11
6	4115.06 (Repair & Overlay)	PCC CA			100	97-100	40-90	0-30					0-1.5	11
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	4120.02, 4120.03 (C gravel)	Granular Surface			100			50-80	25-60					3, 12
11	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, 12
12a	4121 (Cr. St.)	Granular Subbase	100			40-80			5-25				0-6	6, 12
12b	4121 (Cr. Gravel)	Granular Subbase	100			50-80			10-30		5-15		3-7	7, 12
13	4122.02 (Cr. St.)	Macadam St. Base	75 mm nominal maximum size screened over 19 mm or 25 mm screen.											
14	4123	Modified Subbase	100		70-90				10-40				3-10	5, 7, 12
19	4125 (12.5mm Cr. Gr. or Cr. St.)	Cover Aggregate			100	97-100	40-90	0-30	0-15				0-2	12
20	4125 (12.5mm Scr. Gr.)	Cover Aggregate			100	95-100	40-80	0-15	0-7				0-1.5	12
21	4125 (9.5mm)	Cover Aggregate				100	90-100	10-55	0-20	0-7			0-1.5	12
22	4124.02B	Fine Slurry Mixture					100	85-100	40-95	20-60	14-35	10-25	5-25	10, 12
23	4124.02B (Cr. St.)	Coarse Slurry Mixture					100	70-90	~~45-70~~ 40-70	~~19-34~~ 19-42	~~12-25~~	~~7-18~~	5-15	12
29	4131	Porous Backfill			100	95-100	50-100	0-50	0-8					12
30	4132.02 (Cr. St.)	Special Backfill	100						10-40				0-10	5, 12
31	4132.03 (Gravel)	Special Backfill		100	90-100	75-100			30-55				3-7	12
32	4133 (Sand/Gr./Cr. St.)	Granular Backfill	100% passing the 76.2 mm screen						20-100				0-10	8, 9, 12
35	4133.05 (Natural Sand/Gr.)	Floodable Backfill	100						20-90				0-4	12
36	4133.05 (Natural Sand)	Floodable Backfill							100				0-2	12

Notes: (Gradations No. 2, 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 - 4.75 mm, 2.36 mm, 1.18 mm, 600 µm, 300 µm, and 150 µm - not 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 25 mm sieve.

3. When compaction of material is a specification requirement, the minimum percent passing the 75 µm 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 75 µm sieve.

6. The gradation requirement for the 2.36 mm 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 9.5 mm sieve. For Section 4123 gravel, one fractured face on 75% or more of the particles retained on the 9.5 mm sieve.

8. Crushed stone shall have 100% passing the 25 mm sieve.

9. When granular backfill is used in floodable applications, use gradation 35 or 36. When granular backfill is used under flowable mortar, one of the following alternative materials shall be used: natural sand compliant with Section 4110, except the % passing the 75 µm sieve shall not exceed 4%; gravel, crushed stone, or crushed concrete meeting the gradation requirements of Section 4121.

10. Gradation limitations for the (600 µm, 300 µm, and 150 µm) sieves shall not apply when slurry mixture is applied by hand lutes such as for slurry leveling.

11. Maximum of 2.5% passing the 75 µm sieve allowed if generated from the parent material when documented production is 1% or less as determined by the Office of Materials.

12. 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.