MISSOURI
HIGHWAYS and TRANSPORTATION COMMISSION

JEFFERSON CITY, MISSOURI

GENERAL PROVISIONS AND
SUPPLEMENTAL SPECIFICATIONS TO 2011
MISSOURI STANDARD SPECIFICATIONS FOR
HIGHWAY CONSTRUCTION

Effective January 1, 2016

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GENERAL PROVISIONS

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SECTION 404 NATIONWIDE PERMIT GENERAL CONDITIONS

General Conditions. The following general conditions shall be followed in order for authorization by a Nationwide Permit (NWP) to be valid. Permit authorization from U.S. Army Corps of Engineers (USACE) may have additional conditions that will be binding to the project. The contractor shall refer to the permit authorization letter included in the contract.

1.0 Navigation. No activity shall cause more than a minimal adverse effect on navigation.

2.0 Soil Erosion and Sediment Controls. Appropriate erosion and sediment controls shall be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, shall be permanently stabilized at the earliest practical date. Work within waters of the USA shall be performed, when possible, during periods of low-flow or no-flow.

3.0 Aquatic Life Movements. No activity shall substantially disrupt the necessary life-cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams shall be installed such that low flow conditions are maintained.

4.0 Equipment. Heavy equipment working in wetlands shall be placed on mats, or other measures shall be taken to minimize soil disturbance.

5.0 Regional and Case-by-Case Conditions. The contractor's activity shall comply with any regional conditions that may have been added to the contract by the USACE Division Engineer, (see 33 CFR 330.4(e)), and with any case-specific conditions added by the USACE or by the state in the Section 401 water quality certifications.

6.0 Wild and Scenic Rivers. No activity shall occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status; unless the appropriate Federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation, or study status.

7.0 Tribal Rights. No activity shall impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

8.0 Endangered Species.

8.1 No activity will be authorized under any NWP that is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or that is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the USACE District Engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, and shall not begin work on the activity until notified by the USACE District Engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized.

8.2 Authorization of an activity by a NWP shall not authorize the "take" of a threatened or endangered species as defined under the Federal Endangered Species Act. In the absence of separate authorization from the U.S. Fish and Wildlife Service, both lethal and non-lethal "takes" of protected species are in violation of the Endangered Species Act.

9.0 Historic Properties. No contractor activity, that may affect historic properties listed, or eligible for listing, in the National Register of Historic Places, will be authorized until the Commission has complied with the provisions of 33 CFR Part 325, Appendix C.

10.0 Section 404 Conditions. In addition to the General Conditions, the following conditions will apply only to activities that involve the discharge of dredged or fill material into waters of the USA, and shall be followed to maintain authorization by the NWPs.

10.1 Water Supply Intakes. No activity, including structures and work in navigable waters of the U.S. or discharges of dredged or fill material, shall occur in the proximity of a public water supply intake, except where the activity is for repair of the public water supply intake structures or adjacent bank stabilization.

10.2 Suitable Material. No activity, including structures and work in navigable waters of the U.S. or discharges of dredged or fill material, shall consist of unsuitable material such as trash, debris, car bodies, asphalt, etc. Material used for construction or discharged shall be free from toxic pollutants in toxic amounts in accordance with Section 307 of the Clean Water Act.

10.3 Mitigation. The project shall be constructed to avoid and minimize adverse effects to waters of the U.S. to the maximum extent practical at the project site.

10.4 Spawning Areas. Activities, including structures and work in navigable waters of the USA or discharges of dredged or fill material in spawning areas during spawning seasons shall be avoided to the maximum extent practical. Activities that result in the physical destruction of an important spawning area, such as excavation, fill or smother downstream by substantial turbidity, will not be permitted.

10.5 Management of Water Flows. Discharges shall not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water, unless the primary purpose of the fill is to impound waters. The structure or discharge of dredged or fill material shall withstand expected high flows.

10.6 Adverse Effects from Impoundments. If the activity creates an impoundment of water, adverse effects on the aquatic system caused by the accelerated passage of water and/or the restriction of the water's flow shall be minimized.

10.7 Waterfowl Breeding Areas. Activities into breeding areas for migratory waterfowl shall be avoided.

10.8 Removal of Temporary Fills. Any temporary fills shall be completely removed entirety, and the affected areas shall be returned to the pre-existing elevation.

10.9 Section 404 Nationwide Permit No. 3.

10.9.1 The repair, rehabilitation, or replacement of any previously authorized, currently serviceable, structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for the fill in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in material, construction techniques, or current construction codes or safety standards necessary to make repair, rehabilitation, or replacement will be permitted, provided the environmental effects resulting from such repair, rehabilitation, or replacement are minimal. Currently serviceable shall mean useable as is or with some maintenance, but not so degraded as to essentially require reconstruction. The NWP authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced or under contract to commence within two years of the date of the destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the COE District Engineer, provided the permittee can demonstrate funding, contract, or other similar delays.

10.9.2 Discharges of dredged or fill material, including excavation, into all waters of the US to remove accumulated sediment and debris in the vicinity of, and within, existing structures, such as bridges, culverted road crossings, water intake structures, etc., and the placement of new or additional rip rap to protect the structure, provided the permittee notifies the COE District Engineer in accordance with General Condition 13. The removal of sediment shall be limited to the minimum necessary to restore the waterway in the immediate vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend further than 200 feet (60 m) in any direction from the structure. The placement of riprap shall be the minimum necessary to protect the structure or to ensure the safety of the structure. All excavated material shall be deposited and retained in an upland area unless otherwise specifically approved by the COE District Engineer under separate authorization. Any bank stabilization measures not directly associated with the structure will require a separate authorization from the COE District Engineer.

10.9.3 Discharges of dredged or fill material, including excavation, into all waters of the U.S. for activities associated with the restoration of upland areas damaged by a storm, flood, or other discrete event, including the construction, placement, or installation of upland protection structures and minor dredging to remove minor obstructions in a water of the U.S. The NWP applies to activities in waters of the U.S. associated with the replacement of the uplands. The restoration of the damaged areas shall not exceed the contours, or ordinary high water mark, that existing before the damage. Minor dredging to remove obstructions from the adjacent waterbody shall be limited to 50 cubic yards (38 m^3) below the plane of the ordinary high water mark, and shall be limited to the amount necessary to restore the pre-existing bottom contours of the waterbody. The dredging shall not be done primarily to obtain fill for any restoration activities. This permit cannot be used in conjunction with NWP 18 or NWP 19 to restore damaged upland areas. This permit does not authorize new stream channelization or stream relocation projects. Any work authorized by this permit shall not cause more than minimal degradation of water quality, more than minimal changes to the flow characteristics of the stream, or increase flooding.

10.10 Section 404 Nationwide Permit No. 12. Activities required for the construction, maintenance and repair of utility lines and associated facilities in waters of the U.S. shall be as follows.

10.10.1 Utility lines. The construction, maintenance, or repair of utility lines, including outfall and intake structures and the associated excavation, backfill, or bedding for the utility lines, in all waters of the U.S., provided there is no change in

preconstruction contours. A ''utility line'' will be defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. Material resulting from trench excavation may be temporarily sidecast (up to three months) into waters of the U.S., provided that the material is not placed in such a manner that the material is dispersed by currents or other forces. The COE District Engineer may extend the period of temporary side casting, not to exceed a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches (150 to 300 mm) of the trench shall be backfilled with topsoil from the trench. Furthermore, the trench shall not be constructed in such a manner as to drain waters of the U.S., such as backfilling with extensive gravel layers, creating a french drain effect. For example, utility line trenches may be backfilled with clay blocks to ensure that the trench does not drain the waters of the U.S. through which the utility line is installed. Any exposed slopes and stream banks shall be stabilized immediately upon completion of the utility line crossing of each waterbody.

10.10.2 Foundations for Overhead Utility Line Towers, Poles, and Anchors. The construction or maintenance of foundations for overhead utility line towers, poles, and anchors in all waters of the U.S., provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) shall be used where feasible.

10.10.3 Access Roads. The construction of access roads for the construction and maintenance of utility lines, including overhead power lines and utility line substations, in non-tidal waters of the US, provided the discharges do not cause the loss of greater than 1/2 acre (0.20 ha) of non-tidal waters of the U.S. Access roads shall be the minimum width necessary. Access roads shall be constructed so that the length of the road minimizes the adverse effects on waters of the US and as near as possible to preconstruction contours and elevations. Access roads constructed above preconstruction contours and elevations in waters of the U.S. shall be properly bridged or culverted to maintain surface flows. The term ''utility line'' does not include activities which drain a water of the U.S., such as drainage tile, or french drains; however, it does apply to pipes conveying drainage from another area. For the purposes of this NWP, the loss of waters of the U.S. includes the filled area plus waters of the U.S. that are adversely affected by flooding, excavation, or drainage as a result of the project. Activities authorized by paragraph 1.1 through 1.3 may not exceed a total of 1/2 acre (0.20 ha) loss of waters of the U.S. Waters of the U.S. temporarily affected by filling, flooding, excavation, or drainage, where the project area is restored to preconstruction contours and elevation, is not included in the calculation of permanent loss of waters of the U.S. This includes temporary construction mats (e.g., timber, steel, geotextile) used during construction and removed upon completion of the work. Mechanized land clearing necessary for the construction, maintenance, or repair of utility lines and the construction, maintenance and expansion of utility line substations, foundations for overhead utility lines, and access roads is authorized, provided the cleared area is kept to the minimum necessary and preconstruction contours are maintained as near as possible. The area of waters of the U.S. that is filled, excavated, or flooded must be limited to the minimum necessary to construct the utility line, substations, foundations, and access roads. Excess material shall be removed to upland areas immediately upon completion of construction. This NWP may authorize utility lines in or affecting navigable waters of the U.S. even if there is no associated discharge of dredged or fill material (See 33 CFR, Part 322).

10.11 Section 404 Nationwide Permit No. 13. The following bank stabilization activities will be necessary for erosion prevention provided the activity meets all of the following criteria.

10.11.1 No material is placed in excess of the minimum needed for erosion protection.

10.11.2 The bank stabilization activity is less than 500 feet (150 m) in length.

10.11.3 The activity will not exceed an average of one cubic yard per running foot (2.5 m^3 per running meter) placed along the bank below the plane of the ordinary high water mark.

10.11.4 No material is placed in any special aquatic site, including wetlands. Special aquatic sites include wildlife sanctuaries and refuges, wetland, mudflats, vegetated shallow and riffle and pool complexes.

10.11.5 No material is of the type, or is placed in any location, or in any manner, to impair surface water flow into or out of any wetland area.

10.11.6 No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas).

10.11.7 The activity is part of a single and complete project.

10.11.8 This NWP shall not be used for the channelization of a water of the U.S.

10.12 Section 404 Nationwide Permit No. 14. Activities required for the construction, expansion, modification, or improvement of linear transportation crossings (e.g., highways, railways, trails, airport runways, and taxiways) in waters of the U.S., including wetlands, if the activity meets the following criteria.

10.12.1 The discharge does not cause the loss of greater than 1/2-acre (0.20 ha) of waters of the US.

10.12.2 The width of the fill shall be limited to the minimum necessary for the crossing.

10.12.3 This permit does not authorize stream channelization, and authorized activities shall not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality of any stream.

10.13 Section 404 Nationwide Permit No. 15. Discharges of dredged or fill material incidental to the construction of bridges across navigable waters of the U.S., including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills provided such discharges have been authorized by the U.S. Coast Guard as part of the bridge permit. Causeways and approach fills will not be included in this NWP and will require an individual or regional Section 404 permit.

10.14 Section 404 Nationwide Permit No. 23. Activities undertaken, assisted, authorized, regulated, funded, or financed, in whole or in part, by another Federal agency or department where that agency or department has determined, pursuant to the Council on Environmental Quality Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR Part 1500 et seq.), that the activity, work, or discharge is categorically excluded from environmental documentation because it is included within a category of actions which neither individually nor cumulatively have a significant effect on the human environment, and the COEUSACE Office of the Chief of Engineers (ATTN: CECW-OR) has been furnished notice of the agency's or department's application for the categorical exclusion and concurs with that determination.

10.15 Section 404 Nationwide Permit No. 33. Temporary structures, work and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites; provided that the associated primary activity is authorized by the USACE or the U.S. Coast Guard, or for other construction activities not subject to the USACE or U.S. Coast Guard regulations. Appropriate measures shall be taken to maintain near normal downstream flows and to minimize flooding. Fill shall be of materials, and placed in a manner that will not be eroded by expected high flows. The use of dredged material may be allowed if it is determined by the USACE District Engineer that it will not cause more than minimal adverse effects on aquatic resources. Temporary fill shall be entirely removed to upland areas, or dredged material returned to the original location, following completion of the construction activity, and the affected areas shall be restored to the pre-project conditions. Cofferdams shall not be used to dewater wetlands or other aquatic areas changing the use of these areas. Structures left in place after cofferdams are removed will require a Section 10 permit if located in navigable waters of the U. S. (See 33 CFR, Part 322).

SECTION 401 WATER QUALITY CERTIFICATION CONDITIONS

1.0 Description. When a Clean Water Act Section 404 Nationwide Permit is in effect, the contractor is automatically permitted to perform this work under a Water Quality Certification (Section 401) by the Missouri Department of Natural Resources (MDNR). The contractor shall adhere to the following conditions:

1.1 During construction, clearing of vegetation shall be kept to the minimum necessary to accomplish the project.

1.2 Petroleum products, equipment and solid waste shall not be stored after construction working hours below the ordinary high water mark.

1.3 Equipment shall not be operated, except where permitted, nor petroleum products stored in wetlands.

1.4 Riparian areas and stream banks shall be restored to a stable condition as soon as possible after final contouring.

1.5 Work done in streams shall be conducted during low flows whenever possible.

1.6 Petroleum products spilled into any water of the state, or in areas where material could enter waters of the state, shall be cleaned up immediately and disposed of properly.

1.7 The following material shall not be used for streambank stabilization: earthen fill, gravel, fragmented asphalt, broken concrete with exposed rebar, tires, vehicle bodies and liquid concrete, including grouted riprap.

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM REQUIREMENTS

1.0 Disadvantaged Business Enterprise (DBE) Program Requirements. The subsequent Sections will apply only to contracts involving U.S. Department of Transportation (USDOT) federal-aid or federal financial participation. Federal-aid or federal financial participation includes, but is not limited to, any funds directly or indirectly received by MoDOT, or authorized for distribution to or through MoDOT, by the USDOT or any operating administration within the USDOT. These provisions will not apply to Commission contracts funded exclusively with state funds, or state and local funds. Any contractor, subcontractor, supplier, DBE firm, and contract surety involved in the performance of a federal-aid contract shall be aware of and fully understand the terms and conditions of the USDOT DBE Program, as the terms appear in Title 49 CFR Part 26 (as amended), the USDOT DBE Program regulations; Title 7 CSR Division 10, Chapter 8 (as amended), the Commission's DBE Program rules.

2.0 DBE Program Distinguished From Other Affirmative Action Programs. The USDOT DBE Program established by the U.S. Congress is not the same as, and does not involve or utilize, any of the elements or authority of other state or local affirmative action programs, nor does the program rely upon state legislation or gubernatorial executive orders for implementation or authorization, other than the general authority given the Commission in Section 226.150, RSMo. The USDOT DBE Program is implemented by the Commission and MoDOT, through and in conjunction with the FHWA, FTA and FAA, as a "recipient" defined in Title 49 CFR 26.5.

3.0 Policy Regarding DBE Firms. It is the policy of the U. S. Department of Transportation and MoDOT that businesses owned by socially and economically disadvantaged individuals have an opportunity to participate in the performance of contracts financed in whole or in part with federal funds. Consequently, the requirements of 49 CFR Part 26 (as amended) and the Commission's implementing state regulations in Title 7 CSR Division 10, Chapter 8, "Disadvantaged Business Enterprise Program", will apply to any contract with federal funds.

4.0 Opportunity for DBEs to Participate. Each contractor, subcontractor and supplier working on a contract financed in whole or in part with federal funds shall take all necessary and reasonable steps to ensure that DBEs have an opportunity to compete for, and participate in performance on project contracts and subcontracts.

5.0 Required Contract Provision. The federal-aid contract will include the following provision, as mandated by USDOT at Title 49 CFR 26.13(b):

(a) The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of the contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of USDOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of the contract, which may result in the termination of the contract or such other remedy, as the recipient deems appropriate.

In this provision, "contractor" will be defined as the contractor on the contract; "subrecipient" will be defined as any subcontractor performing the work. For the purposes of any federal-aid contract awarded by the Commission, "the recipient" will be defined as either the Commission, or MoDOT, or both. The contractor shall include this same contract provision in every supply contract or subcontract the contractor makes or executes with a subrecipient.

6.0 Bank Services. The contractor, and each subrecipient on a federal-aid contract, is encouraged to use the services of banks owned and controlled by socially and economically disadvantaged individuals. Such banking services, and the fees charged for services, typically will not be eligible for DBE Program contract goal credit. Any questions on this subject should be directed to the MoDOT External Civil Rights Division. See Sec 7.0.

7.0 DBE Program Information. DBE Program information may be obtained from the MoDOT External Civil Rights Division, 105 W. Capitol Avenue, P.O. Box 270, Jefferson City, Missouri 65102-0270. Phone (573) 751-7801, Fax (573) 526-0558, E-Mail: dbe@modot.mo.gov. It will be the duty of each contractor, for the contractor and for the contractor's subrecipients and surety, to take the steps necessary to determine the legal obligations and limitations under the DBE Program, as an element of responsibility. It will be the duty of each certified DBE firm to know, understand and comply with the DBE firm's legal obligations and limitations under the DBE Program, as a requirement of program participation. A surety providing a bid or contract bond will be bound by those bonds to the duties of the surety's principal.

8.0 DBE Certification, and the Missouri Unified Certification Program. The Missouri Department of Transportation and other certifying agencies within Missouri have partnered to form the Missouri Regional Certification Committee (MRCC) and developed a Unified Certification Program (UCP) pursuant to 49 CFR 26.81 and 7 CSR 10-8.061. Only DBE firms certified by the MRCC are eligible to perform work on a federal-aid contract for DBE contract goal credit. It is the contractor's responsibility to ensure firms identified for participation are approved certified DBE firms. The MRCC DBE Directory can be found at the following link:

http://www.modot.mo.gov/business/contractor_resources/External_Civil_Rights/DBE_program.htm

9.0 DBE Program-Related Certifications Made By Bidders and Contractors. If the bidder makes a written, express disclaimer of one or more certifications or assurances in the bid, the bid will be considered non-responsive. By submitting a bid on any call involving USDOT federal financial participation, and by entering into any contract on the basis of that bid, the contractor makes each of the following DBE Program-related certifications and assurances to USDOT, to the Commission, and to MoDOT:

(a) The bidder certifies that management and bidding officers have reviewed and understand the bidding and project construction and administration obligations of the USDOT DBE Program regulations at Title 49 CFR Part 26 (as amended), the USDOT DBE Program regulations; Title 7 CSR Division 10, Chapter 8 (as amended), and the Commission's DBE Program rules. The bidder further certifies that the contractors management personnel on the project understand and are familiar with the requirements of these federal and state DBE Program regulations; and if the bidder was not familiar with or did not understand the requirements of these regulations, they have contacted the External Civil Rights Division of MoDOT and have been informed as to their duties and obligations under the DBE Program regulations by MoDOT staff and/or by USDOT DBE Program staff.

(b) The bidder certifies that the bidder has complied with the federal and state DBE Program requirements in submitting the bid, and will comply fully with these requirements in performing any federal-aid contract awarded on the basis of that bid.

(c) The bidder agrees to ensure that certified DBE firms have a full and fair opportunity to participate in the performance of the contract financed in whole or in part with federal funds. The bidder certifies that all necessary and reasonable steps were taken to ensure that DBE firms have an opportunity to compete for, and perform work on the contract. The bidder further certifies that the bidder not discriminate on the basis of race, color, age, national origin or sex in the performance of the contract, or in the award of any subcontract.

(d) The bidder certifies, under penalty of perjury and other applicable penal laws that if awarded the federal-aid contract, the contractor will make a good faith effort to utilize certified DBE firms to perform DBE work at or above the amount or percentage of the dollar value specified in the bidding documents. The bidder further certifies the bidder's understanding that the bidder may not unilaterally terminate, substitute for, or replace any DBE firm that was designated in the executed contract, in whole or in any part, with another DBE, any non-DBE firm or with the contractor's own forces or those of an affiliate of the contractor, without the prior written consent of MoDOT as set out below.

(e) The bidder certifies, under penalty of perjury and other applicable penal laws that a good faith effort was made to obtain DBE participation in the contract, at or above the DBE participation contract goal. The bidder further certifies, under penalty of perjury and other applicable penal laws, that if the bidder is not able to meet the Commission's DBE contract goal, and if the bidder is not able to meet that DBE contract goal by the time the proposed DBE participation information must be submitted, within three business days after bid opening, the bidder has submitted with and as a part of the bid, a true, accurate, complete and detailed written explanation of good faith efforts to meet the DBE Contract Goal.

(f) The bidder understands and agrees that if awarded the contract the contractor is legally responsible to ensure that the contractor and each DBE subcontractor and supplier, comply fully with all regulatory and contractual requirements of the USDOT DBE Program, and that each DBE firm participating in the contract fully perform the designated tasks, with the DBE's own forces and equipment, under the DBE's own direct supervision and management. The bidder certifies, under penalty of perjury and other applicable penal laws, that if it awarded the contract and if MoDOT or the Commission determine that the contractor, a DBE or any other firm retained by the contractor has failed to comply with the DBE Program requirements or federal or state DBE Program regulations, the Commission, through MoDOT, shall have the sole authority and discretion to determine the extent of the monetary value to which the DBE contract goals have not been met, and to assess against and withhold monetary damages from the contractor in the full amount of that breach. The Commission, through MoDOT, may impose any other remedies available at law or provided in the contract in the event of a contract breach. The bidder further understands and agrees that this clause authorizes the Commission, through MoDOT, to determine and fix the extent of the damages caused by a breach of any contractual or regulatory DBE Program requirement and that the damage assessment will be enforced in addition to, and not in lieu of, any other general liquidated damages clause in the contract. By submitting a bid for a federal-aid contract, and by entering into a contract, the bidder irrevocably agrees to such an assessment of liquidated damages for DBE Program purposes, and authorizes the Commission and MoDOT to make such an assessment of liquidated damages against the contractor, and to collect that assessment from any sums due the contractor under the contract, or any other contract, or by other legal process. The bidder makes this certification, agreement and authorization on behalf of itself, its subcontractors and suppliers, and the bid bond and contract bond sureties, for each federal-aid contract.

(g) The surety upon any bid or contract bond acknowledges the surety is held and firmly bound to the Commission for each and every duty of the surety's principal provided in any bid or contract regarding the DBE program.

10.0 Designation of DBE firms to perform on contract. The bidder states and certifies, under penalty of perjury or other applicable penal laws, that the DBE participation information submitted in the bid or within the stated time thereafter is true,

correct and complete and that the information provided includes the names of all DBE firms that will participate in the contract, the specific line item (s) that each DBE firm will perform, and the creditable dollar amounts of the participation of each DBE. The specific line item must reference the MoDOT line number and item number contained in the proposal. The bidder further states and certifies that the bidder has committed to use each DBE firm listed for the work shown to meet the DBE contract goal and that each DBE firm listed has clearly confirmed that the DBE firm will participate in and perform the work, with the DBE's own forces. Award of the contract will be conditioned upon meeting these and other listed requirements of 49 CFR 26.53.

(a) The bidder certifies the bidder's understanding that as the contractor on a contract funded in whole or in part by USDOT federal funds, the bidder may not unilaterally terminate, substitute for, or replace any DBE firm that was designated in the executed contract, in whole or in any part, with another DBE, any non-DBE firm or with the contractor's own forces or those of an affiliate, without the prior written consent of MoDOT. The bidder understands it must receive approval in writing from MoDOT for the termination of a DBE firm, or the substitution or replacement of a DBE before any substitute or replacement firm may begin work on the project in lieu of the DBE firm participation information listed in the executed contract.

(1) The bidder further certifies understanding, that if a DBE firm listed in the bid or approved in the executed contract documents ceases to be certified at any time during the performance of the contract work, and a contract or subcontract with that firm has not yet been executed by the prime and subcontractor, the contractor can not count any work performed by that firm after the date of the firm's loss of eligibility toward meeting the DBE contract goal. However, if the contractor has executed a subcontract with the firm before the DBE lost eligibility and ceased to be a certified DBE, the contractor may continue to receive credit toward the DBE contract goal for that firm's work.

(2) The bidder further certifies understanding, that if a DBE subcontractor is terminated, or fails, refuses or is unable to complete the work on the contract for any reason, the contractor must promptly request authority to substitute or replace that firm. The request shall include written documentation that the DBE firm is unwilling or unable to perform the specified contract work. The contractor shall make good faith efforts to find another DBE subcontractor to substitute or replace the dollar amount of the work that was to have been performed by the DBE firm. The good faith efforts shall be directed at finding another DBE to perform the same, or more, dollar amount of work that the DBE firm that was terminated was to have performed under the executed contract. The substitute or replacement DBE firm may be retained to perform the same or different contract work from that which the terminated firm was to have performed. The contractor shall obtain approval from MoDOT in writing before the replacement or termination of one firm with another before the work will count toward the project DBE goal.

(3) The bidder further certifies the bidder's understanding, that the dollar value of any work completed by a DBE firm prior to approval of the DBE's substitution or replacement, in writing, by MoDOT will not be credited toward meeting the DBE contract goal. The contractor will remain subject to appropriate administrative remedies, including but not limited to, liquidated damages for the full dollar amount that the DBE contract goal is not met. Liquidated damages will also be assessed against the contractor if the original, substitute or replacement DBE firms perform the required contract work, but are not paid in full for some or all of that work by the contractor, including back charges. No credit toward the DBE goal will be given for any amount withheld from payment to the DBE or "back charged" against monies owed to the DBE, regardless of the purpose or asserted debt.

11.0 Good Faith Effort to Secure DBE Services. The bidder shall make a good faith effort to seek DBEs in a reasonable geographic area to where the solicitation for subcontracts and material is made. If the bidder cannot meet the goals using DBEs from that geographic area, the bidder shall, as a part of the effort to meet the goal, expand the search to a wider geographic area.

11.1 Bidding Procedure. The following bidding procedure shall apply to the contract, for DBE program compliance purposes.

11.2 Contract Goal, Good Faith Efforts Specified. The bidder may submit the completed "DBE Identification Submittal" information in the bid documents at the same time as, and within the sealed bid, at the time the bid is submitted. However, if that information is not completed and submitted with the initial sealed bid, then as a matter of responsiveness and responsibility, the apparent low and second low bidder shall file the completed "DBE Identification Submittal" pages with MoDOT on or before 4:00 p.m. of the third business day after the bid opening date, directly to the External Civil Rights Division, Missouri Department of Transportation, 105 W. Capitol Avenue, P.O. Box 270, Jefferson City, Missouri 65102-0270. Telefax transmittal to MoDOT will be permitted at fax no. (573) 526-0558. The complete and signed original documents shall be mailed to MoDOT no later than the day of the telefax transmission. No extension of time will be allowed for any reason. The means of transmittal and the risk of timely receipt of the information shall be the bidder's.

11.3 Bid Rejection, Bid Security Disposition. The failure of either the apparent low bidder or the second low bidder to file the completed and executed "DBE Identification Submittal", listing actual, committed DBE participation equal to or greater than the DBE contract goal percentage specified in the bid by 4:00 p.m. on the third business day after the bid opening, will be cause for rejection of that bid, and the bid surety bond or bid guaranty of that bidder will be forfeited to and become the property of the Commission upon Commission demand.

(a) Any bidder rejected for failure to submit the completed and executed "DBE Identification Submittal" information in the bidding documents, with full documentation of sufficient DBE participation to satisfy the DBE contract goal cannot submit a bid on the same, or substantially similar, project, when and if the project is re-advertised for bids. By submitting a bid on a federal-aid project, the bidder accepts and agrees to this provision, and the disposition of the bidders bid bond or guaranty, on behalf of the bidder and the bidders bid surety or guaranty.

(b) The surety separately acknowledges the surety to be held and firmly bound to the Commission to immediately upon demand pay to Commission the face amount of the bid bond.

11.4 Good Faith Efforts Described. Good faith efforts to meet the DBE contract goal may include, but are not limited to, the following:

(a) Attending a pre-bid meeting, if any, scheduled by the department to inform DBEs of contracting and subcontracting opportunities.

(b) Advertising in general circulation trade association and socially and economically disadvantaged business directed media concerning subcontracting opportunities.

(c) Providing written notice to a reasonable number of specific DBEs so that the DBE's interest in the contract are solicited in sufficient time to allow the firm to participate effectively.

(d) Following-up on initial written notice or solicitations of interest by contacting DBEs to determine with certainty whether the DBEs were interested.

(e) Maintaining documentation of responses received in the effort to solicit DBE participation.

(f) Selecting portions of work to be performed by DBEs to increase the likelihood of meeting the DBE goal, including, where appropriate, breaking down contracts into economically feasible units to facilitate DBE participation.

(g) Providing interested DBEs adequate information about plans, specifications and requirements of the contract.

(h) Negotiating in good faith with interested DBEs, not rejecting DBEs as unqualified without sound business reasons based on a thorough investigation of the DBE's capabilities.

(i) Making efforts to assist interested DBEs in obtaining bonding, lines of credit or insurance required by MoDOT or by the bidder.

(j) Making effective use of available disadvantaged business organizations, minority bidders' groups, local, state and federal disadvantaged business assistance offices, MoDOT and other organizations that provide assistance in the recruitment and placement of DBEs.

11.5 Documentation, and Administrative Reconsideration of the Bidder's Good Faith Efforts. In the bidding documents, the bidder has the opportunity and responsibility to provide certified written documentation as to whether the bidder made a good faith effort to meet the DBE contract goal as proposed by the Commission. Any bidder that has not met the Commission's proposed DBE contract goal at the time of bid opening must submit the completed "Certification of Good Faith Efforts to Obtain DBE Participation". The certification should be included in the bidding documents, fully and in detail, at the time its sealed bid is submitted; however, if that information is not completed and submitted with the initial sealed bid, the bidder must submit the documentation to MoDOT on or before 4:00 p.m. of the third business day after the bid opening date, directly to the External Civil Rights Division, Missouri Department of Transportation, 105 W. Capitol Avenue, P.O. Box 270, Jefferson City, Missouri 65102-0270. Telefax transmittal to MoDOT will be permitted at fax no. (573) 526-0558. The complete and signed original documents shall be mailed to MoDOT no later than the day of the telefax transmission. No extension of time will be allowed for any reason. The means of transmittal and the risk of timely receipt of the information shall be the bidder's. The bidder shall attach additional pages to the certification, if necessary, in order to fully detail specific good faith efforts made to obtain certified DBE firm participation in the proposed contract work. If the apparent low bidder appears to have failed to adequately document in the bid that the bidder made a good faith effort to achieve sufficient DBE participation in the contract work, that firm will be offered the opportunity for administrative reconsideration upon written request, before MoDOT and the Commission reject that bid as non-responsive. However, regardless of the DBE contract goal participation level proposed by the bidder, or the extent of good faith efforts shown, the apparent low and second low bidders shall each timely and separately file their completed and executed "DBE Identification Submittal" or face potential sanctions and the bid bond or guaranty, as specified in Sec 10.0 of these provisions, may become the property of the Commission subject to Commission's demand.

12.0 DBE Participation for Contract Goal Credit. DBE participation on the contract will count toward meeting the DBE contract goal as follows:

(a) The applicable percentage of the total dollar value of the contract or subcontract awarded to the DBE will be counted toward meeting the DBE contract goal, only if that firm is certified by the Missouri Regional Certification Committee as a DBE before the due date for bids or offers on a contract which a firm seeks to participate as a DBE, and only for the value of the work, goods or services that are actually performed, or provided, by the DBE firm itself in the area(s) in which the DBE firm is certified.

(b) When a DBE performs work as a participant in a joint venture, the contractor may count toward the DBE goal only that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the contract work that the DBE has performed with the DBE's own forces. The MoDOT External Civil Rights Division shall be contacted in advance regarding any joint venture involving both a DBE firm and a non-DBE firm to review and approve the contractor's organizational structure and proposed operation. When a DBE subcontracts part of the work of the contract to another firm, the value of that subcontracted work may be counted toward the DBE contract goal only if the DBE's subcontractor at a lower tier is a MoDOT certified DBE. Work that a DBE subcontracts to a non-DBE firm will not count toward the DBE contract goal. The cost of supplies and equipment a DBE subcontractor purchases or leases from the prime contractor or the prime's affiliated firms, or from another non-DBE subcontractor, will not count toward the DBE contract goal.

(c) The contractor may count expenditures to a DBE subrecipient toward the DBE contract goal only if the DBE performs a commercially useful function (CUF) on that contract.

(d) A contractor may not count the participation of a DBE subcontractor toward the contractor's final compliance with the contractor's DBE contract goal obligations until the amount being counted has actually been paid to the DBE. A contractor may count 60 percent of the contractor's expenditures actually paid for material and supplies obtained from a DBE certified by MoDOT as a regular dealer, and 100 percent of such expenditures actually paid for materials and supplies obtained from a certified DBE manufacturer.

(1) A regular dealer will be defined as a firm that owns, operates, or maintains a store, warehouse or other establishment in which the material, supplies, articles or equipment required and used under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a regular dealer, the DBE firm shall be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions will not be considered regular dealers.

(2) A DBE firm may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone or asphalt, without owning, operating or maintaining a place of business where it keeps such items in stock, if the DBE both owns and operates distribution equipment for the products it sells and provides for the contract work. Any supplementation of a regular dealer's own distribution equipment shall be by a long-term lease agreement, and not on an *ad hoc* or contract-by-contract basis.

(3) If a DBE regular dealer is used for DBE contract goal credit, no additional credit will be given for hauling or delivery to the project site goods or materials sold by that DBE regular dealer. Those delivery costs shall be deemed included in the price charged for the goods or materials by the regular dealer, who shall be responsible for their distribution.

(4) A manufacturer will be defined as a firm that operates or maintains a factory or establishment that produces on the premises, the material, supplies, articles or equipment required under the contract and of the general character described by the project specifications. A manufacturer will include firms that produce finished goods or products from raw or unfinished material, or that purchases and substantially alters goods and materials to make them suitable for construction use before reselling them.

(e) A contractor may count toward the DBE contract goal the following expenditures to certified DBE firms that are not "regular dealers" or "manufacturers" for DBE program purposes:

(1) The contractor may count toward the DBE contract goal the entire amount of fees or commissions charged by a certified DBE firm for providing a bona fide service, such as professional, technical, consultant or managerial services, or for providing bonds or insurance specifically required for the performance of the federal-aid contract, if the fee is reasonable and not excessive, compared with fees customarily charged for similar services.

(2) The contractor may count toward the DBE contract goal the entire amount of that portion of the construction contract that is performed by the DBE's own forces and equipment, under the DBE's supervision. This includes the cost of supplies and material ordered and paid for by the DBE for contract work, including supplies purchased or equipment leased by the DBE except supplies and equipment a DBE subcontractor purchases or leases from the prime contractor or its affiliates.

(f) A contractor may count toward the DBE contract goal 100 percent of the fees paid to a certified DBE trucker or hauler for delivery of material and supplies required on a job site, but not for the cost of those materials or supplies themselves, or for the removal or relocation of excess material from or at the job site, when the DBE certified trucking company is not also the manufacturer of or a regular dealer in those material and supplies, provided that the trucking or hauling fee is determined by MoDOT to be reasonable as compared with fees customarily charged by non-DBE firms for similar services. The certified DBE trucking firm shall also perform a CUF on the project and not operate merely as a pass through for the purposes of gaining credit toward the contract DBE goal. Prior to submitting a bid, the contractor shall determine, or contact the MoDOT External Civil Rights Division for assistance in determining, whether a DBE trucking firm will meet the criteria for performing a CUF on the project.

(g) The contractor will receive DBE contract goal credit for the fees or commissions charged by and paid to a DBE broker who arranges or expedites sales, leases or other project work or service arrangements, provided that those fees are determined by MoDOT to be reasonable and not excessive, as compared with fees customarily charged by non-DBE firms for similar services. A broker will be defined as a person or firm that does not own or operate the delivery equipment necessary to transport materials, supplies or equipment to or from a job site; a broker typically will not purchase or pay for the material, supplies or equipment, and if the broker does purchase or pay for those items, those costs will be reimbursed in full. In most instances, the broker is merely the entity making arrangements for delivery of material, supplies, equipment, or arranging project services. To receive DBE contract goal credit, MoDOT must determine that the DBE broker has performed a CUF in providing the contract work or service.

13.0 Performing a Commercially Useful Function (CUF). No credit toward the DBE contract goal will be allowed for contract payments or expenditures to a DBE firm, if that DBE firm does not perform a CUF on that contract. A DBE performs a CUF when the DBE is solely responsible for execution of a distinct element of the contract work, and the DBE actually performs, manages and supervises the work involved with the firm's own forces. To perform a CUF, the DBE alone shall be responsible, and alone must bear the risk, for the material and supplies used on the contract, selecting a supplier or dealer from those available, negotiating price, determining quality and quantity, ordering the material and supplies, installing those materials with the DBE's own forces and equipment and paying for those materials and supplies. The amount the DBE firm is to be paid under the contract shall be commensurate with the work the DBE actually performs and the DBE credit claimed for the DBE's performance.

13.1 Contractor's Obligation to Monitor CUF Performance. It shall be solely the contractor's responsibility to ensure that all DBE firms perform a CUF. Further, the contractor is responsible to, and shall ensure that each DBE firm fully performs the DBE's designated tasks, with the DBE's own forces and equipment, under the DBE's own direct supervision and management. MoDOT is under no obligation to warn the contractor that a DBE's participation may not count toward the goal, other than through official notification with an opportunity for administrative reconsideration at the conclusion of the contract work.

13.2 DBEs Must Perform a Useful and Necessary Role in Contract Completion. A DBE does not perform a commercially useful function if the DBE's role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation.

13.3 DBEs Must Perform The Contract Work With Their Own Workforces. If a DBE does not perform and exercise responsibility for at least 30 percent of the total cost of the DBE's contract with the DBE's own work force, or the DBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involved, MoDOT will presume that the DBE is not performing a commercially useful function.

13.4 Factors Used to Determine if a DBE Trucking Firm is Performing a CUF. The following factors will be used to determine whether a DBE trucking company is performing a commercially useful function (CUF):

(a) To perform a CUF, the DBE trucking firm shall be completely responsible for the management and supervision of the entire trucking operation that the DBE is being paid for on the contract work. There shall not be contrived arrangement, including but not limited to, any arrangement that would not customarily exist under regular construction project subcontracting practices for the purpose of meeting the DBE contract goal.

(b) The DBE must own and operate at least one fully licensed, insured and operational truck used in performance of the contract work. This does not include a supervisor's pickup truck or a similar vehicle that is not suitable for hauling the necessary materials or supplies.

(c) The DBE receives 100 percent contract goal credit for the total reasonable amount the DBE is paid for the transportation services provided on the contract using trucks the DBE owns, insures and operates, using drivers that the DBE employs.

(d) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE firm that leases trucks from another DBE will receive credit for the total fair market value actually paid for of the transportation services the lessee DBE firm provides on the contract.

(e) The DBE may also lease trucks from a non-DBE firm, including an owner-operator. However, the DBE who leases trucks from a non-DBE is entitled to DBE contract goal credit only for the brokerage fee or commission the DBE receives as a result of the lease arrangement. The DBE will not receive credit for the total value of the transportation services provided by the non-DBE lessee. Furthermore, no DBE contract goal credit will be allowed, even for brokerage fees or commissions, where the DBE leases the trucks from the contractor on the project or a firm owned, controlled by, or affiliated by ownership or control to, the contractor.

(f) For purposes of this section, the lease shall indicate that the DBE firm leasing the truck has exclusive use of and control over the truck. This will not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, provided the lease gives the DBE absolute priority for and control over the use of the leased truck. Leased trucks shall display the name and identification number of the DBE firm that has leased the truck at all times during the life of that lease.

13.5 MoDOT Makes Final Determination On Whether a CUF Is Performed. MoDOT and the Commission will have the final authority to determine whether a DBE firm has performed a CUF on a federal-aid contract. To determine whether a DBE is performing or has performed a CUF, MoDOT will evaluate the amount of work subcontracted by that DBE firm or performed by other firms, and the other firms forces and equipment. Any DBE work performed by the contractor, or by employees or equipment of the contractor will be subject to disallowance under the DBE Program, unless the independent validity and need is demonstrated.

14.0 Verification of DBE Participation, Liquidated Damages.

14.1 Prior to final payment by the Commission, the contractor shall file with the Commission a detailed list showing each DBE used on the contract work, and the work performed by each DBE. The list shall show the actual dollar amount paid to each DBE for the creditable work on the contract, less any rebates, kickbacks, deductions, withholdings or other repayments made. The list shall be certified under penalty of perjury, or other law, to be accurate and complete. MoDOT and the Commission will use this certification and other information available to determine if the contractor and the contractor's DBEs satisfied the DBE contract goal percentage specified in the contract and the extent to which the DBEs were fully paid for that work. The contractor shall acknowledge, by the act of filing the detailed list, that the information is supplied to obtain payment regarding a federal participation contract.

14.2 Failure on the part of the contractor to achieve the DBE participation to which the contractor committed in the contract may result in liquidated damages being imposed on the contractor by the Commission for breach of contract and for non-compliance. If the contract was awarded with less than the original DBE contract goal proposed by the Commission, the revised lower amount shall become the final DBE contract goal, and that goal will be used to determine any liquidated damages to be assessed. Additionally, the Commission or MoDOT may impose any other administrative sanctions or remedies available at law or provided by the contract in the event of breach by the contractor by failing to satisfy the contractor's DBE contract goal commitment. However, no liquidated damages will be assessed, and no other administrative sanctions or remedies will be imposed when, for reasons beyond the control of the contractor and despite the good faith efforts made by the contractor, the final DBE contract goal participation percentage was not achieved. The contractor will be offered the opportunity for administrative reconsideration of any assessment of liquidated damages, upon written request. The administrative reconsideration officer may consider all facts presented, including the legitimacy or business reason for back charges assessed against a DBE firm, in determining the final amount of liquidated damages.

15.0 Prompt Payment Requirements. In accordance with Title 49 CFR 26.29, the contractor shall comply with the prompt payment requirements of that regulation, Section 34.057, RSMo., the provisions of the Commission's rule 7 CSR 10-8.111 and the contract. By bidding on a federal-aid contract, and by accepting and executing that contract, the contractor agrees to assume these contractual obligations, and to bind the contractor's subrecipients contractually to those prompt payment requirements at the contractor's expense.

16.0 Miscellaneous DBE Program Requirements. In accordance with Title 49 CFR Part 26 and the Commission's DBE Program rules in Title 7 CSR Division 10, Chapter 8, the contractor, for both the contractor and for the contractor's subcontractors and suppliers, whether DBE firms or not, shall commit to comply fully with the auditing, record keeping, confidentiality, cooperation and anti-intimidation or retaliation provisions contained in those federal and state DBE Program regulations. By bidding on a federal-aid contract, and by accepting and executing that contract, the contractor agrees to assume these contractual obligations, and to bind the contractor's subrecipients contractually, at the contractor's expense.

TRAINING PROVISION

1.0 Description. This provision supplements subparagraph 7(e) of the Contract Provision entitled "Standard Federal Equal Opportunity Construction Contract Specification" (Executive Order 11246)", and in the implementation of CFR Part 230, Subpart A, Appendix B.

2.0 Training Requirements. As part of the contractor's equal employment opportunity affirmative action program, training shall be provided as follows.

2.1 The contractor shall provide on-the-job training aimed at developing full journeymen in the type of trade or job classification involved.

2.2 The number of trainee hours to be provided under this provision will be specified in the bidding documents.

2.3 Trainee goals will be set in 1,000 hour increments or 1 slot (person). For example, if the trainee goal on the project is 2,000 hours a maximum of 2 trainees will be approved for the project. In the event a trainee leaves the project for valid reasons the trainee shall be replaced as soon as possible. No apprentice/trainee can be assigned less than 500 hours on a contract. Providing less than 500 hours is not considered to be beneficial training nor helping to achieve journey-level status. Therefore, a trainee/apprentice, regardless of craft, must have been trained on the contact for at least 500 hours to be eligible for reimbursement. However, the contractor may transfer the trainee, with MoDOT's approval, to another MoDOT highway construction project in order to continue the training. Upon reaching the 500 hours, the contractor will be compensated as noted herein. If the enrollee is transferred to a non-federal project, MoDOT, upon availability of funding, may have the option of reimbursing the contractor for those hours completed that achieve the 500-hour minimum and for any hours that continue the successful training of the individual(s). The same documentation will be required to be submitted in order to determine if hours will be approved. However, if the trainee is moved to another federally funded enhancement, then a "change order" could be requested for the additional hours, and thus offer the Contractor the necessary credit so as to accomplish the 500 hour plateau. FHWA and MoDOT will only approve training programs meeting the requirements of the Training Special Provisions (TSP). A program will be approved if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training will also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts.

2.4 When a contractor subcontracts a portion of the contract work, the contractor shall determine how many, if any, of the trainee hours are to be trained by the subcontractor, provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this provision.. The contractor shall also insure this training provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

2.5 The number of trainee hours shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the engineer for approval a trainee notification for each individual they intend to train on the project. The contractor will be credited for the hours worked by each trainee employed on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter. If the trainee goal on the project is 1,000, no more than two trainees will be approved for the project. Each individual must complete at least 500 hours before reimbursement or hour will be counted towards meeting the goal. In the event a trainee leaves the training program prior to completing the minimum 500 hours the External Civil Rights Division will determine if that individual can be replaced on the project.

2.6 Training and upgrading of minorities and women toward journeyman status is a primary objective of this provision. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor shall be responsible for demonstrating the steps taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

2.7 No employee shall be employed as a trainee in any classification in which the employee has successfully completed a training course leading to journeyman status or in which the employee has been employed as a journeyman. The contractor shall satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of

the method used the contractor's records shall document the findings in each case.

2.8 The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the engineer and FHWA. A program will be approved if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period... Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a state apprenticeship agency recognized by the Bureau of apprenticeship and training programs approved, but not necessarily sponsored by, the Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training, will also be considered acceptable provided the training is being administered consistent with the equal employment obligations of Federal-aid highway construction contracts.

2.9 Approval or acceptance of a training program shall be obtained from the engineer prior to beginning work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training will be permissible in lower level management positions, such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications and must be approved by FHWA. Training in the laborer classification may be permitted, provided significant and meaningful training is provided and approved by the engineer. Some offsite training will be permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

2.10 Except as otherwise noted below, the contractor will be reimbursed $10.00 per hour of training given an employee in the contract in accordance with an approved training program. As approved by the engineer, reimbursement will be made for training persons in excess of the number of trainee hours specified in the contract. Reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other sources do not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the contractor when the trainees are concurrently employed on a federal-aid project and the contractor does one or more of the following, and contributes to the cost of the training, provides instruction to the trainee, or pays the trainee's wages during the offsite training period. In order receive the reimbursement the trainee must complete at least 500 hours on the project

2.11 No payment will be made to the contractor if either failure to provide the required training or failure to hire the trainee as a journeyman is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this provision. It is normally expected that a trainee will begin training on the project as soon as feasible after start of work, utilizing the skill involved and remain on the project as long as training opportunities exist in the trainee's work classification or until the trainee has completed the training program. It is not required that all trainees be on board for the entire length of the contract. The contractor’s responsibilities under this provision will be fulfilled if the contractor has provided acceptable training for the number of trainee hours specified.

2.12 Trainees shall be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the U.S. Department of Labor or Transportation in connection with the existing program will apply to all trainees being trained for the same classification who are covered by this provision.

2.13 Contractor may choose to transfer trainee hours worked on another project, whether MoDOT or not. The contractor must submit monthly trainee reports for that project to the RE Office where the hours will be credited. The contractor must submit with the monthly trainee reports, copies of the certified payrolls so the RE Office can verify the number of hours worked on the project, as well as the wage the trainee was being paid. Once the RE reviews the monthly reports, copies of the monthly reports should be sent to the External Civil Rights Division. The RE Office should include with the report a note indicating the hours that are being transferred from the other project. Both job numbers must be included in the note.

2.14 When the job is 50% complete the contractor must have at least 50% of the trainee hours assigned on that job completed. The percentage of job completion is based on the total value of the contract paid to the Contractor. The remaining amount of the hours must be completed before the completion of the project or the Contractor will be subject to liquidated damages unless a GFE is submitted to and approved by the External Civil Rights Division.

2.15 If the training hours have not been obtained and a GFE has not been displayed upon project completion, the Contractor will be assessed liquidated damages in the amount of $20.00 per hour for those hours not realized. For instance, if the project goal was 1,000 hours and only 450 hours were met, then liquidated damages would be assessed at 550 x $20.00 = $11,000.00.

2.16 In the event the External Civil Rights Division denies the Good Faith Effort (GFE) submitted by the contractor, the contractor shall have the right to an Administrative Reconsideration Hearing. The request for an Administrative Reconsideration Hearing must be made within seven (7) days of the receipt of the denial letter. The Administrative Reconsideration Committee may be constituted, as MoDOT deems appropriate and fair, provided no committee member on the Reconsideration Committee

shall have taken part in the original MoDOT determination that the contractor failed to meet the OJT contract goal and/or failed to make adequate good faith efforts to do so.

2.17 If the Administrative Reconsideration Committee does not find the contactor met the OJT contract goal, and/or does not find the contractor made adequate and sufficient good faith efforts to do so, then the Administrative Reconsideration Committee will recommend that liquidated damages as outlined in the non-compliance sanctions sections of the OJT Training Special Provision will be carried out. If the Administrative Reconsideration Committed does find that the contractor has met a good faith effort (GFE), then no liquidated damages will be assessed.

2.18 If the Contractor does not achieve the full OJT goal, they will not receive partial credit for hours completed. For instance, if the goal on the project was 1,000 hours and only 450 were convened, then no reimbursement will be given for any hours fulfilled. If the goal on the project is 2,000 hours and only 1,500 hours are completed and no GFE is demonstrated, the contractor will receive credit for the 1,500 hours and also be assessed liquidated damages in the amount of the 500 hours there were not met.

2.19 The contractor shall furnish to the trainee a copy of the training program the contractor will follow in providing the training. The contractor shall provide each trainee and the resident engineer with a certification showing the type and length of training satisfactorily completed.

2.20 The contractor shall provide for the maintenance of records and furnish monthly reports documenting the contractor's performance under this provision. Monthly reports shall include at least the following information:

Contractor's name and address
Period that the report covers
Job Number, Description, and Federal Aid number
Information for each employee being trained on the project, including:
- Name
- Social Security Number
- Trade/craft
- Pay percent, based on portion of training complete (if applicable)
- Journeyman's full prevailing wage applicable
- Trainee wage
- Hours this period
- Cumulative hours for the project

Total trainee hours for the project for this period
Cumulative trainee hours for the project

2.21 When a contractor submits a trainee who is economically disadvantaged the following information should be submitted with the trainee notification to verify this status:

- The previous year's tax return verifying the individual's income is less than the federal poverty guidelines.
- Verification of enrollment in food stamps received from Missouri Department of Social Services.
- Verification of housing assistance received from Missouri Department of Social Services.

COOPERATION BETWEEN CONTRACTORS FOR SAFE AND SOUND PROGRAM

1.0 The Missouri Department of Transportation has approved plans to improve 802 of Missouri's lowest rated bridges within five years. This initiative, the Safe and Sound Program, will be performed under subsequent contracts that may or may not impact this contract. It will be the responsibility of the contractor to coordinate with the project(s) under the initiative that will impact the contractor's operations to perform the work for this contract.

2.0 When necessary for proper prosecution of work, each contractor shall permit the other access through the overlapping construction areas and the use of any access or haul roads constructed by others. In the event of a conflict within the immediate vicinity of the bridge, as defined by the initiative's engineer, preference will be given to the prosecution of work on the Safe and Sound project.

3.0 The contractor agrees that any effects of the presence of another contractor shall not be compensable as a suspension of work, extra work, a change in the work, as a differing site condition or otherwise including but, without limitation, delay, impact, incidental or consequential damages. The contractor waives, for itself, its subcontractors and suppliers the compensability of the presence of another contractor any claim or action arising out of or in relation to the work under the contract.

4.0 A list of the Safe and Sound projects and a corresponding map indicating each bridge location may be found at the Missouri Department of Transportation website: http://www.modot.mo.gov/safeandsound/index.htm

OPTIONAL ROLLER COMPACTED CONCRETE SHOULDERS AND MAINLINE **01/16**

1.0 Description. Roller Compacted Concrete (RCC) is an optional method to be used in constructing A2 and A3 shoulders or mainline pavement up to 7 inches thick in lieu of conventional PCCP or HMA placement. RCC may be used, as designed in the plans, for mainline pavements greater than 7 inches. RCC consists of aggregate, portland cement and water. Supplementary cementing materials, such as fly ash, slag cement (ground granulated blast- furnace slag - GGBFS), and silica fume may be used. RCC is proportioned, mixed, placed, compacted, and cured in accordance with these specifications. RCC shall conform to the lines, grades, thickness, and typical cross section shown in the plans or otherwise established by the Engineer.

2.0 Materials. All materials shall be in accordance with Division 1000, Materials Details, and specifically as follows:

Item	Section
Coarse Aggregate	1005.2
Fine Aggregate	1005.3
Ground Granulated Blast Furnace Slag	1017
Fly Ash	1018
Cement	1019
Concrete Admixture	1054
Curing Compound	407, 1055
Water	1070

2.1 Aggregate. The plasticity index of the aggregates used shall not exceed 5. The aggregate gradation shall be well-graded without gradation gaps and shall meet the following combined gradation for the application type for RCC specified in the contract:

Application	**RCC as a Base or Intermediate Lift** (Overlaid with 2-inch HMA or greater)	**RCC as the Final Surface or with a Thin Lift Overlay** (RCC as the final surface or capped with a thin HMA overlay less than 2-inches)
Sieve Size	**Percent Passing by Weight**	**Percent Passing by Weight**
1 inch	100	---
¾ inch	---	100
½ inch	70 - 95	85 - 100
3/8 inch	60 - 85	---
No. 4	40 - 60	60 - 85
No. 8	--	40 - 60
No. 200	0 - 8	0 - 10

3.0 Mix Design. At least 30 days prior to the beginning of placing RCC on the project, the Contractor shall submit a proposed mix design to the Engineer. The target and allowable gradation range of each fraction shall be included. The contractor may be required to submit representative samples of each ingredient to Construction and Materials for laboratory testing.

3.1 Required Information. The mix design shall contain the following information:

(a) Source, type and specific gravity of portland cement

(b) Source, type (class, grade, etc.) and specific gravity of supplementary materials, if used

(c) Source, name, type and amount of admixture, if used

(d) Source, type (formation, etc.), ledge number if applicable, of the aggregate

(e) Specific gravity and absorption of each fraction in accordance with AASHTO T 85 for coarse aggregate and AASHTO T 84 for fine aggregate, including raw data

(f) Unit weight of each fraction in accordance with AASHTO T 19

(g) Batch weights of portland cement and supplemental cementitious materials

(h) Batch weights of coarse, intermediate and fine aggregates

(i) Batch weight of water in pounds per cubic yard (optimum moisture content)

(j) Maximum laboratory density

(k) The laboratory proctor curves illustrating moisture contents vs. density for each cementitious material content.
The RCC mix design shall be done in a similar fashion as is done to determine the relationship between the moisture content and the unit weight as soils and soil aggregate mixtures. The apparatus and compacted effort used to fabricate the moisture density specimens correspond to that described in AASHTO T 180, Method D. Strength specimens shall be made in accordance with ASTM C 1176 or ASTM C 1435 at the optimum moisture content for each cementitious material content to verify minimum compressive strength requirements.

3.2 Trial Batch. The Contractor shall prepare and test a trial batch mixture at the mixing facility to verify that the RCC mix complies with the design criteria. The trial batch shall be prepared and tested in the presence of the Engineer.

3.3 Production. Production shall not begin until an approved mix design has been obtained and verified by the trial batch.

3.4 Design Strength. The mix design shall have a minimum compressive strength of 3,500 psi within 28 days when specimens prepared according to ASTM C 1176 or ASTM C 1435. Compressive strength test shall be performed in accordance with AASHTO T 22.

3.5 Minimum Water Content. The water-cement ratio shall not be lower than 0.25.

3.6 Minimum Cementitious Content. The total amount of cementitious materials shall not be below 450 pounds per cubic yard.

3.7 Supplementary Cementitious Material. RCC may use fly ash, slag cement (GGBFS), or silica fume. Ternary mixes will be allowed for RCC. Ternary mixes are mixes that contain a combination of portland cement and two supplementary cementitious materials. The amount of supplementary cementitious material content shall be limited to the following requirements:

Supplementary Cementitious Material (SCM)	
SCM	**Maximum Percent of Total Cementitious Material**
Fly Ash (Class C or Class F)	25 %
Slag Cement (GGBFS)	30 %
Silica Fume	8 %
Ternary Combinations	40 %

4.0 Equipment. RCC shall be constructed with any combination of equipment that will produce a pavement meeting the requirements for mixing, transporting, placing, compacting, finishing, and curing as provided in this specification.

4.1 Mixing Plant: The mixing plant shall be capable of producing RCC to the proportions defined by the final approved mix design and within the specified tolerances. The capacity of the plant shall be sufficient to produce a uniform mixture at a rate compatible with the placement equipment.

4.2 Paver: RCC shall be placed with a high-density or conventional asphalt type paver subject to approval by the Engineer. The paver shall be of suitable weight and stability to spread and finish the RCC material, without segregation, to the required thickness, smoothness, surface texture, cross-section, and grade.

4.3 Compactors: When a conventional asphalt type paver is used, self-propelled steel drum vibratory rollers shall be used for primary compaction. For final compaction, a steel drum roller, operated in a static mode, or a rubber-tired roller may be utilized to meet density requirements.

4.4 Haul Equipment: The hauling equipment shall be smooth, mortar-tight, metal containers capable of discharging the concrete at a controlled rate without segregation. Hauling equipment shall have a retractable cover to protect mix from weather and excessive evaporation.

4.5 Access for Inspection and Calibration: The Engineer shall have access at all times for any plant, equipment, or machinery to be used in order to check calibration, scales, controls, or operating adjustments.

5.0 Construction Requirements.

5.1 Preparation of Subgrade. Before the RCC processing begins, the subgrade and base course must be prepared in accordance with Sec 304.

5.2 Subbase Condition. The surface of the subbase shall be clean and free of foreign material and standing water prior to placement of the RCC. The aggregate base shall be uniformly moist at the time of RCC placement. RCC shall not be placed upon frozen subbase.

5.4 Mixing Time. Mixing time shall be adequate to ensure a thorough and complete mixing of all materials. Concrete shall be homogeneous with no aggregate segregation. In no case shall the mixing time, after all materials including water are in the mixer, be less than 90 seconds.

5.5 Operating Tolerances. The mixing plant shall receive the quantities of individual ingredients to within the following tolerances:

Material	Variation by Weight
Cementitious Materials	± 2.0%
Water	± 3.0%
Aggregates	± 4.0%

5.6 Plant Calibration. Prior to RCC production, the Contractor shall calibrate the plant in accordance with the manufacturer's recommended practice. A copy of the calibration shall be provided to the Engineer when requested.

5.7 Curing. Immediately after final rolling, the RCC surface shall be kept continuously moist until an approved curing compound is applied. The application of the curing compound shall progress such that no more than 10 linear feet of the final RCC surface is exposed without curing at any time.

5.7.1. Water Cure. Water cure shall be applied such that a uniform moist condition on the surface of the RCC is attained. Application of this moisture shall be done in a manner that will not erode or damage the finished RCC surface.

5.7.2 Curing Compound. When RCC is used as the final surface, either white pigmented curing compound applied at the rate of one gallon for each 100 square feet or a tack coat product applied at 0.14 gal/yd^2 shall be used for curing. When RCC is to be overlaid with asphalt, the curing compound shall be a tack coat product applied at 0.14 gal/yd^2 in accordance with Sec 407.

5.8 Weather Conditions.

5.8.1 Hot Weather Precautions. During periods of hot weather or windy conditions, special precautions shall be taken to minimize moisture loss due to evaporation.

5.8.2 Cold Weather. The contractor shall provide a method, meeting the approval of the engineer, of monitoring the concrete that demonstrates that the concrete has been protected from freezing.

5.8.3 Protection Against Rain. To protect against rain, the contractor shall have on location at all times material for the protection of the unhardened concrete. The contractor shall protect the concrete from damage due to rain.

5.9 Finished Surface. The finished RCC surface shall be smooth, uniform, and continuous without tears, ridges, or aggregate segregation once it leaves the paver. RCC mainline pavement shall meet the smoothness criteria of Sec 502.8. When RCC is the final surface, the finished surface texture shall be broom finished, diamond ground, or other finishes approved by the engineer. All finished surface textures shall be in accordance with Sec 502.4.

5.9.1 Inaccessible Areas. All areas inaccessible to either roller or paver shall be paved with cast-in-place concrete in accordance with Sec 502.

5.9.2 Handwork. Broadcasting or fanning the RCC material across areas being compacted is not permissible. Such additions of materials may only be done immediately behind the paver and before any compaction has taken place.

5.9.3 Segregation. If segregation occurs in the RCC during paving operations, placement shall cease until corrective measures are taken.

5.10 Cold Joints. Prior to placing fresh RCC mixture against a cold vertical joint, the joint shall be thoroughly cleaned of loose or foreign material. The vertical joint face shall be wetted and in a moist condition immediately prior to placement of the adjacent lane.

5.11 Control Joints. Concrete control joints shall be constructed at 15-foot intervals in RCC mainline pavement. Control joint spacing for RCC shoulders adjacent to HMA or composite pavement shall be a minimum of 30-foot intervals. RCC shoulders adjacent to existing PCC pavement shall have control joints located to match the joints of the adjacent pavement. For all other PCC joint spacing; the RCC control joints shall match the adjacent PCC pavement's joints or cracks not to exceed a 30-foot interval. All control joints shall be tooled or cut to 1/3 the depth of the RCC thickness. Sealing the control joints is not required.

5.12 Opening to Traffic. The Contractor shall protect the RCC from traffic during the curing period. The RCC shoulder pavement may be opened to light traffic after one day and opened to unrestricted traffic after 5 days. The RCC mainline pavement may be opened to light traffic at 2,500 psi and opened to unrestricted traffic at 3,000 psi.

6.0 Material Acceptance.

6.1 Quality Control Testing. The contractor shall perform all quality control tests necessary to control the production and construction processes applicable to this specification. Quality control testing shall be performed by technicians qualified through MoDOT's technician certification program. Testing shall include, but not necessarily be limited to, deleterious content, aggregate gradation, coarse aggregate absorption, thin or elongated pieces, pavement thickness and density. The contractor shall record all test results and furnish a copy to the engineer no later than the beginning of the day following the test.

6.2 Quality Control Plan. A Quality Control Plan (QCP) for RCC mainline pavement and shoulders will be required as per Sec 502.11.1.

6.3 Testing.

6.3.1 Density. The density shall be determined in accordance with AASHTO T 310, direct transmission. Tests shall be performed no later than 30 minutes after the completion of the rolling. Only wet density shall be used for evaluation. QC shall determine the density of the RCC shoulder and mainline pavement at a frequency of no less than one per 7500 square yards. Sampling locations will be determined by the engineer using random sampling procedures in accordance with ASTM D 3665.

6.3.2 Thickness. The contractor shall determine thickness of the RCC shoulder and mainline pavement by testing the fresh concrete. The Resident Engineer will need to review and approve the testing procedure. QC shall determine the thickness of the RCC mainline pavement and shoulders at a frequency of no less than one per 7,500 square yards. Sampling locations will be determined by the engineer using random sampling procedures in accordance with ASTM D 3665.

6.4 Aggregate Gradation. A sieve analysis shall be performed once a week. Testing shall be performed in accordance with AASHTO T 27 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

6.5 Deleterious Materials. Deleterious content shall be determined each day at a frequency of one test per 7500 square yards of material placed or fraction thereof. Test shall be performed in accordance with MoDOT TM 71 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt. Tests shall be performed on coarse aggregate fractions.

6.6 Absorption. Samples for coarse aggregate absorption shall be taken from the discharge gate of storage bins or from the conveyor belt at least once every 2000 cubic yards with a minimum of once per project. Coarse aggregate absorption shall be performed in accordance with AASHTO T 85.

6.7 Thin or Elongated. Thin or elongated pieces shall be determined on samples of coarse aggregate taken from the discharge gate of the storage bins or from the conveyor belt. Test shall be performed in accordance with ASTM D 4791 using a ratio of 5:1. Test shall be performed on aggregate particles retained on the ¾ in. sieve. Tests shall be performed at least once every 10,000 cubic yards with a minimum of once per project.

6.8 Retained Samples. All aggregate samples taken by the contractor, including but not limited to gradation, deleterious, absorption, and thin or elongated pieces shall be retained for the engineer for a minimum of seven days unless otherwise instructed. The retained sample shall be the remaining half of the final reduction in sample size obtained for QC testing. These samples shall be maintained in clean covered containers, without contamination, readily accessible to the engineer. The retained sample's identification shall consist of, but is not limited to:

(a) Time and date sampled

(b) Product specification number

(c) Type of sample, i.e. belt, bin, stockpile

(d) Lot and sublot designation

(e) Sampler/Tester

(f) Project Job Number

6.9 Acceptance.

6.9.1 Density. The density shall not be less than 98 percent of the maximum laboratory density.

6.9.1.1 Compressive Strength. Roller compacted concrete properly placed and compacted, but not meeting the density requirements shall be cored and tested for compressive strength at no additional cost. Cores shall be taken in accordance with AASHTO T 24. The compressive strength shall be determined by approved methods. Cores shall be tested for compressive strength within 7 days of density testing. If the tested area achieves the design strength, the material will be paid for at full price. Areas that fail to comply with the design strength will be deemed unacceptable and shall be addressed in accordance with Sec 105.11.

6.9.2 Thickness. The thickness shall not be deficient by more than 10 percent of the plan thickness. Areas that fail to comply with the design thickness will be deemed unacceptable and shall be addressed in accordance with Sec 105.11.

6.9.3 Aggregate Gradation. When one test is outside the allowable gradation range, immediate steps shall be taken to correct the gradation.

6.9.4 Deleterious Materials. When one test is outside the specification limits, immediate steps shall be taken to correct the deleterious content.

6.9.5 Absorption. The contractor shall halt production and make appropriate adjustments whenever either of the following occurs:

(a) One point falls outside the action limit line for individual measurement

(b) Two points in a row fall outside the specification limit but within the action limit line for individual measurement

6.9.5.1 Action Limits. The following action limit shall be used to control the aggregate absorption.

Individual Measurements	
Control Parameter	**Action Limit**
Absorption	Mix Design plus 0.3% to Mix Design plus 0.6%

6.9.6 Thin or Elongated Pieces. The coarse aggregate shall not have more than 5 percent thin or elongated pieces.

7.0 Quality Assurance.

7.1 Independent Samples. Corrective action shall be required when any QA tests are outside the required ranges or action limits. The engineer will at a minimum, independently test at the following frequency:

Test	**Frequency**
Density	1 test per 30,000 square yards
Thickness	1 test per 30,000 square yards
Aggregate Gradation	1 per project
Coarse Aggregate Deleterious	1 per week

Absorption	1 per 10,000 cubic yards
Thin or Elongated	1 per project

7.2 Test Procedures. The engineer will use the same test procedures as the contractor for determining the density and thickness of the RCC.

7.3 Retained Samples. The QA inspector will test at least ten percent of the retained portion of the QC samples for aggregate gradations and deleterious content. The QA inspector will test at least twenty percent of the QC retained samples for absorption and thin or elongated pieces. Retained samples will be chosen at random. A comparison will be considered favorable when the QA results of a QC retained sample are within the applicable limits specified in Sec 403.

8.0 Method of Measurement. Final measurement of the completed pavement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Where required, measurement of the RCC mainline pavement and shoulders, complete in place, will be made to the nearest 1/10 square yard. The revision or correction will be computed and added to or deducted from the contract quantity.

9.0 Basis of Payment. The accepted quantities of RCC will be paid for at the contract unit price, for specified A2 or A3 shoulders or mainline. Sec 610 for smoothness pay factor adjustments will apply to the final RCC mainline pavement surface. The contract unit price for A2 or A3 shoulders or mainline pavement will be considered as full compensation for all materials, equipment, tools, labor, and incidentals necessary to satisfactorily complete the work. No additional compensation will be allowed for any excess thickness.

ASPHALT CEMENT PRICE INDEX 12/11

1.0 Asphalt Cement Price Index. Adjustments will be made to the payments due the Contractor for any plant mix bituminous base, plant mix bituminous pavement, plant mix bituminous surface leveling, asphaltic concrete pavement and ultrathin bonded asphalt wearing surface that contains performance graded (PG) asphalt binder when it has been determined that the monthly average price for the midpoint of the published prices of PG64-22 for St. Louis, Missouri area and Kansas City area has fluctuated from the monthly average price of the month the project was bid. The St. Louis, Missouri area and Kansas City area prices will be obtained from the Asphalt Weekly Monitor® published by Poten & Partners Inc. The 'asphalt base index' will be the price from the last published Asphalt Weekly Monitor® prior to MoDOT's monthly bid opening. The 'monthly asphalt index' will be the price from the Asphalt Weekly Monitor the month prior to the payment estimate period in which the asphalt was laid. Any asphalt laid on the first day of a month will be included in the second estimate period for the previous month.

1.1 The adjusted contract unit price will be applied to the actual amount of PG asphalt binder used by the Contractor for all asphalt items. The adjustment will be applied to projects that have a quantity of asphalt wet ton mix pay items or converted square yard quantity over 1,000 tons. For projects that are paid for with square yard pay items, the adjustments will be made for applicable tons calculated based upon the plan square yard quantity and thickness converted to tons excluding the 1:1 wedge. The adjustment will be applied to all Job Order Contract projects for all quantities of the wet ton and square yard asphalt mix. The percentage of virgin PG asphalt binder as shown in the job mix formula, in accordance with Sec 401, Sec 403 and Sec 413, will be the basis for adjustments for any asphalt mix type placed on the project during the monthly index period. The effective asphalt binder obtained from the use of Recycled Asphalt Pavement (RAP) and/or Recycled Asphalt Shingles (RAS) will not be eligible for adjustment. The base price index for PG64-22 will be applied to the asphalt mix for mixes using any PG asphalt binder.

2.0 Basis of Payment. To determine the adjustment for any material specified in this provision the following formula will be used.

$A = (B \times C) \times (D-E)$

Where:
A = Adjustment for mix placed during the payment estimate period
B = Tons of Mix Placed during the payment estimate period
C = % of virgin PG asphalt binder as listed in the job mix formula in use
D = monthly asphalt index
E = asphalt base index

3.0 The engineer will make adjustment payments, as defined above, for the applicable work completed during each payment estimate period except for projects on which the contractor is being charged liquidated damages, due to working beyond the project completion date, in accordance with Sec 108. In this case, the "D" value used for the price adjustment will be either the last "D" value prior to the date that liquidated damage assessment began or the current monthly "D" value, whichever is lower.

4.0 Optional. This provision is optional. If the bidder wishes to be bound by this provision, the bidder shall execute the acceptance form in the Bid. Failure by the bidder to execute the acceptance form will be interpreted to mean election to not participate in the Asphalt Cement Price Index. If the Asphalt Cement Price Index is accepted, PG asphalt binder for the project will not be eligible for a material allowance as described in Sec 109.

"RATE OUR WORK ZONE" SIGNS **03/12; 05/12**

1.0 Description. This work shall consist of furnishing and installing a 72 X 36 inch or 48 X 24 inch "Rate Our Work Zone" signs, as indicated in the plans. The contractor shall furnish signs, labor, equipment, posts and hardware for installation of the signs in accordance with this provision, or as directed by the engineer.
Section 503
2.0 Material. All material shall be in accordance with Division 1000, Material Details.

3.0 Construction Requirements. The signs shall be post-mounted and placed approximately 500 feet before the beginning of the project limits or the "ROAD WORK AHEAD" sign or the "ROAD WORK NEXT XX MILES" sign, if used, when these signs are located outside the project limits for each direction of travel affected by the project. A project on only one pavement of a dual divided facility will require only one sign. The contractor shall maintain all signs until completion of the project. Upon completion of the project, the contractor shall remove the signs, posts and hardware. The signs, posts and hardware shall remain the property of the contractor.

4.0 Basis of Payment. The accepted quantity of signs will be paid for at the contract unit price per square feet of construction signs.

"POINT OF PRESENCE" SIGNS **03/12; 05/12**

1.0 Description. This work shall consist of furnishing and installing a 36 X 48 inch or a 96 X 48 inch "Point of Presence" signs, as indicated in the plans. The contractor shall furnish signs, labor, equipment, posts and hardware for installation of the sign in accordance with this provision or as directed by the engineer.

2.0 Construction Requirements. The sign shall be placed as shown on the plans. A project impacting only one direction of a divided highway will require only one sign. The contractor shall maintain all signs until completion of the project. Upon completion of the project, the "Point of Presence" signs shall remain in place ninety days with the "Completed as Promised" decal or plaque attached. After the ninety day period expires, the contractor shall be required to remove the sign. The sign, decal or plaque, posts and hardware will remain the property of the contractor.

2.1 The 36 X 48 inch "Point of Presence" sign shall be post mounted on two 3-pound/foot U-channel posts, or one-2 ½ inch perforated square steel tube post.

2.2 The 96 X 48 inch "Point of Presence" sign shall be post mounted on three 3-pound/foot U-channel posts with 32-inch spacing between posts.

3.0 Basis of Payment. The accepted quantity of "Point of Presence" signs will be paid for at the contract unit price per square feet of construction signing. The "Completed as Promised" decal or plaque shall be considered incidental to the "Point of Presence" sign.

SERVICE SIGNING

1.0 Description. All installation, relocation and repair of Missouri LOGO, Tourist Oriented Destination Signs (TODS) and General Service Signing shall be coordinated between the engineer, contractor and the designated Missouri LOGO representative.

1.1 It shall be noted by the contractor that Missouri LOGOS is responsible for the installation, relocation and repair of all LOGO, TODS and General Service Signs on MoDOT owned right of way. The contractor shall be solely responsible and liable for determining any impact to LOGO, TODS or General Service Signing due to contractor operations during construction of this contract. The contractor shall be responsible for notifying Missouri LOGOS at the time of the preconstruction meeting when a service sign is determined to be impacted and advise Missouri LOGOS of the project details. The Missouri LOGO representative will attend these meetings at their discretion.

The Missouri LOGO representative shall be contacted 24 hours a day, 7 days per week at (573) 291-6788.

1.2 Missouri LOGOS will be responsible any installation or relocation of service signs necessary for this contract. If Missouri LOGO's has to perform work within the limits of the project, Missouri LOGOS will conduct work so as not to interfere with or hinder the progress or completion of the work being performed by the contractor. Full cooperation of the contractors involved, in careful and complete coordination of their respective activities in the area, will be required.

2.0 Basis of Payment. No direct payment will be made to the contractor to recover the cost of equipment, labor, materials or time required to fulfill this provision.

REVISIONS TO 2011 MISSOURI STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

SECTION 101 – DEFINITION OF TERMS

Delete Sec 101.1 and 101.1.1 and substitute the following: ***08/12; 12/13***

101.1 Abbreviations.

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AISC	American Institute of Steel Construction
AGC	Associated General Contractors of America
ANSI	American National Standards Institute
AREA	American Railroad Engineering Association
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
AWG	American Wire Gauge
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CFR	Code of Federal Regulations
CS	Commercial Standards, U. S. Department of Commerce
CSR	Code of State Regulations
COE	Corps of Engineers
CUF	Commercially Useful Function
DBE	Disadvantaged Business Enterprise
EEI	Electrical Engineer's Institute
EEO	Equal Employment Opportunity

EPA	Environmental Protection Agency
EPG	Engineering Policy Guide
ESAL	Equivalent 18-kip Single Axle Load
FCC	Federal Communications Commission
FHWA	Federal Highway Administration
GGBFS	Ground Granulated Blast Furnace Slag
GRI	Geosynthetic Research Institute
ICEA	Insulated Cable Engineers Association
IMSA	International Municipal Signal Association
ITE	Institute of Transportation Engineers
LED	Light Emitting Diode
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MHTC	Missouri Highways and Transportation Commission
MoDOT	Missouri Department of Transportation
MSDS	Material Safety Data Sheet
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP 350	National Cooperative Highway Research Program (NCHRP) Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features*
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NRCS	Natural Resources Conservation
NRMCA	National Ready Mixed Concrete Association
NTPEP	National Transportation Product Evaluation Program
OSHA	Occupational Safety and Health Administration
PAL	Pre-Acceptance List
PS	U.S. Product Standard, U.S. Department of Commerce
PWL	Percent Within Limits
QA	Quality Assurance
QC	Quality Control

RETMA	Radio Electronics Television Manufacturer's Association
RSMo	Revised Statutes of the State of Missouri
SAE	Society of Automotive Engineers
SHPO	State Historic Preservation Office
SSPC	Society of Protective Coatings
SWPPP	Stormwater Pollution Prevention Plan
UCP	Unified Certification Program
UL	Underwriter's Laboratory
USA	United States of America
USACE	United States Army Corps of Engineers
USC	United States Code
USCG	United States Coast Guard
USFW	United States Fish and Wildlife
VOC	Volatile Organic Compound

101.1.1 Unit Symbols.

h	hour
ppm	parts per million
rpm	revolutions per minute
vpm	vibrations per minute
cf	cubic feet
cy	cubic yards
F	degrees Fahrenheit
ft	foot/feet
in	inch/inches
lb	pound/pounds
lf	linear foot/feet
psf	pounds per square foot
psi	pounds per square inch
sf	square foot/square feet
sy	square yard/square yards

Revise Sec 101.2 to include the following definition: ***06/13***

Road User Cost. Includes a combination of both road user delay costs and work zone accident costs.

SECTION 102 – BIDDING REQUIREMENTS AND CONDITIONS

Delete Sec 102.3 and substitute the following: ***04/12***

102.3 Bidding. All bid shall be submitted electronically using the BidExpress® website. Any bid not submitted electronically will be considered irregular in accordance with Sec 102.8

SECTION 105 – CONTROL OF WORK

Delete Sec 105.7 through 105.7.1 and substitute the following: ***03/14***

105.7 Cooperation With Utilities All utility facilities and appurtenances within the project limits shall be installed or relocated by the utility owner, unless specified otherwise. Utility installation and relocation shall be made in accordance with 7 CSR 10-3, Utility and Private Line Location and Relocation.

105.7.1 The contractor shall cooperate with utility owners and the engineer in the installation and relocation of utility facilities to minimize effects on the contractor's work, interruption to utility service and duplication of work by the utility owners. Facilities or appurtenances that are to remain in place during construction shall be accounted for and protected by the contractor's work procedures.

Amend Sec 105.7.2 and 105.7.3 to include the following and renumber accordingly: ***03/14***

105.7.2 The contractor shall notify Missouri One Call (800-344-7483) with its intent to excavate, as described in Chapter 319 RSMo. Locations of all utility facilities and appurtenances within the project limits will be provided by utility owners and may not be exact, particularly with regard to underground.

105.7.3 The contractor shall proceed in a safe and prudent manner to prevent damage to all public and private utilities. Repairs to damaged utilities caused by negligent or wrongful acts or omissions on the part of the contractor shall be corrected at the contractor's expense. Damaged facilities shall be restored to a condition similar or equal to that existing before the damage occurred.

Delete Sec 105.7.4 and substitute the following and renumber accordingly: ***03/14***

105.7.4 In the event of any damage, dislocation or disturbance of any underground facility in connection with any excavation, the contractor shall immediately notify Missouri One Call and cooperate with the utility owners until their facilities have been restored. Work shall not begin around any fire hydrants until provisions for continued service have been made and approved by the local fire authority.

Delete Secs 105.8 through 105.8.2 and substitute the following: ***07/15***

105.8 Construction Stakes, Lines and Grades. Surveying, project layout and setting of construction stakes will be performed by the contractor in accordance with Sec 627.

Delete Sec 105.18.3 through 105.18.4.14 and substitute the following: ***07/15***

105.18.3 Regular Track Procedures. The AAA Construction Industry Arbitration Rules, Regular Track Procedures, October 1, 2009 are amended as follows:

105.18.3.1 R-1. Agreement of Parties and Designation of Applicable AAA Rules. Not revised.

105.18.3.2 R-2. AAA and Delegation of Duties. Not revised.

105.18.3.3 R-3. National Panel of Construction Neutrals. Shall be replaced with the following:

In cooperation with the National Construction Dispute Resolution Committee the AAA shall establish and maintain a National Roster of Construction Arbitrators ("National Roster") and shall appoint arbitrators as provided first by the provisions of Missouri law, including 7 CSR 10-26, and then as provided in these rules. The term "arbitrator" in these rules refers to the arbitration panel, constituted for a particular case, whether composed of one or more arbitrators, or to an individual arbitrator, as the context requires.

105.18.3.4 R-4. Filing Requirements Under an Arbitration Agreement in a Contract. Not revised.

105.18.3.5 R-5. Filing Requirements under a Submission Agreement. Not revised.

105.18.3.6 R-6. Changes of Claim or Counterclaim. Shall be replaced with the following:

The contract between the parties provides for a Notice of Controversy or a Claim for adjustment to the contract prior to any demand for arbitration. Arbitration demands, issues, nature or amount of relief sought, shall not differ or be additional to that in the Notice of Controversy or Claim for contract adjustment provided for in the contract. There may not be a revision of the issues, nature of relief sought or increase in relief during or by way of any presentation of evidence during the arbitration. No

award may be upon different issues or basis of relief or provide relief different in nature or greater in amount than contained in the Notice of Controversy or Claim given under the contract and stated in the demand for arbitration. No new or different controversy, claim or counterclaim may be submitted to the arbitrator except with the consent of both parties and the arbitrator and any consent must be clearly expressed, written and signed by the parties. There will be no amendments by implication.

105.18.3.7 R-7. Consolidation or Joinder. Shall be replaced with the following:

If Commission expressly agrees in writing with regard to multiple disputes arising under a particular contract, multiple demands may be consolidated so long as the relief sought in total does not exceed $409,123 in the principal relief sought, as adjusted on an annual basis effective January first of each year in accordance with the Implicit Price Deflator for Personal Consumption Expenditures as calculated pursuant to subsection 5 of section 537.610, RSMo. See http://insurance.mo.gov/industry/sovimmunity.php. Demands to which Commission is not a party in direct privity of contract will never be joined. The issue of consolidation of claims and joinder of parties will not be arbitrable. Nothing in this section shall prohibit more than one demand for arbitration pursuant to the same contract, provided that each demand for arbitration arises from a separate claim based upon facts supporting a separate right of relief, filed with the Department and accepted by the department under the Missouri Department of Transportation's "Contractor Claims and Controversies Procedures". Neither shall a prime contractor be prohibited from filing a demand for arbitration arising from work, which was subcontracted provided that; (a) the claim was initially accepted by the department under "Contractor Claims and Controversies Procedures." and (b) would provide a right to contract adjustment separate from any claimed or which could be claimed by the prime contractor for its sole benefit. However, subcontractors shall have no right to file a demand for arbitration with the Commission.

105.18.3.8 R-8 Interpretation and Application of Rules.

105.18.3.9 R-9. Jurisdiction. Not revised.

105.18.3.10 R-10. Mediation. Not revised.

105.18.3.11 R-11. Administrative Conference. Not revised.

105.18.3.12 R-12. Fixing of Locale. Not revised.

105.18.3.13 R-13. Date, Time and Place of Hearing. Not revised.

105.18.3.14 R-14. Arbitrator Appointment from National Construction Panel. Delete paragraphs (a), (b), (c), (d) and (e) and replace with the following:

Arbitrators will be selected and appointed in accordance with 7 CSR 10-26.

105.18.3.15 R-15. Direct Appointment by a Party. Not revised.

105.18.3.16 R-16. Appointment by a Chairperson by Party-Appointed Arbitrators or Parties. Not revised.

105.18.3.17 R-17. Nationality of Arbitrator in International Arbitration. Not revised.

105.18.3.18 R-18. Number of Arbitrators. Not revised.

105.18.3.19 R-19. Disclosure. Not revised.

105.18.3.20 R-20. Disqualification of Arbitrator. Not revised.

105.18.3.21 R-21. Communication with Arbitrator and the AAA. Not revised.

105.18.3.22 R-22. Vacancies. Not revised.

105.18.3.23 R-23. Preliminary Management Hearing. Not revised.

105.18.3.24 R-24. Exchange of Information. Not revised.

105.18.3.25 R-25. Attendance at Hearings. Not revised.

105.18.3.26 R-26. Representation. Not revised.

105.18.3.27 R-27. Oaths. Not revised.

105.18.3.28 R-28. Stenographic Record. Not revised.

105.18.3.29 R-29. Interpreters. Not revised.

105.18.3.30 R-30. Postponements of Hearings. Not revised.

105.18.3.31 R-31. Arbitration in the Absence of a Party or Representative. Not revised.

105.18.3.32 R-32. Conduct of Proceedings. Not revised.

105.18.3.33 R-33. Evidence. Not revised.

105.18.3.34 R-34. Evidence by Affidavit and Posthearing Filing of Documents or Other Evidence. Not revised.

105.18.3.35 R-35. Inspection or Investigation. Not revised.

105.18.3.36 R-36. Interim Measures. Not revised.

105.18.3.37 R-37. Closing of Hearing. Not revised.

105.18.3.38 R-38. Reopening of Hearing. Not revised.

105.18.3.39 R-39. Waiver of Rules. Not revised.

105.18.3.40 R-40. Extensions of Time. Not revised.

105.18.3.41 R-41. Serving of Notice. Paragraphs (a) and (b) shall be replaced with the following:

(a) Any papers, notices, or process necessary or proper for the initiation or continuation of an arbitration under these rules; for any court action in connection therewith, or for the entry of judgment on any award made under these rules, may be served on a party by mail addressed to the party or its representative at the last known address with return receipt or by personal service, in or outside the state where the arbitration is to be held, provided that reasonable opportunity to be heard with regard thereto has been granted to the party.

(b) The AAA, the arbitrator and the parties may also use overnight delivery with return receipt or electronic facsimile transmission (fax) to give the notices required by these rules. Facsimile transmission must require an acknowledgment that an entire legible transmission was received. Where all parties and the arbitrator agree, notices may be transmitted by electronic mail (email), or other methods of communication.

(c) Not revised

105.18.3.42 R-42. Majority Decision. Not revised.

105.18.3.43 R-43. Time of Award. Not revised.

105.18.3.44 R-44. Form of Award. Paragraph (b) shall be replaced with the following:

(a) Not revised.

(b) The arbitrator shall provide a concise, written breakdown of the basis of the award and a written explanation and justification for the awarded amount.

(c) Not revised.

105.18.3.45 R-45. Scope of Award. Not revised.

105.18.3.46 R-46. Award upon Settlement. Not revised.

105.18.3.47 R-47. Delivery of Award to Parties. Not revised.

105.18.3.48 R-48. Modification of Award. Not revised.

105.18.3.49 R-49. Release of Documents. Not revised.

105.18.3.50 R-50. Withdrawal of Claims or Counterclaims.

105.18.3.51 R-51. Applications to Court and Exclusion of Liability. Paragraph (c) shall be replaced with the following:

(a) Not revised.

(b) Not revised.

(c) Parties to these rules shall be deemed to have consented that judgment upon the arbitration award shall be entered as provided by 226.096, RSMo (L. 2003, HB 668).

(d) Not revised.

(e) Not. Revised.

105.18.3.52 R-52. Administrative Fees. Not revised.

105.18.3.53 R-53. Expenses. Not revised.

105.18.3.54 R-54. Neutral Arbitrator's Compensation. Not revised.

105.18.3.55 R-55. Deposits. Not revised.

105.18.3.56 R-56. Remedies for Nonpayment. Not revised.

105.18.4 Fast Track Procedures. The AAA Construction Industry Arbitration Rules, Fast Track Procedures, October 1, 2009 are amended as follows:

105.18.4.1 F-1. Fast Track Applicability. Not revised.

105.18.4.2 F-2. Answers and Counterclaims. Not revised.

105.18.4.3 F-3. Limitation on Extensions. Not revised.

105.18.4.4 F-4. Changes of Claim or Counterclaim - Shall be replaced with the following: The contract between the parties provides for a Notice of Controversy or a Claim for adjustment to the contract prior to any demand for arbitration. Arbitration demands, issues, nature or amount of relief sought, shall not differ or be additional to that in the Notice of Controversy or Claim for contract adjustment provided for in the contract. There may not be a revision of the issues, nature of relief sought or increase in relief during or by way of any presentation of evidence during the arbitration. No award may be upon different issues or basis of relief or provide relief different in nature or greater in amount than contained in the Notice of Controversy or Claim given under the contract and stated in the demand for arbitration. No new or different controversy, claim or counterclaim may be submitted to the arbitrator except with the consent of both parties and the arbitrator and any consent must be clearly expressed, written and signed by the parties. There will be no amendments by implication.

105.18.4.5 F-5. Appointment and Qualification of Arbitrator. Shall be replaced with the following:

The provisions of 7 CSR 10-26 and the procedures for regular track arbitrator selection, apply to fast track procedure arbitrations.

105.18.4.6 F-6. Serving of Notice for Hearing– Shall be replaced with the following:

(a) Any papers, notices, or process necessary or proper for the initiation or continuation of an arbitration under these rules; for any court action in connection therewith, or for the entry of judgment on any award made under these rules, may be served on a party by mail addressed to the party or its representative at the last known address with return receipt or by personal service, in or outside the state where the arbitration is to be held, provided that reasonable opportunity to be heard with regard thereto has been granted to the party.

(b) The AAA, the arbitrator and the parties may also use overnight delivery with return receipt or electronic facsimile transmission (fax) to give the notices required by these rules. Facsimile transmission must require an acknowledgment that an entire legible transmission was received. Where all parties and the arbitrator agree, notices may be transmitted by electronic mail (email), or other methods of communication.

105.18.4.7 F-7. Preliminary Telephone Management Hearing. Not revised.

105.18.4.8 F-8. Exchange of Information. Not revised.

105.18.4.9 F-9. Discovery. Not revised.

105.18.4.10 F-10. Date, Time, and Place of Hearing. Not revised.

105.18.4.11 F-11. The Hearing. Not revised.

105.18.4.12 F-12. Time Standards. Not revised.

105.18.4.13 F-13. Time of Award. Not revised.

105.18.4.14 F-14. Neutral Arbitrator's Compensation. Not revised.

SECTION 106 – CONTROL OF MATERIAL

Delete Sec 106.2.2 and substitute the following: ***08/12***

106.2.2 Contractor Furnished Sources. If sources of material are not designated on the plans or described in the contract, or if the contractor desires to use material from sources other than those designated, the contractor shall acquire the necessary rights to take material from the sources and shall pay all costs related thereto, including any that may result from an increase in length of haul. All costs of exploring, meeting environmental requirements and developing such other sources shall be at the contractor's expense. Environmental compliance documentation shall follow MoDOT requirements for contractor furnished borrow, as described in Sec 203.3, and shall be submitted to the engineer for review and approval. The use of material from other than designated sources will not be permitted until representative samples taken by the contractor in the presence of the engineer have been approved and written authority is issued for the use thereof. If sources of material or material deposits are provided by the contractor, the engineer will test the samples and determine the suitability of the material.

Delete Sec 106.3 and substitute the following: ***12/13***

106.3 Samples, Tests and Cited Specifications Samples for tests will be taken and shipped to the laboratory in accordance with MoDOT's *Engineering Policy Guide (EPG) 106.3.1*. There shall be no direct charge to the Commission for material taken as samples, either for field tests or for laboratory tests. If a specification of a recognized national standard agency (AASHTO, ASTM, AWS, AWWA, etc.) is designated, the material shall meet either the designated specification if a date is indicated or the latest revision thereof in effect at the time of bid opening. Tests of samples of material will be conducted by the engineer in accordance with the methods specified in the contract or in accordance with the latest methods in effect at the time of bid opening, as prescribed by the national standard agency. Such national standard specifications and methods of tests will include those designated as tentative, interim or amended and officially approved and published by the sponsoring agency. If appropriate methods have not been so prescribed, tests shall be performed in a manner determined by the engineer.

Amend Sec 106.13.1 and include the following: ***10/15***

106.13.1 Access to Contractor QC Testing. The engineer shall be allowed to witness contractor QC testing at any time.

SECTION 107 – LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

Delete Sec 107.1 and substitute the following: ***04/13***

107.1 Laws to be Observed. The contractor shall know, observe and comply with all federal and state laws, local laws, codes, ordinances, orders, decrees and regulations existing at the time of or enacted subsequent to the execution of the contract that in any manner affect the prosecution of the work, except as specified in the contract or as directed by the engineer. The Contractor

shall also ensure that any subcontractor know, observe and comply with all federal and state laws, local laws, codes, ordinances, orders, decrees and regulations as outlined above. The contractor and surety shall indemnify and save harmless the State, the Commission, the Commission's agents, employees and assigns from any claim or liability arising from or based on the violation of any such law, code, ordinance, regulation, order or decree, except any local regulations, decrees, orders, codes or ordinances that the contract or the engineer has specifically directed that the contractor need not obey.

Amend Sec 107.4 and include the following and renumber accordingly: ***04/15***

107.4 Safety and Sanitary Provisions. The contractor shall at all times take necessary precautions to protect the life and health of all persons employed on the project or, who at the direction of the contractor are present on the right of way. The contractor shall be familiar with the latest accepted accident prevention methods and shall provide necessary safety devices and safeguards accordingly. The Commission will refuse to provide inspection services at plants or work sites where adequate safety measures are not provided and maintained.

107.4.1 Apparel. All workers within highway right of way shall wear approved ANSI/ISEA 107 Performance Class 2 or 3 safety apparel and more specifically as follows:

107.4.1.1 During daytime activities, flaggers shall wear a high visibility hard hat, safety glasses, a Performance Class 3 top OR a Performance Class 2 top, and safety footwear. Hard hats other than high visibility orange or green shall be covered with a high visibility covering.

107.4.1.2 During daytime activities, workers shall wear a hard hat, safety glasses, a Performance Class 3 top OR a Performance Class 2 top, and safety footwear.

107.4.1.3 During nighttime activities, flaggers shall wear a high visibility/reflective hard hat, safety glasses, a Performance Class 3 top AND Class E bottoms, OR Performance Class 2 top AND Class E bottoms, and safety footwear. Hard hats shall be reflective or covered with a high visibility covering.

107.4.1.4 During nighttime activities, workers shall wear a hard hat, safety glasses, a Performance Class 3 top OR Performance Class 2 top AND Class E bottoms, and safety footwear.

Delete Sec 107.7 and substitute the following: ***11/12***

107.7 Use of Explosives. All blasting operations shall be conducted under the direct supervision of a licensed blaster as required by the Missouri Blasting Safety Act. When explosives are used in the prosecution of the work, the contractor shall use the utmost care to prevent bodily injury and property damage. The contractor shall be responsible for damage resulting from the use of explosives. The engineer will have the authority to suspend any unsafe blasting operation. The contractor shall be familiar and comply with the rules and regulations of any city, county, state or federal agency or any other agency that may have jurisdiction in the handling, loading, transporting, storage and use of explosives. All places used for explosives storage shall be marked clearly "DANGEROUS EXPLOSIVES".

Delete Sec 107.7.5 through 107.7.5.4.3 in its entirety: ***11/12***

Delete Sec 107.13.2.1 to 107.13.2.2 and substitute the following: ***07/12***

107.13.2.1 Commercial Liability Insurance. The contractor shall carry commercial general liability insurance and commercial automobile liability insurance from a company authorized to issue insurance in Missouri. Each such policy shall name the Commission, and the Missouri Department of Transportation and its employees, as additional named insureds, in amounts sufficient to cover the sovereign immunity limits for Missouri public entities as calculated by the Missouri Department of Insurance, Financial Institutions and Professional Registration, and published annually in the Missouri Register pursuant to Section 537.610, RSMo. These amounts are $392,734 for any one person in a single accident or occurrence and $2,618,230 for all claims arising out of a single accident or occurrence. Each policy shall be endorsed to cover liability arising from blasting if applicable, other inherently dangerous activities, and underground property damage. Each policy shall be endorsed to include broad form general liability, contractual liability and completed operations coverage.

107.13.2.2 Annual Updates. The contractor shall cause the insurer to update the contractor's liability insurance coverage minimums annually to correspond to the statutory limits as adjusted on an annual basis effective January 1st, and published in the Missouri Register as provided for in section 537.610 RSMo. If a statutory limit of liability for a type of liability specified in this section is repealed or does not exist, the Commission shall set reasonable limits for that insurance coverage which shall be subject to adjustment periodically, in a written notice from the Commission to the Contractor.

Delete Sec 107.13.2.3 and renumber accordingly: ***07/12***

SECTION 108 – PROSECUTION AND PROGRESS

Delete Sec 108.1.2 and substitute the following: ***07/11***

108.1.2 The value of the work sublet will be the amount designated in the contractual agreement between the contractor and the subcontractor. The subcontractor shall perform the work described in the subcontract agreement. No subcontracts, or transfer of contract, will in any case release the contractor's liability under the contract and bonds. Consent to a subcontract will not create a direct contractual relationship between the subcontractor and the Commission.

Delete Sec 108.1.1 and substitute the following: ***06/13***

108.8.1.1 The liquidated damages shown in the contract will be listed separately as contract administrative costs and project road user costs. A combination of projects awarded as a single contract will be considered as one unit for the determination and assessment of the administrative liquidated damages. The road user costs will be specified independently for each project in the contract and will be assessed independently for each project not completed within the time specified in the contract.

Amend Sec 108.8.1.2 to include the following and renumber subsequent section accordingly: ***06/13***

108.8.1.2 The Commission may waive the road user cost as may accrue if the work is deemed to be significantly complete. A project will be considered significantly complete when all necessary signing, permanent pavement markings or as allowed in Sec 620.2.2.1, guardrail, signals, all permanent traffic control devices and other safety appurtenances have been installed and are operational. At a minimum, traffic must have complete use of the roadways and shoulders, with no delays due to construction activity. The suspension of the road user cost by the engineer will not constitute a waiver by the Commission of any contractual rights, and its application will be contingent upon the discretion of the engineer in completing the remaining items of work.

SECTION 109 – MEASUREMENT AND PAYMENT

Delete Sec 109.8 and substitute the following: ***01/16***

109.8 Final Acceptance and Payment. When the project has been accepted as provided in Sec 105, the engineer will prepare the final tabulation of the quantities of work performed. All prior partial estimates and payments will be subject to correction in the final tabulation and payment. The contractor will be paid the entire sum found to be due after deducting all previous payments and all amounts to be retained or deducted under the provisions of the contract. The contractor shall submit the following for file with the Commission:

(a) An affidavit, on the form prescribed by the Commission, to the effect that all payments have been made and all claims have been released for all material, labor and other items covered by the contract bond.

(b) The written consent of the surety to such payment is required if retainage was held.

(c) Any other documents that may be required by the contract.

Delete Sec 109.11.2 and substitute the following: ***08/13; 10/13; 12/13***

109.11.2 All costs claimed shall be adequately documented when measuring additional equipment expenses (i.e. ownership expenses) arising as a direct result of a delay caused by MoDOT. Actual records kept in the usual course of business, measuring actual increased ownership expenses pursuant to generally accepted accounting principles, may be required at the discretion of the engineer for determining equipment costs. For delays that the engineer determines to be short-term, or when the engineer determines this method acceptable, equipment costs shall be calculated using the provisions for authorized standby time in Sec 109.5.4, except that no increase for overhead or profit will be allowed in excess of what is established in Sec 109.11.1.

Delete Sec 109.12 and substitute the following: ***04/13***

109.12 Change Orders. Except as otherwise provided for in the change order, an adjustment of the contract price or time of contract performance in a change order constitutes compensation in full to the contractor subcontractors and suppliers for all costs and time effects directly or indirectly attributable to the matter described in the change order, for all delays related thereto, for all impact, cumulative impacts and for performance of the change within the time stated. The surety's liability under the contract bond and contract shall not be limited to the penal sum as set forth in the contract bond. The surety shall be liable and

responsible to the Commission for the contractor's entire performance and of all obligations arising under or from the contract, which shall include, but not be limited to, any change orders issued under the contract that increase the cost of the contract.

Delete Sec 109.14 and substitute the following: ***08/12; 04/13; 04/15***

109.14 Price Adjustment for Fuel. If the contractor accepts the option for fuel adjustment in the bid proposal, the method of price adjustment for the fuel used on the items of work specified herein will be based on "Fuel Usage Factors" The following table specifies the fuel usage factors for Production and On-Road Hauling. The On-Road Hauling Factor is based on an average 30-mile round trip and will be used regardless of the actual haul distance.

Item of Work	Unit	Fuel Usage Factor for Production	Fuel Usage Factor for On-Road Hauling	Total Fuel Usage Factor
Class A Excavation	gal/yd^3	0.20	n/a	0.20
Unclassified Excavation	gal/yd^3	0.30	n/a	0.30
Class C Excavation (Includes Sandstone and Igneous Rock Excavation)	gal/yd^3	0.40	n/a	0.40
Embankment in Place	gal/yd^3	0.35	n/a	0.35
Bituminous Construction on Roadways, Shoulders and Entrances. Includes both full depth asphalt and overlays. Includes all asphalt mixes under Secs 401, 402 and 403, as well as Ultrathin Bonded Asphalt Wearing Surface (UBAWS). Asphalt mixes paid by SY will be converted to equivalent tons.	gal/ton of total asphalt mix	2.65	0.67	3.32
Concrete Pavement Construction on Roadways, Shoulders and Entrances. Includes both full depth concrete and overlays. Includes roller compacted concrete. Round to nearest 1 in. increment. (e.g. if 7.5" pavement use 8 in. factor). If less than 6 in., use 6 in. factor. Concrete paid by CY will be converted to equivalent thickness.	gal/yd^2 6 in. 7 in. 8 in. 9 in. 10 in. 11 in. 12 in. 13 in. 14 in.	 0.27 0.29 0.31 0.33 0.35 0.36 0.39 0.41 0.42	 0.22 0.26 0.29 0.33 0.37 0.41 0.44 0.48 0.52	 0.49 0.55 0.60 0.66 0.72 0.77 0.83 0.89 0.94
Aggregate Base Construction[a] on Roadways, Shoulders and Entrances.	gal/yd^2 3in. 4 in. 5 in. 6 in. 7 in. 8 in.	 n/a n/a n/a n/a n/a n/a	 0.11 0.15 0.19 0.23 0.26 0.30	 0.11 0.15 0.19 0.23 0.26 0.30

	9 in.	n/a	0.34	0.34
	gal/ton	n/a	0.67	0.67
	gal/yd^3	n/a	1.35	1.35

[a] Includes all base in Secs 302 and 304, when hauled to the project, but does not include material in Secs 303 or 310. Does not included any base produced within project limits or adjacent to the project. Includes base shown in pay limits for optional shoulder designs (e.g. A3 shoulder), but not the portion indentified as incidental base.

Delete Sec 109.14.4 and substitute the following: ***08/12***

109.14.4 The difference (±) between the "Monthly Fuel Index" and the "Starting Fuel Index" will be the "Monthly Fuel Index Adjustment Factor". This "Monthly Fuel Index Adjustment Factor", along with the "Fuel Usage Factor" and quantities of completed work for which payment is made will determine the fuel adjustment payment or deduction.

Delete Sec 109.15 and substitute the following: ***06/13***

109.15 Fixed Cost Items. The following fixed prices shall be used when referenced in the specifications:

Sec	Item No.	Item of Work	Unit	Fixed Price
201.4.3	201-30.00	Clearing and Grubbing	Acre	$3,500.00
203.9.4	**≤500 cy**			
	203-20.00	Class C Excavation	cy	$ 25.00
	>500 cy but < 2000 cy			
	203-20.00	Class C Excavation	cy	$ 20.00
	≥ 2000 cy)			
	203-20.00	Class C Excavation	cy	$ 8.00
206.6.2	206-36.00	Supplemental Foundation Test Holes	ft	$ 6.00
206.6.3.1	206-10.03	Class 1 Excavation in Rock	cy	$ 120.00
206.6.3.2	206-20.03	Class 2 Excavation in Rock	cy	$ 170.00
206.6.3.3	206-31.00	Class 3 Excavation in Rock	cy	$ 85.00
206.6.3.4	206-34.00	Class 4 Excavation in Rock	cy	$ 85.00
214.5.1.2	214-20.00	Furnishing Rock Fill	cy	$ 15.00
303.5.1.2	303-06.00	Furnishing Rock Base Material	sy	$ 10.00
401.14	401-05.00	Sample of Compacted Plant Mix Bituminous Pavement	Each	$ 75.00
403.23.2	403-05.00	Sample of Compacted Asphaltic Concrete Pavement	Each	$ 75.00
611.30.5.1	611-30.10	Furnishing Type 1 Rock Blanket	cy	$ 24.00
	611-30.20	Furnishing Type 2 Rock Blanket	cy	$ 25.00
701.7.7	701-15.00	Concrete Coring	lf	$ 100.00
703.5.1	**Concrete Fill > 2 cy**			
	703-20.02	Class B Concrete (Misc)	cy	$ 500.00
703.5.1	**Concrete Fill < 2 cy**			
	703-20.02	Class B Concrete (Misc)	cy	$ 750.00
704.6	706-10.00	Reinforcing Steel	lb	$2.00

SECTION 110 – STATE AND FEDERAL WAGE RATES AND OTHER REQUIREMENTS

Delete Sec 110.2 and substitute the following: ***04/13***

110.2 Federal-Aid Projects. If the federal government is participating in the cost of construction of the project, all applicable federal laws, and the regulations made pursuant to such laws, will be applicable to and become part of the contract, shall be observed by the contractor, and the work will be subject to the inspection of the appropriate federal agency in accordance with Sec 105.10. Contracts with federal-aid will require payment of the prevailing hourly wage rate for each craft or type of work required to execute the contract as determined by the Missouri Department of Labor and Industrial Relations, and will require adherence to a schedule of minimum wages as determined by the U.S. Department of Labor. For work performed anywhere on the project, the contractor and the subcontractors shall pay the higher of these two applicable wage rates.

SECTION 203 – ROADWAY AND DRAINAGE EXCAVATION, EMBANKMENT AND COMPACTION

Delete Sec 203.3.2.5 and substitute the following: ***08/12***

203.3.2.5 Environmental clearances under applicable federal and state laws and regulations will include, but are not limited to the following: Clean Water Act (COE and MDNR), the Endangered Species Act (USFW and MDC), the National Historic Preservation Act (SHPO), the Farmland Protection Act (NRCS), Resource Conservation and Recovery Act (MDNR), Comprehensive Environmental Response (MDNR), Compensation, and Liability Act (MDNR) and RSMo Chapter 194, Section 194.400 *Unmarked Human Burial Sites* (SHPO). Certification shall be obtained in advance of the proposed use of a borrow site and furnished to the engineer. Certification shall include clearance letters and other evidence of coordination from the appropriate regulatory agencies as attachments. Guidelines for obtaining environmental clearances for contractor furnished borrow sites may be obtained from the project contact as designated in the contract proposal.

Delete Sec 203.3.2.6 in its entirety and renumber subsequent sections accordingly: ***12/13***

Delete Sec 203.4.15 and substitute the following: ***12/11; 10/13***

203.4.15 Excess or Unsuitable Material. All excess or unsuitable excavated material, including rock and boulders that cannot be used in embankments, may be placed on the sideslopes of the nearest embankment in a satisfactory manner or shall be disposed of off the right of way in areas secured by the contractor. The contractor shall be responsible for compliance with all federal, state and local laws in the disposal of excess or unsuitable material. Rock or boulders greater than 24 inches shall not be used routinely in constructing sideslope embankments. A distinct shoulder line shall be maintained by keeping all such waste material at least 24 inches below the finished shoulder elevation, and specific density control will not be required.

Delete Sec 203.5 and substitute the following: ***10/13***

203.5 Compaction of Embankment and Treatment of Cut Areas with Moisture and Density Control. AASHTO T 99, Method C, replacing any material retained on a 3/4-inch sieve, as provided therein, or MoDOT Test Method TM 40 will be used as the Standard Compaction Test for determining the moisture density relations of soils. The optimum moisture as determined by the Standard Compaction Test may be used as a guide in determining the proper moisture content at which each soil type should be compacted. Water shall be added or removed as necessary to permit obtaining the required density and moisture control. The field density of the embankment after compaction will be determined in accordance with AASHTO T 191 or T 205, using the total material or T 310, for wet density. The volume of the test hole may be reduced as necessary to accommodate available testing equipment. If nuclear density methods are used, moisture content will be determined in accordance with AASHTO T 239, except that a moisture correction factor will be determined for each soil in accordance with MoDOT Test Method TM 35. The calculated density obtained in a field density test will be compared with the maximum density as directed by the Standard Compaction Test to determine the percent of compaction attained.

Delete Sec 203.5.8 and substitute the following: ***10/14***

203.5.8 Compacting in Cut. Cut compaction shall be performed in all Class A material areas and in all unclassified material areas that meet the requirements of Sec 203.2.2 after removal of the roadway excavation material to the required section. A surface parallel to the pavement slope, 12 inches below the bottom of the pavement or lowest base course, shall be temporarily exposed for the full width between roadway inslopes. The exposed material shall be manipulated and compacted to no less than the required density to a depth of 6 inches . The material above this compacted plane shall be spread in layers not exceeding 8-inch loose thickness, each layer being wetted or dried as necessary and compacted to the specified density. The entire volume of material so handled and compacted, including the 6-inch layer compacted in place, will be considered as Compacting in Cut. All Class A material having a liquid limit of 40 or more, including the 6-inch layer compacted in place, shall be compacted at no less than the optimum moisture content.

SECTION 206 – EXCAVATION FOR STRUCTURES

Delete Sec 206.4.2 and substitute the following: ***03/14***

206.4.2 Foundation Key. Foundations for structures and retaining walls shall be free of loose material, and the footing shall be placed on undisturbed material. Footings shall be keyed no less than 6 inches into rock (limestone, dolomite or other suitable material with $q_u \geq 100$ ksf), and no less than 18 inches into weak rock (shale or other suitable material with 5 ksf $\leq q_u \leq 100$ ksf) or other suitable material specified for spread footings. Excavation in rock or weak rock for the key shall be made as near as practical to the size of the footing, or of the key, as shown on the plans. When placing the footing, the key portion shall be cast against the vertical, undisturbed face of the rock or weak rock. If side forms are necessary for footings, the forms shall be removed approximately 24 hours after placing the concrete, and the excavation immediately backfilled to the top of the footing.

All cavities or crevices shall be cleaned out and filled with concrete in accordance with Sec 703.3.3.9, or spanned with a reinforced concrete beam, as directed by the engineer.

Delete Sec 206.4.13 and substitute the following: ***03/14***

206.4.13 Excavation Classification. Unless otherwise shown on the plans, excavation for structures will be classified as Class 1 Excavation, Class 1 Excavation in Rock, Class 2 Excavation, Class 2 Excavation in Rock, Class 3 Excavation, Class 3 Excavation in Rock, Class 4 Excavation and Class 4 Excavation in Rock. In general, Class 1 Excavation and Class 2 Excavation will apply to excavation for bridges and large retaining walls. Class 3 Excavation will apply to excavation for pipe culvert installations, utilities, retrofit pipe culverts, drop inlets, and manholes. Class 4 Excavation will apply to excavation for box culverts, small retaining walls and other miscellaneous structures. Class 1 Excavation will include all excavation above a specified elevation indicated on the plans while Class 2 Excavation will include all excavation below this specified elevation. The classification of excavation for all structures will be shown on the plans.

Delete Sec 206.5.2 and substitute the following: ***04/13***

206.5.2 Final measurement of Class 3 Excavation for pipe culverts, utilities, retrofit pipe culverts, drop inlets or manholes will not be made unless there is an authorized change from plan location resulting in a different quantity or there is an authorized change averaging more than 6 inches in the foundation elevation. If a revision is made or an appreciable error is found in the contract quantity, the revision or correction will be computed and added to or deducted from the contract quantity. Measurement of Class 3 Excavation will be made to the nearest cubic yard for each structure of that volume of material actually removed from within the area bounded by vertical planes 18 inches outside of the outer walls of the structure. The upper limits of the volume measured, will be the existing ground line, or the lower limits of the roadway excavation, whichever is lower. The lower limits of the volume measured will include excavation necessary for pipe bedding.

SECTION 216 – REMOVAL FOR BRIDGE STRUCTURES

Delete Sec 216.50.2.2 and substitute the following: ***12/11; 10/14; 10/15***

216.50.2.2 The contact surfaces of all existing structural steel, including any shear connectors, exposed by removal of the bridge deck shall be cleaned, including the removal of stratified rust, with a minimum of SSPC-SP-3 surface preparation. Any tightly adhered concrete remaining after the surface preparation may be left in place. The area, including the welded connection between the shear connector and the top flange, shall be coated with one coat of gray epoxy-mastic primer (non-aluminum) in accordance with Sec 1081 to produce a dry film thickness of no less than 3 mils. Overspray on other areas of the shear connector will be considered acceptable. The gray epoxy-mastic primer (non-aluminum) shall be compatible with concrete.

Delete Sec 216.60.2.4 and substitute the following: ***12/11; 10/14***

216.60.2.4 The contact surfaces of all existing structural steel, including any shear connectors, exposed by partial removal of the bridge deck shall be cleaned and coated in accordance with Sec 216.50.2.2.

Amend Sec 216.90.3.4 and include the following: ***12/11***

216.90.3.4 The contact surfaces of all existing structural steel exposed by removal of the existing expansion joints and adjacent concrete shall be cleaned and coated in accordance with Sec 216.50.2.2.

SECTION 303 – ROCK BASE

Delete Sec 303.2.1 thru 303.2.3 and substitute the following: ***12/13***

303.2.1 Material for rock base shall be durable stone or broken concrete or asphalt containing a combined total of no more than 10 percent, by weight, of earth, sand, shale and non-durable rock. Material from geologic-filled sink deposits or stone indicating evidence of solution activity shall not be used.

303.2.2 The material shall be as large as can be conveniently handled within the limits of this specification. No particle dimension shall exceed approximately 12 inches, for 18 inches rock base or 9 inches for 12 inch rock base . There shall be some material with particle dimensions exceeding approximately 9 inches for 18 inch rock base or 6 inches for 12 inch rock base. The material shall be uniformly graded from coarse to fine.

303.2.3 Broken, sound concrete pavement and composite pavements may be used provided the ratio of the longest dimension measurement to thickness does not exceed 2:1 and provided there is no excessive exterior steel mesh that would affect compaction.

Delete Sec 303.3.3 and substitute the following: ***12/13***

303.3.3 Material for either 12 inch or 18 inch rock base may be placed in one lift. Rock base material may be placed thicker, with approval from the engineer, in maximum 24-inch lifts, provided a uniform drainage plane under the rock base is provided. No particle dimension shall exceed approximately 6 inches less than the placed lift thickness. There shall be some material with particle dimensions exceeding approximately 50 percent of the lift thickness. No additional payment will be made for the thicker rock base material. Class C Excavation in rock cuts shall be performed to allow placement of the specified lift thickness.

Delete Sec 303.3.5 and substitute the following: ***11/12; 12/13***

303.3.5 The final surface shall be of a uniform texture and grade suitable for paving. The top 2 inches of rock base shall consist of either 2 inch maximum rock fragments, spalls, reclaimed asphalt, or concrete. The 2 inch maximum size granular material shall have a plasticity index not to exceed 10 and a gradation such that at least 50 percent of the material will be retained on the No. 4 sieve or have a gradation meeting Type 5 or 7 aggregate as specified in Sec 1007. There shall be no exposed rock exceeding the 2 inch size in the final surface that would interfere with final preparation of the base for paving.

Delete Sec 303.5.3 and substitute the following: ***12/13***

303.5.3 Payment for placing rock base will be made at the contract unit price per square yard complete in place, based entirely on the surface area of the design thickness. No additional payment will be made for material needed to maintain the required edge slopes.

SECTION 304 – AGGREGATE BASE COURSE

Delete Sec 304.4.1 and substitute the following: ***12/11***

304.4.1 Quality Control. The contractor shall control operations to ensure the aggregate base, in place, meets the specified requirements for density, thickness, gradation, deleterious, and plasticity index. Tests shall be taken at random locations designated by the engineer at the following frequency:

Tested Property	Test Method	Contractor Frequency	Engineer Frequency
Density	AASHTO T 191 or AASHTO T 310	1 per 1000 tons, minimum of 1 per day	1 per 4,000 tons, minimum of 1 per project
Dynamic Cone Penetrometer Index Value (for Type 7 base)	ASTM D6951	1 per 1000 tons, minimum of 1 per day	1 per 4,000 tons, minimum of 1 per project
Thickness	Applicable method meeting engineer's approval	1 per 1000 tons, minimum of 1 per day	1 per 4,000 tons, minimum of 1 per project
Gradation and Deleterious Material[a]	AASHTO T 11, AASHTO T 27 and MoDOT Test Method TM 71	1 per 2000 tons, minimum of 1 per day[b]	1 per 8,000 tons, minimum of 1 per project
Plasticity Index[a]	AASHTO T 89 and AASHTO T 90	1 per 10,000 tons, minimum of 1 per project	1 per 40,000 tons, minimum of 1 per project

[a]Sampled at point of delivery, prior to rolling.
[b]When production for a week is anticipated to be 1,000 tons or less, the contractor may test the material at a frequency of 1 per 250 tons or 1 per week, whichever occurs first.

Delete Sec 304.4.3 in its entirety: ***10/13***

Delete Sec 304.5 and substitute the following: ***02/12***

304.5 Method of Measurement. Final measurement of the completed aggregate base course will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Measurement will include aggregate course placed under curb and gutter. Where required, measurement of aggregate base course, complete in place, will be made to the nearest square yard. Where the aggregate base course extends to the inslope of the shoulder, the pay limit of the aggregate base course will be measured from the mid-point of the sloped portion. The revision or correction will be computed and added to or deducted from the contract quantity.

SECTION 401 – PLANT MIX BITUMINOUS BASE AND PAVEMENT

Delete Sec 401.4.4.1 and substitute the following: ***12/11; 06/13***

401.4.4.1 Base, BP-1, BP-2 and BP-3 mixtures shall have the following properties, when tested in accordance with AASHTO T 245 or AASHTO T 312. The number of blows with the compaction hammer shall be 35 or the number of gyrations shall be 35 with the gyratory compactor. BP-1 and BP-2 mixtures shall have between 60 and 80 percent of the VMA filled with asphalt binder. BP-3 mixtures shall be compacted with the gyrator compactor to 35 gyrations and shall have a minimum 75 percent of the VMA filled with asphalt binder and dust to effective binder ratio of 0.9 to 2.0.

Mix Type	Percent Air Voids	AASHTO T 245 Stability lb	Voids in Mineral Aggregate (VMA)
BB	3.5	750	13.0[a]
BP-1	3.5	750	13.5
BP-2	3.5	750	14.0
BP-3	3.5	750	15.0

[a]Bituminous base mixtures that would require 12.0 percent VMA following Asphalt Institute MS-2 will have a minimum 12.0 percent requirement.

Delete Sec 401.4.4.2 and renumber accordingly: ***12/11***

Delete Sec 401.5 and substitute the following: ***12/11***

401.5 Gradation and Deleterious Content Control. In producing mixtures for the project, the plant shall be operated such that no intentional deviations from the job-mix formula are made. The contractor shall determine on a daily basis at minimum, the gradation on the aggregate reclaimed from the RAP by either extraction or binder ignition. The gradation results shall be used to determine the daily specification compliance for the combined gradation. Mixtures as produced shall be subject to the following tolerances and controls:

(a) The maximum variations from the approved job-mix formula shall be within the tolerances as shown in the table below:

	Percent Passing by Weight	
Sieve Size	Tolerance	Action Limit
No. 8[a]	± 5.0	± 10.0
No. 200	± 2.0	± 4.0

[a] Use No. 16 sieve for BP-3

(b) The deleterious content of the material retained on the No. 4 sieve shall not exceed the limits specified in Sec 1004.2.

(c) If the plasticity index of any fraction exceeds that of the material approved for the mix design, additional testing may be required.

(d) The quantity of asphalt binder introduced into the mixer shall be the quantity specified in the job-mix formula. No changes shall be made to the quantity of asphalt binder without written approval from the engineer. The quantity of asphalt binder determined by tests on the final mixture shall not vary by more than ± 0.3 percent from the job-mix formula.

Delete Sec 401.5.2 and substitute the following: ***07/15***

401.5.2 Substitutions. At the option of the contractor and at no cost to the Commission, the contractor may use a Sec 401 mixture with a smaller nominal maximum size aggregate or an approved Sec 403 mixture, design level C or E, or F with the same or smaller nominal maximum size aggregate in lieu of any Sec 401 mixture. When a Sec 403 mixture is substituted, the layer thickness requirements of Sec 403 will apply. The gradation, asphalt content, deleterious, and density acceptance of the substituted mixture during production will be in accordance with Sec 401.

Delete Sec 401.8.4 and substitute the following: ***06/13***

401.8.4 Pavement Testing. During construction, the engineer will designate as many tests as necessary to ensure that the course is being constructed of proper thickness, composition and density. Density of the roadway shall be determined by a daily sample consisting of four cores obtained by the contractor at stratified random locations selected by the engineer. A joint density sample shall consist of four cores taken from alternating sides of the lane placed at random locations selected by the engineer. The maximum theoretical density shown on the job mix formula shall be used for this determination. Samples, minimum 4-inch diameter cores, shall be taken the full depth of the layer to be tested. Cores tested by AASHTO T 166 shall be in accordance with Sec 403.19.3.1.3. The contractor shall restore the surface from which samples have been taken immediately with the mixture under production or with a cold patch mixture acceptable to the engineer.

Delete Sec 401.10 and substitute the following: ***08/12***

401.10 Surface Smoothness. The finish of the pavement surface shall be substantially free from waves or irregularities and shall be true to the established crown and grade. The pavement shall be thoroughly tested for smoothness by profiling or straightedging in accordance with Sec 610.

SECTION 402 – PLANT MIX BITUMINOUS SURFACE LEVELING

Delete Sec 402.5 and substitute the following: ***12/11***

402.5 Gradation and Deleterious Content Control. In producing mixture for the project, the plant shall be operated such that no deviations from the job mix formula are made. The contractor shall determine on a daily basis, at a minimum, the gradation on the aggregate reclaimed from the RAP by either extraction or binder ignition. The gradation results shall be used to determine the daily specification compliance for the combined gradation. Mixture as produced will be subject to the following tolerances and control:

(a) The total aggregate gradations shall be within the master range specified in Sec 402.3.
(b) Material passing the No. 200 sieve shall not vary from the job mix formula by more than ± 2.0 percentage points.

(c) The deleterious content of the material retained on the No. 4 sieve shall not exceed the limits specified in Sec 1004.2.
(d) If the plasticity index of any fraction exceeds that of the material approved for the mix design, additional testing may be required.

(e) The quantity of asphalt binder introduced into the mixer shall be that quantity specified in the job mix formula. No changes may be made to the quantity of asphalt binder specified in the job mix formula without written approval from the engineer. The quantity of asphalt binder determined by calculation or tests on the final mixture shall not vary more than ± 0.3 percent from the job-mix formula.

SECTION 403 – ASPHALTIC CONCRETE PAVEMENT

Delete Sec 403.2.6.1 and substitute the following: ***07/11***

403.2.6.1 Reclaimed Asphalt Pavement. Reclaimed Asphalt Pavement (RAP) may be used in any mixture, except SMA mixtures. Mixtures may be used with more than 30 percent virgin effective binder replacement provided testing according to AASHTO M 323 is included with the job mix formula that ensures the combined binder meets the grade specified in the contract. All RAP material, except as noted below, shall be tested in accordance with AASHTO T 327, *Method of Resistance of Coarse Aggregate Degradation by Abrasion in the Micro-Deval Apparatus.* Aggregate shall have the asphalt coating removed either by extraction or binder ignition during production. The material shall be tested in the Micro-Deval apparatus at a frequency of once per 1500 tons . The percent loss shall not exceed the Micro-Deval loss of the combined virgin material by more than five percent. Micro-Deval testing will be waived for RAP material obtained from MoDOT roadways. All RAP material shall be in accordance with Sec 1002 for deleterious and other foreign material.

Delete Sec 403.3.3 and substitute the following: ***11/12; 12/13***

403.3.3 Porphyry Mixtures. For LP and SMA mixtures, at least 50 percent by volume of the aggregate shall be crushed porphyry retained on the following sieves: No. 30 for SP048, No. 16 for SP095 and No. 8 for SP125. Depending on the actual

gradation of porphyry aggregate furnished, the amount of crushed porphyry required may vary, however at least 40 percent by weight of crushed porphyry will be required. Steel slag may be substituted for porphyry in LP and SM mixtures, except at least 45 percent by weight of crushed porphyry and/or slag will be required. The engineer may approve the use of other hard, durable aggregate in addition to porphyry and steel slag. . When an SMR mixture is designated, the mixture shall contain aggregate blends with at least 30 percent non-carbonate material in accordance with Sec 403.3.5.

Delete Sec 403.4 and substitute the following: ***07/11***

403.4 Job Mix Formula. At least 30 days prior to placing any mixture on the project, the contractor shall submit a mix design for approval to Construction and Materials. The mixture shall be designed in accordance with AASHTO R 35 or R 46 and shall be tested in accordance with AASHTO T 312 except as noted herein. A detailed description of the mix design process shall be included with the job mix formula (JMF). Representative samples of each ingredient for the mixture shall be submitted with the mix design. Aggregate fractions shall be provided in the same proportions as the proposed job mix formula. A minimum of 150 pounds will be required for any individual fraction. The amount of each ingredient submitted shall be as follows for each mix design to be verified:

Ingredient	Minimum Amount
Aggregate	750 Pounds
Hydrated Lime, Mineral Filler and/or Baghouse Fines	20 Pounds
Asphalt Binder	10 Gallons

Delete Sec 403.4.5 and substitute the following: ***11/12***

403.4.5 Design Gyrations. The number (N) of gyrations required for gyratory compaction shall be as follows:

Design	[b,] $N_{initial}$	[a,] N_{design}	[a,b] $N_{maximum}$
F	--	50	--
E	7	75	115
C	8	80 or 100	160
B	9	125	205

[a]SMA mixtures shall have N_{design} equal to 100 and no $N_{maximum}$ requirement.

[b]Design Level C mixtures designed at 80 gyrations shall have no $N_{initial}$ or $N_{maximum}$ requirements.

Delete Sec 403.11.1 and substitute the following: ***07/11***

403.11.1 Field Mix Redesign. When a new mix design will be required, the contractor will be permitted to establish the new mix design in the field. The mixture shall be designed in accordance with AASHTO R 35 or AASHTO R 46 and shall meet the mix design requirements, including TSR. A representative sample of the mixture shall be submitted with the new mix design to the Central Laboratory for mixture verification. The amount of mixture submitted for verification shall weigh at least 50 pounds.

Delete Sec 403.17.1.2 in its entirety: ***06/13***

Amend Sec 403.18.2 to include the following and renumber subsequent section accordingly: ***07/15***

403.18.2 Core Chain of Custody. QA density cores that are not in possession of the engineer for the entire time from extraction till testing shall be sealed in tamper proof bags after extraction.

Delete Sec 403.19.3 and substitute the following: ***07/11; 10/15; 01/16***

403.19.3 Test and Pay Factor Items. As a minimum, the contractor and engineer shall test in accordance with the following table. Where multiple test methods are allowed, the contractor shall designate the test method to be used in the QC Plan. Final payment will be based on the indicated pay factor items.

Tested Property	Pay Factor	Test Method	Contractor Frequency	Engineer Frequency
Mixture temperature	No	----	1/Sublot	1/day
Temperature of base and air	No	----	As needed	As needed

Mat Density (% of theoretical maximum density) by contractor		MoDOT Test Method TM-41 or AASHTO T 166[e]	1 Sample[b]/Sublot As needed for joints & shoulders.	1 Sample/4 Sublots
Unconfined Joint Density	No	MoDOT Test Method TM-41 or AASHTO T 166[e]	1 Sample[b]/Sublot	1 Sample/4 Sublots
Cold feed or hot bin gradation and deleterious content	No	AASHTO T 27 and AASHTO T 11	1/2 Sublots	1/4 Sublots
Ground shingles	No	AASHTO T 27	1/10,000 tons with a minimum of 1/project	1/project
FAA, CAA, Clay Content and Thin, Elongated Particles from material sampled from the cold feed or hot bin	No	AASHTO T 304, ASTM D 5821, AASHTO T 176 and ASTM D 4791	1/10,000 tons with a minimum of 1/project/mix type	1/project
Asphalt content	Yes	AASHTO T 164, or MoDOT Test Method TM-54, or AASHTO T 287, or AASHTO T 308	1/Sublot	1/4 Sublots
Asphalt content of RAP	No	AASHTO T 164[d]	1/4 Sublots	1/project
VMA @ N_{des} gyrations	Yes[a]	AASHTO T 312 and R 35[e]	1/Sublot	1/4 Sublots
V_a @ N_{des} gyrations	Yes[a]	AASHTO T 312 and R 35[e]	1/Sublot	1/4 Sublots
VFA @ N_{des} gyrations	No[a]	AASHTO T 312 and R 35[e]	1/Sublot	1/4 Sublots
Theo. max SG of the mixture	No	AASHTO T 209	1/Sublot	1/4 Sublots
TSR of the in place mixture	No[c]	AASHTO T 283	1/10,000 Tons or fraction thereof	1/50,000 Tons or 1/project combination
Tested Property	**Pay Factor**	**Test Method**	**Contractor Frequency**	**Engineer Frequency**
Mixture temperature	No	----	1/Sublot	1/day
Temperature of base and air	No	----	As needed	As needed
Mat Density (% of theoretical maximum density) by contractor	Yes	MoDOT Test Method TM-41 or AASHTO T 166[e]	1 Sample[b]/Sublot As needed for joints & shoulders.	1 Sample/Lot
Unconfined Joint Density	No	MoDOT Test Method TM-41 or AASHTO T 166[e]	1 Sample[b]/Sublot	1 Sample/Lot

Cold feed or hot bin gradation and deleterious content	No	AASHTO T 27 and AASHTO T 11	2/Lot	1/Lot
Ground shingles	No	AASHTO T 27	1/10,000 tons with a minimum of 1/project	1/project
FAA, CAA, Clay Content and Thin, Elongated Particles from material sampled from the cold feed or hot bin	No	AASHTO T 304, ASTM D 5821, AASHTO T 176 and ASTM D 4791	1/10,000 tons with a minimum of 1/project/mix type	1/project
Asphalt content	Yes	AASHTO T 164, or MoDOT Test Method TM-54, or AASHTO T 287, or AASHTO T 308	1/Sublot	1/Lot
Asphalt content of RAP	No	AASHTO T 164[d]	1/Lot	1/project
VMA @ N_{des} gyrations	Yes[a]	AASHTO T 312 and R 35[e]	1/Sublot	1/Lot
V_a @ N_{des} gyrations	Yes[a]	AASHTO T 312 and R 35[e]	1/Sublot	1/Lot
VFA @ N_{des} gyrations	No[a]	AASHTO T 312 and R 35[e]	1/Sublot	1/Lot
Theo. max SG of the mixture	No	AASHTO T 209	1/Sublot	1/Lot
TSR of the in place mixture	No[c]	AASHTO T 283	1/10,000 Tons or fraction thereof	1/50,000 Tons or 1/project combination

[a]Based on the average of a minimum of two compacted specimens.
[b]Core samples shall consist of one core. Up to two additional cores, as stated in the QC Plan, may be obtained at the same offset within one foot of the randomly selected location. If more than one core is obtained, all cores shall be combined into one sample.
[c]Payment will be based on the table in Sec 403.23.5.
[d]Other methods may be approved by establishing correction factors for RAP from the same source.
[e]AASHTO T 331 may be substituted for AASHTO T 166.

Amend Sec 403.19.3.1.3 to include the following: ***06/13***

403.19.3.1.3 Mixture Bulk Specific Gravity. Determining bulk specific gravity using paraffin-coated specimens, AASHTO T 275, shall not be used when required by AASHTO T 166. Alternate methods are AASHTO T 331 and ASTM D1188. The surface of specimens prepared for testing by these methods may have the surface texture removed by sawing a minimal amount. Specimens shall be securely held in a jig or other clamping device to eliminate distortion and retain a face parallel to the original surface. Measurements for lift thickness shall be made prior to sawing.

Delete Sec 403.20 and substitute the following: ***08/12***

403.20 Surface Smoothness. The finish of the pavement surface shall be substantially free from waves or irregularities and shall be true to the established crown and grade. The pavement surface shall be thoroughly tested for smoothness by profiling or straighedging in accordance with Sec 610.

Delete Sec 403.20.1 and 403.20.2 in its entirety: ***12/11; 08/12***

Delete Sec 403.23.4 and substitute the following: ***04/13***

403.23.4 Smoothness Adjustment. The contract unit price for all mixes, except wedge or level course, will be adjusted in accordance with Sec 610.5. The contract unit prices for asphaltic concrete pavement will be considered full compensation for all materials entering into the construction of the pavement and for the cost of the smoothness testing and correction.

Delete Sec 403.23.4.1 through 403.23.4.3 in their entirety: ***04/13***

SECTION 404 – BITUMINOUS MIXING PLANTS

Delete Sec 404.2.2.3 and substitute the following: ***10/14***

404.2.2.3 Binder Sampling. The contractor shall provide a sampling outlet in the asphalt binder feed lines connecting the plant storage tanks to the proportioning or injection system. The sampling outlet shall be installed in a readily accessible location such that representative samples may be withdrawn safely and slowly at any time during plant operation. A drainage receptacle shall be provided for flushing the outlet prior to sampling. When all of the chemical admixtures are added to the plant storage tank prior to use, the engineer may allow the contractor to sample the asphalt binder from the storage tanks located at the mixing facilitates. Sampling procedures shall be approved by the engineer prior to samples being taken.

Delete Sec 404.2.13 and substitute the following: ***10/14; 04/15***

404.2.13 Ticket Information. The printer shall be capable of keeping and printing cumulative totals for each project for each type of bituminous mixture. The printer shall produce a ticket in triplicate to accompany each load delivered to the project and shall be furnished to the engineer. The ticket shall show the following: (as a minimum)

(a) Gross and tare and/or net weights.

(b) Current date and time.

(c) MoDOT mix number assigned to the mix being placed.

(d) Unique ticket number (may be preprinted on the ticket).

(e) Job number, route and county.

(f) License plate number of the delivery vehicle (Must be displayed legibly on the ticket)

Delete Sec 404.4.2 and Sec 404.4.3 and substitute the following: ***10/14***

404.4.2 Feed Indicators. Each feeding orifice shall have an adjustable gate with an indicator provided to reference the opening setting. A device shall be installed on each aggregate feeder to indicate when the flow of material from the bin is below the point where accurate proportioning through the feeder gates can be accomplished. These indicators shall be positive in action and shall actuate a clearly visible or audible signal to the plant operator, or stop the flow of material to the drum when the level of material in the bin is too low for accurate proportioning. A scalping screen mounted independent of other proportioning or weighing equipment shall be provided if directed by the engineer. The total daily asphalt binder quantity numbers for the project shall be provided to the engineer.

Delete Sec 404.4.3 and substitute the following: ***10/14; 10/15***

404.4.3 Asphalt Meter. Asphalt binder shall be introduced through a continuously registering cumulative indicating meter by a pump specifically designed for drum mix plants. The meter shall be located in the asphalt line so that the meter will continuously register the asphalt discharge to the mixer and such that the discharge through the meter can be readily diverted into a container for measurement. The meter shall be equipped with a nonsetback register and shall have an accuracy within 2 percent by weight of the material actually being measured in any given period of time. The nonsetback register shall register only the asphalt discharged to the mixer and shall not record asphalt circulated back to the storage tank. A device shall be provided in the asphalt

storage tank to indicate when the supply of asphalt to the pump and metering device is such that accurate proportioning is not accomplished. The accuracy of the pump and meter shall be verified at periodic intervals as designated by the engineer. The total daily asphalt binder quantity number for the project shall be provided to the engineer.

Delete Sec 404.4.4 and substitute the following: ***10/15***

404.4.4 Mineral Filler. If mineral filler or hydrated lime, or both, are used, a separate bin and feeder for each material shall be furnished and each material shall be dispensed by weight by continuous batching device. The batching device shall have a continuous weight display in clear view of the plant operator. The delivery system shall be variable speed and interlocked with the aggregate weigh belt so the total dry aggregate weight, including mineral filler or hydrated lime, or both, is indicated to the asphalt proportioning system. A continuously registering, cumulative, nonsetback register shall record the quantity of mineral filler or hydrated lime, or both, discharged into the mixer. Mineral filler and hydrated lime shall be introduced and uniformly dispersed into the drum mixer at the point of introduction of the asphalt binder without loss to the dust collection system. The mineral filler and hydrated lime proportioning and delivery system shall have an accuracy of 10 percent by weight of the material actually being measured in any given period of time. The total daily mineral filler and hydrated lime quantity numbers for the project shall be provided to the engineer.

Delete Sec 404.4.5 and substitute the following: ***10/14; 10/15***

404.4.5 Belt Scales. Positive weight measurement of the combined cold feed aggregate shall be by use of belt scales. The combined cold feed aggregate shall be continuously recorded on a nonsetback register. The belt scale shall have an accuracy within 2 percent by weight of the material actually being measured in any given period of time. The accuracy of the belt scales shall be verified at periodic intervals as directed by the engineer. The total daily aggregate quantity numbers for the project shall be provided to the engineer.

SECTION 409 – SEAL COAT

Delete Sec 409.2.2 and substitute the following: ***10/14***

409.2.2 Emulsified asphalt or polymer modified emulsions shall be in accordance with Sec 1015, with the following exceptions:

Asphalt Emulsion Requirements			
Tests on Asphalt Binder[a]	**Test Method**	**Minimum**	**Maximum**
Penetration @ 77°F	ASTM D 5	60	150
Elastic Recovery @ 50°F, %	AASHTO T 301	65	---

[a]These tests shall be done on the asphalt residue for emulsions and cutbacks.

Delete Sec 409.3 through 409.5.2 and substitute the following: ***10/14***

409.3 Job Mix Formula. The contractor shall submit the mix design to the laboratory for approval no less than two weeks prior to placing the seal coat.

409.3.1 The mix design shall contain the following information:

(a) Source, grade and certified test results for the asphalt binder.

(b) Source, type (formation, etc.), ledge number if applicable, and gradation of the aggregate.

(c) The grade and certified test results for the aggregate.

(d) The application rate used to pre-coat the aggregate as allowed in Sec 1003.

(e) The percent binder application rate, gallons per square yard. The adjustment factor shall be included if specified in the contract plans.

(f) The aggregate application rate, pounds per square yard.

409.3.1.1 The target binder application rates for each aggregate grade, as found in Sec 1003, shall be:

Grade	A1	A2	B1	B2	C
Target Binder Application Rate, gal/sy[a]	0.38	0.28	0.38	0.28	0.38

[a] Corrections to the rate listed may be included in the plans

409.3.2 A surface condition, aggregate properties and traffic volume correction may be provided in the plans. This assessment will contain an allowable variance from the binder application rate. The aggregate application rates shall not vary from the mix design by more than ± 5 pounds per square yard.

409.4 Equipment. Equipment shall be capable to perform the following:

(a) Heating and applying bituminous material, measuring temperature of tank contents and continuously verify application rates. The calibration of the system shall be accomplished by the contractor and approved by the engineer prior to use. The contractor shall furnish all equipment, material, labor and supervision necessary to perform this calibration. Equipment shall be calibrated subsequent to any repair that may affect calibration.

(b) Removal of loose aggregate from applied surface.

(c) Seating of aggregate without causing aggregate fracture.

(d) Accurately measuring and uniformly spreading of the aggregate over the full width of the bituminous material and have ability to vary the application width depending upon road width. It shall also be able to have verifiable application rates. The calibration of the system shall be accomplished by the contractor and approved by the engineer prior to use. The contractor shall furnish all equipment, material, labor and supervision necessary to perform this calibration. Equipment shall be calibrated subsequent to any repair that may affect calibration.

409.5 Construction Requirements.

409.5.1 Weather Limitations. Bituminous material shall not be placed on any wet surface. Seal coat shall only be placed when the ambient temperature and the temperature of the pavement on which it is to be placed is above 60 F. Temperatures shall be obtained in accordance with MoDOT Test Method TM 20.

409.5.1.1 Forecasted Weather. No seal coat shall be placed when the forecast from the National Weather Service predicts ambient temperatures falling below 40 F within 24 hours of construction.

409.5.2 Surface Preparation. The surface shall be thoroughly cleaned or swept to remove all dirt, packed soil, or any other foreign material prior to spraying the bituminous material.

Delete Sec 409.5.3.1 and substitute the following: ***10/14***

409.5.3.1 Bituminous material shall be uniformly applied within the temperature range recommended by the manufacturer. Any bituminous material applied on adjacent Portland cement or asphaltic concrete pavements, curbs, bridges or any areas not specified to be sealed shall be removed by the contractor, at the contractor's expense.

Amend Sec 409.5.4 through Sec 409.5.6 to include the following: ***10/14***

409.5.4 Compaction. All aggregate shall be uniformly seated over the entire area being sealed in a manner which minimizes aggregate loss and prevents crushing of aggregate.

409.5.5 Dust Control. The contractor may be required to control dust should airborne dust become a concern, or as directed by the engineer.

409.5.6 Loose Aggregate. Loose aggregate shall be removed from curbs, gutters, sidewalks, driveways, and other areas designated by the engineer.

Delete Sec 409.6.1 and substitute the following: ***10/14***

409.6.1 During application of the seal coat, the contractor shall control traffic through the work zone by means of pilot vehicles traveling at a maximum speed of 35 miles per hour. The contractor shall designate a responsible person for receiving and resolving damage claims made by the public. This person shall be available by telephone during the contractor's normal business hours Monday through Friday.

Delete Sec 409.7 through Sec 409.8 and substitute the following: ***10/14***

409.7 Basis of Acceptance. Acceptance shall be made no less than 14 days from completion of the route. Seal coat will be evaluated for acceptance by the engineer based on the following criteria:

(a) No location having bleeding of binder in excess of two square feet or a combined area of bleeding greater than 10 square feet on any 50 foot length of two lane roadway.

(b) No continued or ongoing tracking from seal coat onto other roadways or adjacent driveways.

(c) No transverse and longitudinal construction joints from the seal coat application that are not straight, create a bump, or produce a poor riding surface.

(d) Longitudinal construction joints that are straight and contain no gaps.

(e) No asymmetric appearance stemming from longitudinal grooves or ridges in the surface.

(f) A pavement treatment having complete aggregate coverage with full adherence to the roadway.

The contractor is responsible for any damage claims that are associated with the seal coat until the route is accepted by the engineer.

409.8 Method of Measurement.

Amend Sec 409.8.1 through Sec 409.8.3 to include the following: ***10/14***

409.8.1 Final measurement for aggregate in the completed seal coat will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity.

409.8.2 Where required, measurement of seal coat, complete in place, will be made to the nearest square yard for aggregate.

409.8.3 Final measurement for binder will be in accordance with Sec 1015 and will be made to the nearest 10 gallons for actual quantity used. Any revision or correction will be computed and added to or deducted from the contract quantity.

Delete Sec 409.9 and substitute the following: ***10/14***

409.9 Basis of Payment. The accepted quantities of seal coat aggregate and binder, in place, will be paid for at the contract unit price. No separate payment will be made for pre-coating aggregate, fog sealing, dust control, or for providing and installing contract information signs. If the binder application rate includes a correction fact, it is included in the plan quantities.

SECTION 413 – SURFACE TREATMENTS

Delete Sec 413.30.2.1 and substitute the following: ***07/11***

413.30.2.1 Coarse Aggregate. Coarse aggregate may consist of crushed gravel, limestone, dolomite, porphyry, steel slag, flint chat, or blends of two or more of these aggregates will be acceptable. When coarse aggregate for these mixes are from more than one source or of more than one type of material, the coarse aggregate shall be proportioned and blended to provide a uniform mixture. Coarse aggregate shall be material predominantly retained above the No. 4 sieve and shall be in accordance with the following requirements:

Coarse Aggregate Modified Requirements			
Test	**Method**	**Min**	**Max**
Los Angeles Abrasion Value, % Loss[a]	AASHTO T 96		35
Soundness, % Loss, Sodium Sulfate[a]	AASHTO T 104		12
Flat & Elongated Ratio, % @ 3:1[b]	ASTM D 4791		25
% Crushed, single face[b]	ASTM D 5821	95	
% Crushed, two faces[b]	ASTM D 5821	85	
Micro-Deval, % loss[a]	AASHTO T 327		18

[a]Tests shall be determined on each individual ledge combination.
[b]Tested on the coarse portion of the blended aggregate

Delete Sec 413.30.2.2 and substitute the following: ***02/12***

413.30.2.2 Fine Aggregate. Fine aggregate shall be material predominantly passing the No. 4 sieve and shall be in accordance with the following requirements:

Fine Aggregate Modified Requirements			
Tests	**Method**	**Min**	**Max**
Sand Equivalent[a]	AASHTO T 176	45	
Methylene Blue[a]	AASHTO T 330		10
Uncompacted Void Content[a]	AASHTO T 304	40	

[a]Tested on the fine portion of the blended aggregate

Amend Sec 413.30.2.3 to include the following and renumber accordingly: ***04/13***

413.30.2.3 Reclaimed Asphalt Pavement. The RAP shall be in accordance with Sec 403.2.6 and shall have 100 percent passing the 3/8 inch and no less than 70 percent passing the No. 4 sieve. The mixture shall contain no less than 80 percent effective virgin binder.

Delete Sec 413.30.4.2 and substitute the following: ***11/12***

413.30.4.2 Gradation. Prior to mixing with asphalt binder, the combined aggregate gradation, including filler if needed, shall meet the following gradation for the type of mixture specified in the contract.

Mix Design Criteria			
Composition by Weight Percentages			
	Type A	**Type B**	**Type C**
Sieves	**% Passing**	**% Passing**	**% Passing**
3/4 in.			100
1/2 in.		100	75 – 100
3/8 in.	100	75 – 100	50 – 80
No. 4	40 – 55	25 – 38	25 – 38
No. 8	22 – 32	19 – 27	19 – 27
No. 16	15 – 25	23 max.	23 max.
No. 30	18 max.	18 max.	18 max.
No. 50	13 max.	13 max.	13 max.
No. 100	10 max.	10 max.	10 max.
No. 200	4.0 – 6.0	4.0 – 6.0	4.0 – 6.0

Delete Sec 413.30.4.7 in its entirety: ***04/13***

SECTION 501 – CONCRETE

Delete Sec 501.2 and Sec 501.2.2 and substitute the following: ***10/14***

501.2.1 Aggregate Acceptance. Quality control (QC) sampling and testing will be performed by the contractor and quality assurance (QA) sampling and testing will be performed by the engineer for aggregate in Portland cement concrete masonry in accordance with the following table at the last possible point of incorporation into the project. Aggregate samples may be taken either by sampling the flowing aggregate stream or upon approval by the engineer, from the stockpile.

Item	Property	QC Test Frequency	QA Test Frequency
Portland Cement Concrete Masonry	Gradation of Coarse Aggregate - AASHTO T 27 and T 11	One per 500 cubic yards per fraction per project.	One QC split per 2,500 cubic yards with a minimum of one per project. One independent QA per project.
	Gradation of Fine Aggregate - AASHTO T 27 and T 11		
	Deleterious Content - MoDOT Test Method TM 71		
	Absorption of Coarse Aggregate - AASHTO T 85		

	Thin or Elongated Pieces - ASTM D 4791 (+3/4 in., 5:1)	One per source per project.	One per source per year.

Delete Sec 501.2.2 and substitute the following: ***01/16***

501.2.2 Retained Samples. The contractor shall retain the QC split sample, obtained as specified in Sec 502.11.2.1.5, for seven days until requested by the engineer for comparison testing. A comparison will be considered favorable when the QA results of a QC retained sample are within the applicable limits specified in Sec 403.18.2.

Delete Sec 501.3.3 and substitute the following: ***12/11***

501.3.3 Optimized Masonry Concrete. For optimized PCCM mixes, the gradation requirements of Sec 1005.2 and Sec 1005.3 will not apply. For coarse aggregate, 100 percent of each fraction shall pass the one-inch sieve and no more that 2.5 percent shall pass the No. 200 sieve. This value may be increased to 3.0 percent passing, provided there is no more than 1.0 percent of the material passing the No. 200 sieve in the fine aggregate. For fine aggregate, no more than 2.0 percent shall pass the No. 200 sieve for natural sand, and no more than 4.0 percent shall pass the No. 200 sieve for manufactured sand.

Delete Sec 501.3.4 and substitute the following: ***03/14***

501.3.4 Non-Optimized Masonry Concrete. When optimized aggregate gradations are not selected by the contractor, all provisions, including gradations requirements of Sec 1005 shall apply

Delete Sec 501.3.6 and substitute the following: ***11/12***

501.3.6 Cement Factors. The minimum cement requirements in pounds per cubic yard of concrete for the various classes of sand shall be as follows:

Cement Requirements[a,b]							
Class of Sand	**Class A-1 Concrete**	**Class B Concrete**	**Class B-1 Concrete**	**Class B-2 Concrete**	**Class MB-2 Concrete[g, h]**	**Pavement Concrete**	**Seal Concrete**
A[c]	600	525	610	705	600	560	660
B[d]	640	565	640	735	620	560	695
C[e]	--	585	660	750	640	560	715
D[f]	--	620	695	790	660	560	735

[a]When used, Type IP, I(PM), IS or I(SM) cement shall be substituted on a pound for pound basis for Type I or Type II cement and adjustments in design mix proportions will be required to correct the volume yield of the mixture.

[b]The contractor may submit an optimized mix design which has a maximum 50 pounds per cubic yard reduction in cement from that shown in the tables. If the contractor chooses this option, the mixture will be subject to review, laboratory testing and approval by the engineer. All other requirements for the cement factor will apply.

[c]Class A sand will include all sand, except manufactured sand, weighing 109 pounds per cubic foot or more.

[d]Class B sand will include all chert, river and Crowley Ridge sand weighing from 106 to 108 pounds, inclusive, per cubic foot or glacial sand weighing 108 pounds or less per cubic foot.

[e]Class C sand will include all chert, river and Crowley Ridge sand weighing from 101 to 105 pounds, inclusive, per cubic foot.

[f]Class D sand will include all sand weighing 100 pounds or less per cubic foot and any manufactured sand that is produced by the process of grinding and pulverizing large particles of aggregate or which contains more than 50 percent of material produced by the reduction of coarser particles. Manufactured sand produced from limestone or dolomite shall not be used in Portland cement concrete for driving surfaces such as bridge decks, pavements and full depth shoulders.

[g]Modified B-2 (MB-2) concrete may be used in-place of Class B-2 Concrete.

[h]Modified B-2 (MB-2) concrete shall use at least one supplementary cementitious material in accordance with this specification. In no case shall MB-2 concrete use less than 15 percent fly ash or GGBFS when used as the individual supplementary cementitious material. In no case shall MB-2 concrete use less than 6 percent metakaolin when used as the individual supplementary cementitious material.

Amend Sec 501.3.9 to include the following: ***10/14***

501.3.9 Absorptions. Coarse aggregate absorption tolerances shall be in accordance with Sec 502.11.3.3.

Delete Sec 501.6.3 and substitute the following: ***10/14; 04/15***

501.6.3 Calibration Frequency. Plant scales and water metering devices shall be calibrated and certified annually and after every plant move by an approved commercial scale service. Admixture metering devices shall be calibrated by a commercial scale company, the admixture company or the concrete plant company. Plant scales that have not been moved shall be verified six months after their calibration. A copy of the calibration and verification shall be provided to the engineer.

Delete Sec 501.8.2 and substitute the following: ***10/14***

501.8.2 Uniformity Testing. A uniformity test in accordance with ASTM C 94, shall be performed during the annual calibration at a central mix drum plant and at the beginning of production for a project at a mobile paving plant.

(a) A uniformity test shall be performed for the largest and smallest proposed batch size.

(b) The two samples shall be obtained within an elapsed time of no more than 15 minutes.

(c) The air content, slump and mix proportions of the concrete tested shall be in accordance with these specifications for that class of concrete or the uniformity tests shall be invalid.

(d) The use of a one-quarter cubic foot measure will be permitted in determination of weight per cubic foot.

(e) Cylinders may be cured in damp sand after the first 48 hours.

(f) The contractor may designate the mixing time for which uniformity tests are to be performed. The mixing time shall be a minimum of 60 seconds. The maximum mixing time shall not exceed the mixing time established by uniformity tests by more than 60 seconds for air-entrained concrete. The mixed concrete shall meet the uniformity requirements specified above before any concrete may be used for pavement or structures. The engineer may allow the use of the test concrete for appropriate incidental construction. Tests shall be performed by the contractor, in the presence of the engineer. No direct payment will be made for labor, equipment, material or testing. After operational procedures of batching and mixing are thus established, no changes in procedure will be permitted without re-establishing procedures by uniformity tests.

Delete Sec 501.8.10 and Sec 501.8.11 and substitute the following: ***10/14***

501.8.10 Testing Facilities. The contractor shall provide a Type 1 laboratory in accordance with Sec 601 at a paving plant for the engineer to inspect ingredients and processes used in the manufacture and delivery of the concrete. The contractor shall furnish the necessary equipment and personnel to assist the engineer in obtaining a representative QA sample. The ready mix producer shall notify the designated MoDOT representative every day that concrete is being supplied for a MoDOT project. A daily log of plant production shall be available for the engineer to review.

501.8.11 Delivery Tickets. The manufacturer of truck mixed concrete and of central mixed concrete for use in structures shall furnish to the engineer with each truck load of concrete before unloading at the site, a delivery ticket on which is shown information concerning the concrete as follows:

(a) Name of concrete plant.

(b) Serial number of the ticket.

(c) Truck number when a truck mixer is utilized.

(d) Name of contractor.

(e) Job Number, route and county designation.

(f) MoDot mix identification number assigned to the mix

(g) Specific class of concrete.

(h) Quantity of concrete in cubic yards.

(i) Date and time when batch was loaded or of first mixing of cement and aggregate.

(i) Number of revolutions, when truck mixed.

Amend Sec 501.8.12 to include the following: ***10/14***

501.8.12 Concrete Plant Documentation. The contractor shall complete the required concrete plant documentation once per working day at the central ready mix or paving plant. The documentation shall be made available to the engineer within 24 hours after concrete is batched.

SECTION 502 – PORTLAND AND CEMENT CONCRETE BASE AND PAVEMENT

Delete Sec 502.8 and substitute the following: ***08/12***

502.8 Surface Smoothness. The pavement surface shall be thoroughly tested for smoothness by profiling or straightedging as indicated in Sec 610.

Delete Sec 502.8.1 through 502.8.6.5 in their entirety: ***08/12***

Delete Sec 502.10.3.2 and substitute the following: ***04/15***

502.10.3.2 Pavement Thickness after Diamond Grinding. If the contractor elects to diamond grind to improve smoothness or surface texture, in accordance with Sec 610.5.1.3 and 610.5.1.4, then pavement thickness determination will be made after all smoothness correction has been completed. Cores shall be 4 inch in diameter. Location of coring will be determined by the engineer using random sampling procedures in accordance with ASTM D 3665.

Delete Sec 502.12 and substitute the following: ***10/14***

502.12 Quality Assurance. Corrective action shall be required in accordance with Sec 502.11.3 for any QA tests outside the action limit. The engineer will at a minimum, independently test at the following frequency:

Test	Frequency
Compressive Strength	1 per lot
Thickness	1 per lot
Surface Texture	1 per lot
Slump	1 per day
Entrained Air Content	1 per day
Aggregate Gradation	1 per project
Coarse Aggregate Deleterious	1 per week
Aggregate Absorption	1 per 10,000 cubic yards
Thin or Elongated Pieces	1 per project

Amend Sec 502.12.2 to include the following and renumber subsequent section accordingly: ***07/15***

502.12.2 Core Chain of Custody. QA strength and thickness cores that are not in possession of the engineer for the entire time from extraction till testing shall be sealed in tamper proof bags after extraction.

Delete Sec 502.15.1 through 502.15.3.5 in their entirety and renumber accordingly: ***08/12***

Delete Sec 502.15.8 and substitute the following, with no revisions made to table contents: ***12/13***

502.15.8 PWL Determination Table. Values in Table I are estimates of the PWL corresponding to specific values of the Quality Index (Q). For Q values less than zero, the table shall be subtracted from 100.

SECTION 503 – BRIDGE APPROACH SLAB

Delete Sec 503.1 through 503.3.1 and substitute the following and renumber subsequent section accordingly: ***07/15***

503.1 Description. This work shall consist of constructing a reinforced concrete or asphaltic concrete bridge approach slab on a prepared subgrade in accordance with these specifications and as shown on the plans or as directed by the engineer.

503.2 Material. All material, proportioning, air-entraining, mixing, slump and transporting of Portland cement concrete shall be in accordance with Sec 501. All material for asphalt shall meet the specification requirements for the mix type specified. Approach slabs shall be constructed of pavement concrete or an approved Class B-1 concrete mixture, or asphaltic concrete. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Reinforcing Steel for Concrete Structures	1036
Concrete Sealer	1053
Concrete Curing Material	1055
Material for Joints	1057
Polyethylene Sheeting	1058

503.3 Construction Requirements. Concrete bridge approach slabs shall be constructed in accordance with Secs 703 and 706, and shall attain a compressive strength of 4,000 psi prior to opening to traffic. Concrete bridge approach slabs shall be textured in accordance with Sec 703. Curing shall be in accordance with Sec 502, except the liquid membrane-curing compounds shall be in accordance with Sec 1055 for bridge curing compounds. Bridge approach slabs will not require sealing with a concrete sealer.

Asphalt bridge approach slabs shall be constructed in accordance with the specifications for the mix type specified.

503.3.1 Voids Under Completed Concrete Approach Slabs. Prior to acceptance of the work, all underseal access holes shall be opened by the contractor to permit investigation by the engineer. Any voids or cavities found shall be filled by the contractor using an approved method. Care shall be taken during pumping operations to avoid raising the approach slab.

Delete Sec 503.5 and substitute the following: ***07/15***

503.5 Basis of Payment. The amount of completed and accepted work as shown on the plans, measured as provided above, will be paid for at the contract unit price. No direct payment will be made for the reinforcing steel for concrete bridge approach slabs. No direct payment will be made for investigating void conditions under the completed slab or for filling any voids found for concrete bridge approach slabs.

SECTION 506 – CONCRETE OVERLAYS FOR PAVEMENTS

Amend Sec 506.20.3.4.2.5 to include the following and renumber subsequent section accordingly: ***06/13***

506.20.3.4.2.5 The surface temperature of the fabric shall not exceed 90 degrees F prior to the overlay placement.

SECTION 601 – FIELD LABORATORIES

Amend Sec 601.2.2 and 601.2.2.1 to include the following and renumber accordingly: ***04/13***

601.2.2 Laboratory Approval. Laboratory verification and approval shall be required for laboratories performing acceptance tests for related work and shall be performed by the engineer annually; not to exceed 18 months.

601.2.2.1 Equipment Verification Samples. Equipment Verification Samples are required to verify equipment where QC and QA are performing acceptance test(s) on the same equipment. Frequency of Equipment Verification Samples for permanent laboratories shall be required once per laboratory per quarter. Frequency of Equipment Verification Samples for mobile labs shall be required after setup and continued at once per quarter. Testing of samples shall be on independent equipment meeting the requirements as outlined in Sec 403.17.3.1. Test equipment that requires a correction factor is exempt.

SECTION 603 – WATER LINE INSTALLATION

Delete Sec 603.2 and substitute the following: ***05/12; 04/13***

603.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section/Specification

Concrete	501
Reinforcing Steel for Concrete	1036
Ductile Iron Pipe, 3 to 48 inchdiameters	AWWA C151
Polyethylene (PE) Pipe and Tubing, 1.2 to 3 inch diameter	AWWA C901
Polyethylene (PE) Pipe and Fittings, 4 to 63 inch diameter	AWWA C906
Polyvinyl Chloride (PVC) Pipe and Fabricated Fittings, 4 to 12 inch diameter	AWWA C900
Polyvinyl Chloride (PVC) Pipe and Fabricated Fittings, 14 to 48 inch diameter	AWWA C905
Ductile Iron and Gray-Iron Fittings	AWWA C110
Rubber Gasket Joints	AWWA C111
Cement Mortar Lining	AWWA C104
Gate Valves	AWWA C500
Rubber-Seated Butterfly Valves	AWWA C504
Dry-Barrel Fire Hydrants	AWWA C502
Seamless Copper Water Tube	ASTM B 88, Type K (ASTM B 88 M, Type A)

SECTION 605 – UNDERDRAINAGE

Delete Sec 605.10.2 and substitute the following: ***12/11***

605.10.2 Construction Requirements. Aggregate shall be Grade 3, Grade 4 or Grade 5 drainage aggregate. Edge drain pipe shall have a nominal internal diameter of 4 inches unless otherwise shown on the plans.

Amend Sec 605.70 to include the following: ***06/13***

SECTION 605.70 AGGREGATE DRAINS

605.70.1 Description. This work shall consist of trenching and placing granular filler material wrapped with geotextile as shown on the standard plans or as directed by the engineer. Construction of aggregate drains shall be after completion of granular base courses on new pavement or at least two weeks prior to shoulder work or pavement repair during pavement rehabilitation.

605.70.2 Construction Requirements.

605.70.2.1 The trench shall be constructed to the width and depth as shown on the standard plans. The bottom of the trench shall be no higher than the bottom of pavement or granular base. The trench shall be smooth, firm and furnish a clean exposure to the pavement bottom or granular base course.

605.70.2.2 Any remaining trench shall be backfilled and compacted with suitable material in accordance with Sec 203. When erodible aggregate material such as recycled glass, tire chips or fine aggregate, are used, the in-slope or exposed area shall be covered with a minimum of 6 inches Grade 3, Grade 4, or Grade 5 aggregate, in accordance with Sec 1009.

605.70.3 Method of Measurement. Final measurement of aggregate drains will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, measurement of aggregate drains will be made to the nearest linear foot along the centerline of the drain from the edge of pavement to the end of the trench top.

605.70.4 Basis of Payment. Accepted quantities of aggregate drain, complete in place, will be paid for at the contract unit price per linear foot. Payment will be considered full compensation for all labor, equipment, materials, and incidentals to complete this work, including excavation and geotextile wrap.

SECTION 606 – GUARDRAIL, CRASHWORTHY END TERMINALS, ONE-STRAND ACCESS RESTRAINT CABLE AND THREE-STRAND GUARD CABLE

Delete Sec 606.10.2.3.2.1 and substitute the following: ***10/14***

606.10.2.3.2.1 Delineator reflector colors shall correspond with pavement marking. Delineators shall be sheeted on one side, facing oncoming traffic, unless otherwise specified. Where guardrail divides opposing lanes of travel, the delineators shall have retro-reflective sheeting on both sides corresponding to adjacent pavement markings. Guardrail located on off ramps shall have red reflective sheeting placed on the reverse side of the reflector. The use of the red sheeting on the back side of guardrail delineators may be used wherever there is a need to discourage wrong way driving. Guardrail located on two lane roads shall have retro-reflective sheeting on both sides corresponding to the adjacent pavement markings. If there are not edgelines present, white retro-reflective sheeting shall be used.

SECTION 608 – CONCRETE MEDIAN, MEDIAN STRIP, SIDEWALKS, CURB RAMPS, STEPS AND PAVED APPROACHES

Delete Sec 608.3.1 and substitute the following: ***12/11***

608.3.1 Placement, finishing and curing of concrete shall be in accordance with Sec 502 When items are constructed on a subgrade, the subgrade shall be compacted to the specified density of the applicable subgrade material in accordance with Sec 209. The subgrade shall have a sufficient moisture content such that moisture is not drawn out of the concrete. Transparent membrane shall be used in lieu of pigmented membrane for curing concrete median strips, sidewalks, curb ramps and steps.

Amend Sec 608.3.8 to include the following: ***04/15***

608.3.8 Transitions from curb ramps to sidewalks, gutters or streets shall be flush and free of abrupt changes. All curb ramps at streets, signalized commercial entrances, and railroad crossings shall include truncated domes that contrast visually with the adjoining surface light on dark or dark on light.

608.3.8.1 Truncated domes shall be aligned on a square or radial grid pattern, 24 inches deep in the direction of travel, and the full width of curb ramp, landings or blended transition, exclusive of flares.

608.3.8.2 Truncated domes shall be installed as per manufacturer's specifications.

SECTION 609 – PAVED DRAINAGE

Delete Sec 609.30.3 and substitute the following: ***12/11***

609.30.3 Composition of Mixture. The asphaltic concrete mixture shall consist of aggregate, filler if needed, and asphalt binder combined in such proportions that the composition by weight of the finished mixture shall be within the limits specified for BP-3 or SP048 mixture in accordance with Sec 401 and Sec 403. The contractor shall submit in writing to Construction and Materials for approval of the job mix formula the contractor proposes to use for asphalt curb. A mixture demonstrating satisfactory results provided by the contractor may be used in lieu of the above mixtures.

SECTION 610 – PAVEMENT SMOOTHNESS

Amend Sec 610 to include the following: ***08/12***

SECTION 610

PAVEMENT SMOOTHNESS

610.1 Description. This work shall consist of measuring the smoothness of the final pavement surface. Smoothness shall be measured using the International Roughness Index (IRI). The following pavement types shall comply with this specification:

a) Multi-lift asphalt construction contained in Secs 401 and 403.

b) Concrete pavement construction contained in Secs 502 and 506.

c) Combination of surface planning, such as diamond grinding or milling, and single lift asphalt construction contained in Secs 401 and 403.

d) Single lift asphalt construction contained in Secs 401 and 403.

610.2 Material Requirements.

610.2.1 Inertial Profiler. IRI shall be computed from profile data collected with an inertial profiler (IP) that meets the requirements of AASHTO M 328

Delete Sec 610.2.2 and substitute the following: ***10/14***

610.2.2 ProVAL Software. The ProVAL software program shall be used to compute IRI smoothness and locate areas of localized roughness (ALR) in accordance with MoDOT TM-59.

610.2.3 Straightedge. A rolling 10-foot straightedge shall be used for checking longitudinal elevation changes. A 4-foot straightedge shall be used for checking transverse elevation changes.

610.3 Certification. All inertial profilers used to collect data on MoDOT projects shall be annually certified at the MoDOT certification site in accordance with TM-59. The operator of the IP shall be certified through the MoDOT technician certification program.

610.4 Construction Requirements.

610.4.1 Smoothness Increments. Length of pavement shall be defined in the following increments for the purpose of smoothness acceptance:

a) Section – A section is a day's paving and shall begin and terminate at the construction joints. Interruptions designated by the engineer which cause placement to cease and begin at a new location will considered as a separate section for that day's operation if the separate section is greater than 250 feet.

b) Segment – Sections shall be divided into segments of 0.1 mile lengths with the exception of the last segment. If the last segment is greater than 250 feet and less than 0.1 mile, then the segment shall be measured for smoothness as an independent segment. If the last segment is 250 feet or less, the profile for that segment shall be included in the evaluation for the previous segment. The combined segment IRI shall be weighted for the length.

610.4.2 Profiling Areas.

610.4.2.1 Profiling will be applicable to the surface of all the following:

a) Mainline paving
b) Auxiliary lanes, turning lanes and ramps for projects or combination of projects, consisting of more than 0.5 mile of total profilable pavement.

Delete Sec 610.4.2.2 and substitute the following: ***03/14***

610.4.2.2 Profiling will not be required for the following exceptions:

(a) Bridge decks, bridge approach slabs and concrete approach pavements.

(b) Pavement on horizontal curves with centerline radius of curve less than 1000 feet and pavement within the superelevation transition of such curves.

(c) Pavement on vertical curves having a "K" value less than 90 and a length less than 500 feet.

(d) Pavement width transitions.

(e) Fifty feet in direction of travel on each side of utility appurtenances such as manholes and valve boxes.

(f) Fifty feet in direction of travel on each side of intersecting routes with special grade transition.

(g) Shoulders.

(h) Interruptions designated by the engineer which provide independently placed sections shorter than 50 feet.

(i) The last 15 feet of any section where the prime contractor is not responsible for the adjoining surface.

(j) Any lane which abuts an existing lane not constructed under the same contract.

610.4.2.3 In addition to the exceptions in Sec 610.4.2.2, profiling may be waived by the engineer if staging of the overall project; such as multiple entrance lane gaps, lane staging, etc.; affects the normal paving operation, or if multiple profile exceptions continuously exist on a large portion of the same roadway. Upon waiver, exempted areas shall be checked with a 10-foot straightedge.

Delete Sec 610.4.3 and substitute the following: ***04/13; 04/15***

610.4.3 Longitudinal Straightedging. Any pavement surface not measured with an inertial profiler shall be measured with a 10-foot straightedge. The straightedge path in the longitudinal direction for driving lanes will be located three feet from the outside edge and for shoulders will be located in the center. Additional paths with suspect roughness may be selected at the engineer's discretion. Shoulders that are paved integrally with an adjacent driving lane will not require straightedging. The engineer also has discretion to use a straightedge for spot checking pavement that had been measured with an inertial profiler. Any variations in the longitudinal direction exceeding 1/4 inch in 10 feet on shoulders and 1/8 inch in 10 feet on all other pavements shall be marked for correction in a manner approved by the engineer.

610.4.4 Transverse Straightedging. The engineer shall randomly check driving lanes, regardless of the smoothness measurement method used, for variations in the transverse direction with a 4-foot straightedge. Any variations in the transverse direction more than 1/4 inch shall be marked for correction in a manner approved by the engineer.

610.4.5 Full Depth Pavement and Multi-lift Overlays. These construction procedures apply to pavement treatments described in Sec 610.1 (a) and (b).

Delete Sec 610.4.5.1 and Sec 610.4.5.2 substitute the following: ***10/14***

610.4.5.1 Quality Control Testing. The contractor shall perform quality control (QC) testing on all eligible profiling areas and provide electronic files for daily section smoothness data in .PFF file format to the engineer in accordance with the testing and reporting procedures in MoDOT TM-59. Reported IRI for each segment is the average of both wheel paths. Furnishing inaccurate test results may result in decertification of the inertial profiler operator.

610.4.5.2 Quality Assurance Testing. The engineer will perform quality assurance (QA) testing with a MoDOT inertial profiler to verify the QC test results. The engineer shall select a continuous portion of roadway; not adjacent to the beginning or ending of the project limits and free to the degree possible of exempted areas, such as bridges; that constitute at least 10 percent of the project lane-miles, which will be designated as the QA test length. The beginning and ending of the QA test length shall be clearly marked with paint. Both the contractor and engineer shall measure the IRI in both wheel paths for the entire QA test length with their respective inertial profilers. The stat and stop of the inertial profiler runs shall be triggered automatically. The contractor inertial profiler run on the QA test length may constitute the regular QC test result or may be run independently from previous QC test results. The contractor shall provide the electronic file for the QA test length run in .PFF format to the engineer within 24 hours of testing. The IRI value for each segment within the QA test length shall be computed as the average of both wheel paths. The absolute value of the difference between the contractor and engineer IRIs shall be computed for each segment within the QA test length. The average of the absolute values of the IRI difference shall be 8 inches/mile or less. The absolute value of the IRI difference for any single segment shall be 12 inches/mile or less.

610.4.5.3 Minimum Daily Smoothness. If any section has an average IRI of 125.1 inches/mile or greater for a pavement having a final posted speed greater than 45 mph, or 175.1 inches per mile or greater for pavement having a final posted speed of 45 mph or less, the paving operation will be suspended and will not be permitted to resume until corrective action approved by the engineer is taken by the contractor.

Delete Sec 610.4.5.4 and substitute the following: ***04/13; 10/14***

610.4.5.4 Areas of Localized Roughness. All areas of localized roughness (ALR) in the right wheel path; defined as any length of pavement, having a final posted speed greater than 45 mph, with a continuous 25-foot average IRI of 125.0 inches or greater, or any length of pavement, having a final posted speed of 45 mph or less, with a continuous 25-foot average IRI of 175.0 inches/mile or greater; shall be corrected. After correcting ALRs, additional correction may be necessary to reduce any profile segment in a pavement with a final posted speed greater than 45 mph, to an average IRI of 80.0 inches or less; or reduce any profile segment in a pavement with a final posted speed of 45 mph or less to an average IRI of 125.0 inches/mile or less. The contractor shall reprofile the corrected lengths to verify smoothness compliance and submit an electronic data file in .PFF format to the engineer within 48 hours after testing.

610.4.5.5 Method of Correction. Corrective action to eliminate ALRs and improve the average IRI shall be accomplished by a method approved by the engineer. Diamond grinding may be used for bumps, but the use of an impact device, such as a bush hammer, will not be permitted. Total grinding depth shall be limited to ¼ inch. The final surface texture of corrected pavement shall be comparable to adjacent sections that do not require correcting. Satisfactory longitudinal grinding is acceptable as the final surface of the corrected pavements. All corrective work shall be completed prior to determination of pavement thickness.

610.4.6 Multi-treatment Overlays. These construction procedures apply to pavement treatments described in Sec 610.1 (c).

610**.4.6.1 Quality Control Testing.** The requirements are the same as Sec 610.4.5.1.

610.4.6.2 Quality Assurance Testing. The requirements are the same as Sec 610.4.5.2.

610.4.6.3 Minimum Daily Smoothness. The requirements are the same as Sec 610.4.5.3.

Delete Sec 610.4.6.4 and substitute the following: ***03/14; 10/14***

610.4.6.4 Areas of Localized Roughness. All areas of localized roughness (ALR) in the right wheel path; defined as any length of pavement at any final posted speed with a continuous 25-foot average IRI of 175.0 inches shall be corrected. After correcting ALRs, additional correction may be necessary to reduce any profile segment in a pavement with a final posted speed greater than 45 mph, to an average IRI of 80.0 inches or less; or reduce any profile segment in a pavement with a final posted speed of 45 mph or less to an average IRI of 125.0 inches/mile or less. A new IRI and ALR ProVAL report shall be furnished to the engineer no later than two days after the contractor profiles the corrected areas to verify compliance with minimum smoothness requirements.

Delete Sec 610.4.6.5 and substitute the following: ***10/14***

610.4.6.5 Method of Correction. Corrective action to eliminate ALRs and improve the average IRI shall be accomplished with a method approved by the engineer. Diamond grinding bumps shall only be permitted for a 1 1/2-inch or greater single lift overlay. Grinding depth shall be limited to ¼ inch. The final surface texture of corrected pavement shall be comparable to adjacent sections that do not require correcting. All corrective work shall be completed prior to determination of pavement thickness.

610.4.7 Single Lift Overlays. These construction procedures apply to pavement treatments described in Sec 610.1 (d).

Delete Sec 610.4.7.1 and substitute the following: ***04/15; 10/15***

610.4.7.1 Pre-Construction. Prior to performing any surface work or pavement repairs, the contractor shall profile the right wheel path in accordance with TM-59. This control profile will serve as the baseline for calculating percent improvement for the project.

Delete Sec 610.4.7.2 and substitute the following: ***04/15***

610.4.7.2 Post-Construction. As soon as practical after resurfacing, the contractor shall profile the right wheel path again. The same stationing shall be used to ensure a direct comparison with the pre-construction profile.

610.4.8 Marred Surface Area. Any area of a segment that has corrective diamond grinding performed without grinding the entire segment shall be defined as a marred surface area.

610.5 Basis of Payment.

610.5.1 Fixed Value Improvement. The following basis of payment procedures shall apply to all pavement treatments described in Sec 610.1 (a), (b) and (c).

610.5.1.1 Smoothness Adjustment. Smoothness adjustments will be paid per segment based on the IRI before any corrections, except for the allowances in Sec 610.5.1.5. Any segment with an IRI above the maximum limit in Tables 1 and 2 must be corrected through a method approved by the engineer to achieve the desired smoothness. When paving widths are greater than the travel lane widths, incentive payment will apply to the driving lane design width only.

610.5.1.2 Incentives. Incentive payment for smoothness shall be based on either Table 1 or Table 2. Table 1 shall be used for pavements having a final posted speed greater than 45 mph. Table 2 shall be used for pavements having a final posted speed of 45 mph or less and for pavements with no posted speed limits. Constant-width acceleration and deceleration lanes shall be considered as mainline pavements.

Table 1	
International Roughness Index, Inches Per Mile	**Percent of Contract Price**
40.0 or less	105
40.1 - 54.0	103
54.1 - 80.0	100
80.1 or greater	100[a]

Table 2	
International Roughness Index, Inches Per Mile	**Percent of Contract Price**
70.0 or less	103
70.1- 125.0	100
125.1 or greater	100[b]

[a]After correction to 80.0 inches per mile or less.
[b]After correction to 125.0 inches per mile or less.

Delete Sec 610.5.1.3 in its entirety and renumber subsequent sections accordingly: ***04/15***

610.5.1.3 Segment Correction. If the contractor elects to diamond grind an entire segment and the corrected surface drops below the maximum IRI limits in the designated Table, then the contractor cannot receive any incentives, but the marred surface area deductions for that segment will be waived.

610.5.1.4 Section Correction. If the contractor elects to diamond grind an entire section then all segments within the section will be eligible for their respective incentives and the marred surface area deductions for that section will be waived.

Delete Sec 610.5.1.6 in its entirety: ***10/14***

610.5.2 Percent Improvement. The following basis of payment procedures shall apply to all pavement treatments described in Sec 610.1 (d).

Delete Sec 610.5.2.1 and substitute the following: ***04/13; 03/14; 10/14***

610.5.2.1 The contract price for resurfacing will be adjusted based on the improvement in profile index according to Table 3 for each segment with an initial IRI greater than 60 inches per mile. Any segment with an initial IRI less than or equal to 60 inches per mile shall receive no percent improvement price adjustment if the segment IRI after placement of the overlay is also less than or equal to 60 inches per mile. Any segment with an initial IRI less than or equal to 60 inches per mile that has an IRI greater than 60 inches per mile after placement of the overlay shall be paid at 97 percent of the contract unit price for pavement, but no correction shall be required.

Table 3	
Percent Improvement (Change in IRI / Initial IRI) X 100	**Percent of Contract Unit Price For Pavement**
35.0 or greater	103
20.0 to 34.9	100
0.0 to 19.9	97[c]

[c] After correction to 0.0 or greater

Amend Sec 610.5.3 and substitute the following and renumber subsequent section accordingly: ***10/14; 04/15***

610.5.3 Marred Surface Deductions. A minimum deduction of 20 percent of the contract unit price of the paving quantities will be made for marred surface areas as defined in Sec 610.4.7. The deduction will be applied to an area of pavement extending from edge of the pavement to a longitudinal joint or between longitudinal joints in that section of pavement affected. If the length of the section affected is less than 10 feet, the deduction will be computed for 10 feet.

610.5.4 Testing Cost. The contract unit price for pavement will be considered as full compensation for all items entered into the construction of the pavement including the cost of smoothness testing.

610.5.5 Dispute Resolution. Any dispute between the engineer and contractor regarding IRI QC/QA comparisons that cannot be settled at the project office level shall be arbitrated with the MoDOT reference profiler per the test procedure in TM-59. The results of the reference profiler shall be binding for the engineer and contractor.

SECTION 611 – EMBANKMENT PROTECTION

Delete Sec 611.50.2.4 and substitute the following: ***10/14***

611.50.2.4 The contractor may use broken concrete as blocks for revetment provided all protruding reinforcement, trash, asphaltic concrete, and other extraneous materials are removed prior to placement in waters of the United States, and their associated floodplains.

Amend Sec 611.50.2.5 to include the following: ***10/14***

611.50.2.5 Broken concrete used as revetment shall be reasonably well graded, and contain a combined total of no more than 15 percent of soil or gravel. The gradation shall consist of pieces ranging in volume from 0.1 cubic foot to 1 cubic foot. The contractor shall break larger slabs to conform to this requirement. The maximum volume of any piece shall not exceed 3 cubic feet. Acceptance of the quality and size of this material will be made by visual inspection at the job site.

SECTION 613 – PAVEMENT REPAIR

Delete Sec 613.10.2.3.2.2 in its entirety: ***10/14***

Amend Sec 613.10.2.4 to include the following: ***10/14***

613.10.2.4 If the concrete pavement has been previously resurfaced, the repair area shall be filled with Portland cement concrete to the surface of the existing bituminous overlay, even when the existing surface is to be removed by milling, unless contract provisions allow the milling to occur prior to the pavement repair operation.

Delete Sec 613.10.10.2.5 in its entirety and renumber subsequent sections accordingly: ***10/14***

Delete Sec 613.10.3.1 and substitute the following: ***12/13***

613.10.3.1 Measurement for full depth sawing will be made to the nearest linear foot for the combined length of perimeter diamond saw cuts and of internal saw cuts at 6 foot or greater intervals.

Amend Sec 613.35 thru 613.35.5 and include the following: ***12/13***

SECTION 613.35 CLASS C PARTIAL DEPTH PAVEMENT REPAIR

613.35.1 Description. Class C partial depth pavement repair shall consist of performing repairs in asphalt pavements, including pavements that have an asphalt surface. This work includes removal of unsound pavement to the depth specified on the plans, or as directed by the engineer, and replacement with an approved asphalt mixture.

613.35.2 Material. The material used for Class C partial depth repairs shall be the asphalt surface mix specified in the contract, or a mix approved by the engineer.

613.35.3 Construction Requirements.

613.35.3.1 Removal of Bituminous Material. All unsuitable pavement shall be removed by milling or other method approved by the engineer. For composite pavements, the repair may extend into the underlying concrete pavement if deterioration is found at that depth. The minimum depth of repair shall be 2 inches. The repair area shall be square or rectangular in shape. The exposed faces of the repair area shall be cleaned to remove loose material. Material removed from the repair area shall be disposed of off right of way unless otherwise approved by the engineer.

613.35.3.2 Placement of Repair Material. The repair area shall be adequately tacked on the sides and bottom to ensure bonding of the repair material. The repair area shall be filled with the approved asphalt mixture and thoroughly compacted over the entire area to a density approved by the engineer. Areas greater than 3 inches in depth shall be filled and thoroughly compacted in two lifts. For pavements that will receive a final overlay, the final compacted surface of the repair shall be level with, or not more than ¼ inches above, the surrounding pavement. If the repair will as the final driving surface, smoothness shall be in accordance with Sec 610.4.3 and Sec 610.4.4.

613.35.4 Method of Measurement.

613.35.4.1 Removal of Bituminous Material. Measurement of removal for Class C partial depth repairs will be made to the nearest 1/10 square yard. For composite pavements, this removal includes both asphalt and concrete material. Any material removed beyond the repair area designated by the engineer due to the removal methods used by the contractor will not be included in the measurement.

613.35.4.2 Furnishing and Placement of Repair Material. Measurement for furnishing and placing the asphalt repair material will be made to the nearest 0.1 ton.

613.35.5 Basis of Payment. The accepted quantities for Class C partial depth pavement repair will be paid for at the contract unit price of the pay items included in the contract.

SECTION 616 – TEMPORARY TRAFFIC CONTROL

Delete Sec 616.3.1 in its entirety and renumber accordingly: ***04/15***

Delete Sec 616.8.1.6 and substitute the following: ***04/15***

616.8.1.6 Measurement of WZTS systems, consisting of lighting and traffic signals at both ends of a one-lane, two-way section, will be made per each.

Delete Sec 616.11 and substitute the following: ***04/15***

616.11 Basis of Payment. All temporary traffic control devices authorized for installation by the engineer will be paid for at the contract unit price for each of the pay items included in the contract. No direct payment will be made for the following:

(a) Incidental items necessary to complete the work, unless specifically provided as a pay item in the contract.

(b) Installing, operating, maintaining, cleaning, repairing, removing or replacing traffic control devices.

(c) Covering and uncovering existing signs and other traffic control devices.

(d) Relocating temporary traffic control devices, including permanent traffic control devices temporarily relocated, unless specifically included as a pay item in the contract.

(e) Worker apparel.

(f) Flaggers, AFADs, PFDs, pilot vehicles, and appurtenances at flagging stations.

(g) Furnishing, installing, operating, maintaining and removing construction-related vehicle and equipment lighting.

(h) Construction and removal of temporary equipment crossovers, including restoring pre-existing crossovers.

SECTION 617 – CONCRETE TRAFFIC CONTROL

Delete Sec 617.20.2 and substitute the following: ***10/15***

617.20.2 Material. All material shall be in accordance with Division 1000 Materials Details and Sec 1064.2.2.1.

Delete Sec 617.20.4.3 and substitute the following: ***10/15***

617.20.4.3 Equipment or material shall be stored a minimum of 3 feet away from loop system Type F temporary concrete traffic barrier. For other temporary barriers approved for use, equipment or material shall be stored no closer than the maximum deflection that occurred during NCHRP 350 impact tests or specified by the manufacturer.

Delete Sec 617.20.4.4 and substitute the following: ***10/15***

617.20.4.4 Temporary concrete traffic barrier shall not be anchored unless shown on plans or approved by the engineer. Anchoring of Type F temporary concrete traffic barrier shall be as shown on the plans. Two-loop style Type F temporary

concrete traffic barrier shall not be anchored. Other types of temporary traffic barrier shall be anchored in accordance with the manufacturer's recommendations.

SECTION 620 – PAVEMENT MARKING

Delete Sec 620.2.2.1 and substitute the following: ***11/12***

620.2.2.1 On roadways open to traffic, permanent pavement marking shall be in place no later than fourteen days after final paving operations, except when the permanent striping will be placed within the rumble strip, then the permanent striping shall be placed no later than fourteen days after the completion of the rumble strip. Permanent pavement marking applications for surface treatments requiring more than fourteen days of cure shall be placed in accordance with manufacturer's recommendations and as directed by the engineer.

Delete Sec 620.2.4.1 and substitute the following: ***11/12***

620.2.4.1 Retroreflectivity inspection will be performed by the engineer using a 30-meter geometry retroreflectometer at 0.1 mile intervals for a mobile retroreflectometer. If a hand held retroreflectometer is used, the intervals and acceptance shall be in accordance with MoDOT Test Method TM 80. Retroreflectivity acceptance requirements will be as follows:

Retroreflectivity Acceptance Requirements		
Type of Material	**Color**	**Millicandelas/m^2/lux Minimum Initial**
Epoxy	White	300
	Yellow	225
Preformed Marking Tape	White	Per Manufacturer's Specifications
	Yellow	Per Manufacturer's Specifications
Paint	White	300
	Yellow	225

Delete Sec 620.2.5and 620.2.5.1 and substitute the following: ***11/12***

620.2.5 Temporary Pavement Marking for Milling, Grinding and Resurfacing Operations. The contractor shall place and maintain preformed removable pavement marking tape, preformed short term marking tape or temporary raised pavement markers on pavement undergoing milling, grinding or resurfacing operations. At the completion of each day's operation, the contractor shall install and maintain temporary pavement marking until permanent pavement marking material has been placed as specified in the contract, at the contractor's expense. At no time shall more than one mile of roadway behind the operation be unmarked. The contractor shall ensure all pavement marking, temporary or permanent, has been placed prior to leaving the work zone unattended. Pavement marking shall be replaced in the same configuration as the previously existing pavement marking unless otherwise shown on the plans or directed by the engineer.

620.2.5.1 On two-lane, two-way roadways with "no passing zone marking, all yellow centerline marking shall be replaced with yellow temporary raised pavement markers with yellow reflective material on both sides. White lane line marking on climbing or turn lanes shall be replaced with white raised pavement markers with white reflective material facing traffic. Temporary raised pavement markers shall be in accordance with Sec 620.60.

Delete Sec 620.10.3.1.1 in its entirety and renumber accordingly: ***11/12***

Delete Sec 620.40.2 and substitute the following: ***07/15***

620.40.2 Material. Traffic paint shall be used as specified on the plans or as approved by the engineer. Material for application of traffic marking paint shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	**Section**
Drop-On Glass Beads	1048.40.5
Acrylic Copolymer Fast Dry Pavement Marking Paint	1048.80
High Build Waterborne Pavement Marking Paint	1048.90
Waterborne Pavement Marking Paint	1048.100

Delete Secs 620.40.3.4.3, 620.3.4.4 and620.3.5 and substitute the following: ***07/15***

620.40.3.4.3 High build paint shall be applied to a minimum wet thickness of 25 mils. The wet film thickness of the applied paint shall be tested with a paint thickness gauge as directed by the engineer. Type L beads shall be used with all high build paint applications.

620.40.3.4.4 Waterborne paint and acrylic copolymer paint shall be applied to a minimum wet thickness of 15 mils. The wet film thickness of the applied paint shall be tested with a paint thickness gauge as directed by the engineer. Type P beads shall be used with all waterborne paint and acrylic copolymer paint applications.

620.40.3.5 Drop-On Glass Bead Application. Drop-on glass beads shall be mechanically applied to the wet paint directly behind the paint spray guns. Type L beads shall meet the provisions of Sec 620.2.4.1 and meet or exceed the application rate of 12 lbs per gallon of pavement marking material to achieve wet reflectivity characteristics. Type P glass beads shall be applied at a rate required to meet the provisions of Sec. 620.2.4.1. For stop lines, arrows, words and symbols, glass beads may be applied by hand. Glass beads shall be applied evenly and shall completely cover the painted area. If beads do not embed properly in the paint, all marking operations shall cease until corrections are made.

Delete Sec 620.60.3.1 and substitute the following: ***12/11***

620.60.3.1 Temporary RPM's shall be of the colors shown on the plans unless otherwise directed by the engineer. Reflective faces shall be oriented to face traffic. Temporary RPM's shall be installed according to the manufacturer's recommendations and placed as shown in the Missouri Standard Plans for Highway Construction.

Delete Sec 620.60.3.1.1 through 620.60.3.2 and substitute the following: ***12/11***

620.60.3.1.1 Type 1 Temporary RPM's, with covers, shall be used for Seal Coat as defined in Sec 409 and for surface treatment projects as defined in Sec 413 with the exception of Sec 413.30. When used for other than surface treatment projects, Type 1 Temporary RPM's, with no covers, may be used for temporary edgeline marking as shown on the plans.

620.60.3.1.2 Type 2 Temporary RPM's shall be used as shown on the plans for lane lines on all resurfacing projects.

620.60.3.2 On resurfacing projects, temporary RPM's shall be removed on intermediate lifts of asphalt before additional lifts are laid above them. Temporary RPM's on final wearing surfaces shall be removed if permanent striping is included in the contract.

Delete Sec 620.70.3.1.3 and substitute the following: ***07/15***

620.70.3.1.3 Drop-on glass beads shall be mechanically applied to the wet paint directly behind the paint spray. Type L beads shall meet the provisions of Sec 620.2.4.1 and meet or exceed the application rate of 12 lbs per gallon of pavement marking material to achieve wet reflectivity characteristics. For stop lines, arrows, words and symbols, glass beads may be applied by hand. Type L glass beads shall be applied evenly and shall completely cover the painted area. If beads do not embed properly in the paint, all marking operations shall cease until corrections are made.

Delete Sec 620.80 in its entirety: ***12/11***

SECTION 622 – PAVEMENT AND BRIDGE REMOVAL AND TEXTURING

Delete Sec 622.30.3.3 and substitute the following: ***04/13***

622.30.3.3 Grinding shall be accomplished in a manner that eliminates joint or crack faults and provides lateral drainage by maintaining a constant cross slope between grinding extremities in each lane. A maximum tolerance of 1/16 inch will be allowed for adjacent sides of joints and cracks, except that under no circumstances shall the grinding depth exceed 1/4 inch from the top of the original surface. When grinding across faulted joints, a minimum of a 20-foot transition onto the approach side slab shall be used.

Delete Sec 622.30.3.6 and substitute the following: ***04/13***

622.30.3.6 Substantially all of the pavement surface shall be textured. Extra depth grinding to eliminate minor depressions in order to provide texturing on 100 percent of the pavement surface will not be required. No unground surface area between passes will be permitted, except as specified otherwise in the contract documents.

Amend Sec 622.30.3.9 and include the following: ***04/13***

622.30.3.9 The pavement shall be cleaned prior to opening to traffic as directed by the engineer.

Delete Sec 622.30.4.1 through 622.30.5 and substitute the following: ***04/13***

622.30.4.1 Prior to performing any grinding work, but after completion of all pavement repairs, the contractor shall provide a control International Roughness Index (IRI) per pavement segment, as defined in Sec 610.4.1 (b), from the right wheel path of each lane being diamond ground in accordance with TM-59. This control IRI will be used to identify the required smoothness for the project.

Delete Sec 622.30.4.1.1 and substitute the following: ***04/15***

622.30.4.1.1 Each segment of the finished ground surface shall be reprofiled in the right wheel path and have a final IRI per segment of 65 percent of the control IRI or 80 inches per mile, whichever is greater.

622.30.4.1.2 Depressed pavement areas due to subsidence or other localized causes and areas where the maximum cut at mid panel or a fault restricts further grinding, will be excluded from testing with the inertial profiler when approved by the engineer.

622.30.4.1.3 After the initial diamond grinding operation has been profiled, additional correction shall be performed, where determined necessary by the engineer, to reduce the average segment profile to the specified final profile requirements. The contractor will not be allowed to make corrective grinding to increase the percent of pay when the final IRI is in accordance with Sec 622.30.4.1.1. On pavement segments where corrections are necessary, additional profiles shall be made to verify that the corrections have produced an average final profile in accordance with Sec 622.30.4.1.1.

Delete Sec 622.30.4.1.4 and substitute the following: ***04/15***

622.30.4.1.4 The engineer shall use the ProVAL software program to compute IRIs in accordance with TM-59. The contractor shall provide the raw unfiltered profile data file in .ppf format.

622.30.4.2 Inertial profile testing shall not be performed in excluded areas as defined in Sec 610.4.2.2.

622.30.4.2.1 Excluded areas shall be tested with a 10-foot straightedge in accordance with Sec 610.4.3.

622.30.5 Method of Measurement. Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, measurement will be made to the nearest square yard. Measurement will be based upon the full pavement lane width. No deduction will be made for gaps within the pavement lane to avoid striping, raised pavement markers, manholes or other structures.

622.30.6 Basis of Payment. The accepted quantity of ground pavement surface will be paid for at the contract unit price for diamond grinding concrete pavement. Payment will be considered full compensation for all labor, equipment, material and incidentals to complete this work, including hauling and disposal of grinding residue and cleaning the pavement prior to opening to traffic.

Delete Sec 622.30.6.1 and substitute the following: ***03/14***

622.30.6.1 The contract unit price for diamond grinding will be adjusted based on the final IRI for any segment before corrections, according to the following schedule:

IRI, inches per mile	Increase in Contract Unit Price
40.0 or less	$0.25
40.1 to 54.0	$0.15
54.1 to 80.0	None
80.1 or greater	None*

* After correction to either equal to or less than 65 percent of the control IRI or 80.0 inches per mile.

622.30.6.2 At the contractor's expense, segments with an IRI not in accordance with Sec 622.30.4.1.1, after the initial grinding, shall be corrected until the IRI is reduced in accordance with Sec 622.30.4.1.1, unless waived by the engineer.

Delete Sec 622.40.3.2.1 and substitute the following: ***01/16***

622.40.3.2.1 No diamond grinding shall be done until the pavement has attained a strength sufficient to be opened to all types of traffic. All diamond grinding shall be completed on any section prior to opening that section to other than construction traffic, unless approved by the engineer.

SECTION 625 – SLAB STABILIZATION

Delete Sec 625.10.2.2.1 and substitute the following: ***02/12***

625.10.2.2.1 Asphalt cement material shall meet ASTM D3141. The Contractor shall provide a supplier certification with each shipment in accordance with Sec 1015.2.2.1.

SECTION 627 – CONTRACTOR SURVEYING AND STAKING

Delete Sec 627.3 and substitute the following: ***10/15***

627.3 Method of Measurement. No measurement will be made for contractor surveying and staking. This work shall be considered a lump sum unit when a pay item is provided in the contract.

Delete Sec 627.4 and 627.4.1 and substitute the following: ***12/13***

627.4 Basis of Payment. When a pay item is provided in the contract, contractor furnished surveying and staking will be paid for at the contract lump sum price and will be considered full compensation for the following:

(a) Performing this work.

(b) All material, labor, tools, equipment and incidentals necessary to complete the work.

(c) For all effects, impacts, cumulative impacts, incidental and consequential costs, loss or damage arising from, relating to or produced by error or discrepancies in surveys or staking and plans based on such surveys or staking, and any cost, including time effects, to correct the errors or discrepancies.

627.4.1 Payment for surveying and staking will only be made when a pay item is provided in the contract. If no pay item is provided, all costs associated with surveying and staking shall be considered included in the cost of other bid items.

Amend Sec 627.4.1 to include and renumber subsequent sections accordingly: ***10/13***

627.4.1 All surveying and staking shall be completed by the contractor in accordance with Sec 627 except as specified herein. Payment for surveying and staking will only be made when a pay item is provided in the contract. If no pay item is provided, all costs associated with surveying and staking shall be considered included in the cost of other bid items.

SECTION 701 – DRILLED SHAFTS

Delete Sec 701.3.1 and substitute the following: ***11/12***

701.3.1 Concrete. Drilled shafts shall be constructed of Class B-2 concrete, and all material, proportioning, mixing and transporting of concrete shall be in accordance with Sec 501, except as specified herein. An air entrainment admixture shall be used. A high range water-reducing admixture may be used to increase the slump to a maximum of 9 inches ± 1 inch. If used, the water-reducing admixture shall be added only after the concrete has reached the job site to reduce the potential for flash setting. The concrete mix for drilled shafts shall be dense, homogeneous, fluid and resistant to segregation, and shall consolidate under self-weight. The concrete mix shall have a set time that ensures that fluidity is maintained throughout the shaft concrete placement and removal of temporary casing, if used. A concrete retarder in accordance with AASHTO M 194, Type B, may be incorporated into the mix to retard set approximately two hours. Concrete for drilled shafts shall have a 28-day minimum compressive strength of 4,000 psi. Portland cement shall be Type I or Type II. The maximum water to cement ratio of a concrete mix to be placed under water shall be 0.45.

Delete Sec 701.3.3.2 and substitute the following: ***11/12***

701.3.3.2 General Properties. The material used to make the slurry shall not be detrimental to the concrete or surrounding ground strata. Mineral slurries shall have both a mineral grain size that remains in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Polymer slurries shall have sufficient viscosity and gel characteristics to transport excavated material to suitable screening systems or settling tanks. The percentage and specific gravity of the material used to make the slurry shall be sufficient to maintain the stability of the excavation and to allow proper

concrete placement. If approved by the engineer, the contractor may use water and on-site soils as a drilling slurry. In that case, the range of acceptable values for density, viscosity and pH, as shown in the following table for bentonite slurry, shall be met, except that maximum density shall not exceed 70 pounds/cubic foot. When water is used as the drilling fluid to construct rock sockets in limestone, dolomite, sandstone or other formations that are not erodible, the requirements for slurry testing will not apply if the entire fluid column is replaced with fresh water after drilling. To do so, fresh water should be introduced at the top of the casing and existing water used during drilling should be pumped out of the excavation from near the base of the socket until the entire volume of fluid has been replaced.

Delete Sec 701.4.4.2 and substitute the following: ***11/12***

701.4.4.2 General Methods. Excavations required for shafts and rock sockets shall be completed in a continuous operation. The contractor shall be responsible for ensuring the stability of the shaft excavation and the surrounding soil. When obstructions, either expected or unexpected, are encountered, the contractor shall notify the engineer promptly. Either the dry method, wet method, temporary casing method, permanent casing method if specified, or combinations, as necessary, shall be used to produce sound, durable concrete drilled shafts free of defects. The permanent casing method shall be used only when required by the contract documents. Blasting excavation methods will not be permitted. When a rock socket is required, the engineer will be the sole judge as to what constitutes the top of sound rock. Sound rock will be considered as the point where the rock is sufficient quality to allow the permanent casing to be seated. The engineer may order in writing additional depths of rock socket below the top of sound rock as considered necessary to improve the foundation. If the top surface of the sound rock is found to be inclined across the width of the shaft, the contractor shall immediately notify the engineer. The contractor shall use an airlift, or other method approved by the engineer, to clean the bottom of the shaft excavation.

Delete Sec 701.4.4.2.3 and substitute the following: ***11/12***

701.4.4.2.3 Temporary Casing Construction Method. The temporary casing construction method shall be used at all sites where the stability of the excavated hole or the effects of groundwater cannot be controlled by other means. In this method, the hole shall be advanced through caving material by the wet method in accordance with Sec 701.4.4.2.2. When a formation is reached that is nearly impervious, a casing shall be placed in the hole and sealed. Drilling may proceed by the dry method to the projected depth. The placement of concrete shall proceed by the dry or wet method, except that the casing shall be withdrawn after the concrete is placed. In the event seepage conditions prevent use of the dry method, excavation shall be completed by the wet method. Before and during casing withdrawal, a 5-foot minimum head of fresh concrete above the bottom of the casing shall be maintained at such a level that fluid trapped behind the casing is displaced upward out of the shaft excavation without mixing with or displacing the shaft concrete. Casing extraction shall be at a slow, uniform rate with the pull in line with the axis of the shaft. Temporary casings shall be removed while the concrete is still workable and the slump of the concrete is between 6 and 10 inches. Vibratory hammers shall not be used for casing installation or removal within50 feet of other shafts that have been completed less than 24 hours earlier. The reinforcing cage shall not be damaged or displaced when withdrawing the temporary casing.

Delete Sec 701.4.8 and substitute the following: ***11/12***

701.4.8 Unexpected Obstructions. When unexpected obstructions are encountered, the contractor shall notify the engineer immediately. Obstructions are defined as a impenetrable objects that a) cannot be removed or excavated with augers fitted with soil or rock teeth, drilling buckets and/or underreaming tools and b) cause a significant decrease in the rate of excavation advancement, relative to the rate of advancement for the rest of the shaft excavation with the particular strata that the obstruction is located in. The engineer will be the sole judge of the significance of any reduced rate of shaft advancement and shall be present to evaluate the occurrence of the obstructions. Subsurface obstructions at drilled shaft locations shall be removed by the contractor. Such obstructions may include man-made materials such as old concrete foundations and natural materials such as boulders. The contractor shall employ special procedures or tools which may include but are not limited to: chisels, boulder breakers, core barrels, air tools, hand excavation, temporary casings, and increasing the hole diameter. Blasting will not be permitted. In the event, unexpected obstructions are encountered, the contractor shall strictly follow the procedure provided for a differing site condition set forth in Sec 104. Any adjustment to the contract amount or time will only be those expressly permitted by the contract documents and only to the extent expressly provided in the contract documents. No contract adjustment will be determined, as to entitlement or amount on any basis other than under the contract as a differing site condition. Specifically, but not by way of limitation, the contractor agrees that the contractor will not be entitled to any contract adjustment arising from encountering an unexpected obstruction on the basis that, with respect to the obstruction, the Commission made: (1) a positive representation; (2) of a material fact; (3) which was false or incorrect; (4) as to which positive representation of material fact the contractor lacked knowledge that the representation was false or incorrect; (5) upon which positive representation of material fact the contractor asserts that the contractor relied; and (6) was damaged as a direct result of the positive representation of material fact.

Delete Sec 701.4.11.1 and 701.4.11.2 and renumber accordingly: ***11/12***

Delete Sec 701.4.11.1 and substitute the following: ***11/12***

701.4.11.1 Log of Excavated Material. The contractor shall maintain a log of excavated material for each foundation inspection hole, and a rough draft of the logs shall be delivered to the engineer within 24 hours of completion of the boring. A typed log prepared by a geologist or engineer along with recommendations for the tip of casing shall be delivered to the engineer within 5 days. The log shall include the following:

(a) The amount of NX cored per run and the amount recovered. All core loss shall be noted and explained. Clay layers shall be noted and located on the log by depth.

(b) The Rock Quality Designation (RQD) for the NX core. The bedding thickness and degree of weathering shall also be noted.

(c) One unconfined compression test per 5 feet of NX core, unless otherwise specified by the contract documents or directed by the engineer, shall be run on samples of NX core from the rock socket. The results of these tests shall be delivered to the engineer. The results of the unconfined compression tests shall be reported in units of kips per square foot (ksf). Any effect on time of performance resulting from delays in delivery of the above test results to the engineer will be nonexcusable.

(d) Color photographs of the core.

Delete Sec 701.4.13.1.3 and substitute the following: ***11/12***

701.4.13.1.3 Time Limitations. The elapsed time from the beginning of concrete placement in the shaft to the completion of the placement shall not exceed two hours. All admixtures shall be adjusted for the conditions encountered on the job so the concrete remains in a workable plastic state throughout the two-hour placement limit. Prior to concrete placement, the contractor shall provide test results of both a trial mix and a slump loss test conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets the two-hour requirement. The contractor may request a longer placement time if a concrete mix is provided that will maintain a slump of 6 inches or greater over the longer placement time in the entire shaft as demonstrated by trial mix and slump loss tests. The trial mix and slump loss tests shall be conducted using concrete and ambient temperatures approved for site conditions.

Delete Sec 701.4.17.2.3 and substitute the following: ***11/12***

701.4.17.2.3 Sonic Logging Test Procedure. The drilled shaft shall be tested between 2 and 40 days after concrete placement. The following procedures shall apply:

(a) Pipes shall be checked to ensure the pipes are free from blockages and are filled with water any addition of water shall be noted and reported.

(b) Levels shall be taken on top of each pipe, each pipe shall be plumbed and the length shall be recorded.

(c) Testing shall be performed between each pair of adjacent pipes around the shaft perimeter and also in pairing combinations between each pipe with all other pipes in the shaft. If concrete coring is performed to confirm the nature of an anomaly identified during CSL testing, a subsequent CSL survey shall be performed using the concrete core hole(s) and the CSL access pipes.

(d) All tests shall be carried out with the probes in the same horizontal plane unless the engineer directs that defects be further evaluated with the probes on different horizontal planes.

(e) The probes shall be raised simultaneously from the bottom of the pipes ensuring that all slack is taken out of the cables before the analyzer is switched on, and that the distance between transducers remains constant during the course of the test. The speed of ascent shall be less than 12 inches per second. Measurements shall be taken at 3-inch intervals or less. Anomalies indicated by reduced velocity in the drilled shaft concrete and significantly lower energy shall be reported. If anomalies are detected, additional tests with two or more sources per receiver with vertical offsets of greater than or equal to 20 inches may be conducted at the request of the engineer between the same tubes unless the anomaly is within 20 inches of the bottom of the shaft.

(f) The contractor shall provide accurate measurements of probe depths on the logs.

Delete Sec 701.4.17.2.4 and substitute the following: ***11/12***

701.4.17.2.4 Record of Testing. Preliminary results of the testing shall be provided on site prior to the CSL consultant leaving the site. A detailed CSL report and test data shall be submitted to the engineer within seven days. The CSL report shall be

signed and sealed by a Professional Engineer. The CSL report shall include, but is not limited to, the following: project identification and dates of testing, a table and schematic showing shafts tested with accurate identification of tube coordinates and collar elevation, name of personnel that performed the tests and interpretation and those personnel's affiliation, equipment used, data logs, interpretation, analysis, and results. The data logs shall include XY plots of velocity and energy versus depth. CSL data shall be processed to provide easy to understand 2D cross-sections between tubes for all tube pair combinations. These plots shall be annotated by the CSL consultant as appropriate to delineate anomalous results. If offset surveys are performed as part of 3D tomography, data plots shall include 3D volumetric images for the entire shaft, color-coded, to indicate velocity or energy variations along the shaft. Locations and geometry of anomalies or unconsolidated zones shall be identified in 3D color images with detailed discussion. The results for CSL and 3D surveys shall be based on the percentage decrease in velocity as correlated to the following Concrete Condition Rating Criteria (CCRC). The velocity of good concrete shall be established from a nearby zone of good concrete. Deviations from the velocity shall be used for determining the Concrete Condition Rating.

Concrete Condition Rating Criteria			
Concrete Condition Rating	**Rating Symbol**	**Velocity Reduction**	**Indicative Results**
Good	G	0 to 10%	Acceptable concrete
Questionable	Q	10% to 25%	Minor concrete contamination or intrusion. Questionable quality concrete.
Poor	P/D	> 25%	Possible defects exist, possible water slurry contamination, soil intrusion, and or poor quality concrete.
Water	W	V= 4760 to 5005 ft/sec	Water intrusion, or water filled gravel intrusion with few or no fines present.
No Signal	NS	No signal received	Soil intrusion or other severe defect absorbed the signal, tube debonding if near top.

Delete Sec 701.6.1 and 701.6.2 and substitute the following: ***11/12***

701.6.1 Drilled Shaft. Accepted drilled shafts will be measured for payment to the nearest 0.10 linear foot of length along the axis of each shaft complete-in-place. For shafts without a rock socket, measurement will be from the plan top of the shaft elevation to the bottom of the shaft. For shafts with a rock socket, measurement will be from the plan top of the shaft to the top of the rock socket. "Top of the rock socket" will be defined as the upper elevation at which rock occurs across the entire width of the shaft, as determined by the engineer. Reinforcing steel will be measured for payment in accordance with Sec 706.

701.6.2 Rock Socket. The accepted rock sockets, if required, will be measured for payment to the nearest 0.10 linear foot of length along the axis of each rock socket in-place from the top elevation of the rock, as determined by the engineer and in accordance with Sec 701.6.1, to the bottom of the rock socket as built. In the event that additional rock socket construction is directed by the engineer, the additional length will be measured to the nearest 0.10 linear foot. Reinforcing steel will be measured for payment in accordance with Sec 706.

Delete Sec 701.6.5 and substitute the following: ***11/12***

701.6.5 Foundation Inspection Holes. Measurement for payment for foundation inspection holes will be to the nearest 0.10 linear foot of length along the axis of each hole by the linear foot. Measurement will be from the top of the rock socket to the bottom of the foundation inspection hole. If the engineer directs foundation inspection borings more than 10 feet or twice the diameter of the rock socket, whichever is greater, below the anticipated bottom of the rock socket elevation as shown on the plans, measurement for payment for that portion of the boring in excess of 10 feet below or twice the diameter anticipated bottom of the rock socket elevation as shown on the plans will be to the nearest 0.10 linear foot of excess.

Delete Sec 701.7.6 and substitute the following: ***11/12***

701.7.6 Foundation Inspection Holes. Payment for foundation inspection holes will be at the contract unit price and will be considered full compensation for drilling or coring the holes, extracting and packaging the samples or cores, laboratory testing, delivering the samples or cores to the specified MoDOT location and for all other expenses necessary to complete the work. If the engineer directs foundation inspection borings more than 10 feet or twice the diameter of the rock socket, whichever is greater, below the anticipated bottom of rock socket elevation as shown on the plans, payment for that portion of the boring in excess of 10 feet or twice the diameter of the rock socket, whichever is greater, below the anticipated bottom of the rock socket elevation as shown on the plans will be at the rate of 150 percent of the contract price per linear foot of excess.

SECTION 702 – LOAD-BEARING PILES

Delete Sec 702.3.1 and substitute the following: ***03/14***

702.3.1 Driving Equipment. Piles shall be driven with power-driven hammers, or by a combination of power-driven hammer and water jets. Power-driven hammers will be defined as hammers operated by steam, air or diesel power. For determining the energy per blow of diesel power hammers without a fully enclosed ram, the manufacturer's energy rating for the hammer will apply and may be assumed equal to the ram weight times the stroke. If the contractor desires to check a diesel power hammer against an approved steam hammer on a specified type of pile at a particular site, the contractor may do so at the contractor's expense, and the checked rating of the diesel powered hammer will be used in determination of pile nominal axial compressive resistances at that site. Diesel hammers that have a fully enclosed ram shall be equipped with a gauge and accompanying charts which evaluate the equivalent manufacturer's rated energy being produced under any driving condition.

Delete Sec 702.4.3.1 and substitute the following: ***03/14***

702.4.3.1 Other locations where preboring for piles will be required will be shown on the plans. At such locations, holes shall be prebored to the elevation specified prior to pile placement. The holes shall have a diameter no less than that of the pile and shall be large enough to avoid damage to the pile being driven through the hole in hard material. The size of the hole shall be approved by the engineer before preboring is started. Pilot holes of lesser diameter than the pile shall not extend below the pile tip. For holes not prebored into hard rock , the hole shall be filled with sand or other approved materials prior to or after placement of the pile. For holes prebored into hard rock, the hole shall be filled with sand or other approved materials prior to placement of the pile. At all locations, the hole shall be maintained full with sand or other approved material during the driving of the pile. The pile shall then be driven in accordance with Sec 702.4.11.

Delete Sec 702.4.11 and substitute the following: ***03/14***

702.4.11 Minimum and Maximum Limits of Pile Driving. Piles shall be driven to at least the minimum tip elevation indicated on the plans. If no minimum tip elevation is shown on the plans, piles shall have a tip elevation at least 10 feet below the bottom of the supported footing or 10 feet below the natural ground line, whichever is lower, unless specifically authorized otherwise by the engineer. Piles shall be driven to attain a nominal axial compressive resistance determined in accordance with Sec 702.4.10 and no less than that shown on the plans as the minimum nominal axial compressive resistance.

Amend Sec 702.4.11.1 to include the following: ***03/14***

702.4.11.1 Pile Driving to Hard Rock. Prior to driving structural steel piles, the contractor shall review the boring logs to determine the depth at which rock may be anticipated. The contractor shall be attentive to the physical conditions associated with pile refusal on hard rock. When indication of hard rock occurs, in no case shall the pile be driven more than 3 blows when the hammer is operating at maximum rated energy and the penetration per blow is equivalent to or less than 10 blows per 0.5 inch. Driving shall cease immediately to avoid damage to the pile and to reduce the risk of injury.

SECTION 703 – CONCRETE MASONRY CONSTRUCTION

Amend Sec 703.3.2.15 to include the following: ***07/15***

703.3.2.15 Girders and beams shall not be set on bent cap until the concrete in the bent cap has attained at least the required compressive strength shown in Sec 703.3.2.13.

Amend Sec 703.3.4.3 to include the following: ***10/15***

703.3.4.3 Geotextile filter cloth, three feet wide double in thickness, meeting the requirements of Sec 1011.3.4, shall be centered on transverse joints in top slab and sidewalls for both cast-in-place and precast box culverts.

Delete Sec 703.3.6.1.4 and substitute the following: ***05/12***

703.3.6.1.4 Wet Curing. The concrete shall be covered with clean mats as soon as the curing compound has dried sufficiently to prevent adhesion, and the concrete surface will support the curing mat without marring or distorting the finish, but no more than 90 minutes after the concrete is floated or textured. If the concrete mix contains more than 15 percent fly ash or slag or combination thereof and remains plastic after 90 minutes, coverage with mats may be delayed, as directed by the engineer, until the surface will support the curing mat without marring or distorting the finish. The mats shall be sufficiently wet at the time of

placement to prevent moisture absorption from the finished surface. The contractor shall control the run-off so as not to cause a traffic hazard or soil erosion. The continuous wet cure shall be maintained a minimum of seven days and until the concrete has attained a minimum compressive strength of 3,000 psi.

Delete Sec 703.3.6.1.5 and substitute the following: ***10/14***

703.3.6.1.5 Opening to Construction Activities. Light material and equipment weighing less than 1,000 pounds may be carried onto the bridge deck after the deck concrete has been in place at least 24 hours, provided curing is not interfered with and the surface texture is not damaged. Vehicles, material and equipment needed for construction activities and weighing less than 4,000 pounds shall not be moved onto any span until after the last placed deck concrete has attained a compressive strength of at least 3,200 psi. Loads in excess of the above shall not be moved onto the bridge deck until the deck concrete has reached the compressive strength specified on the plans. Placement of barrier walls on bridge decks shall not begin until the 7 day wet cure is complete and the deck has reached the minimum compressive strength shown on the plans.

Delete Sec 703.3.8 through 703.3.8.2 and substitute the following: ***07/15***

703.3.8 Surface Sealing for Concrete. Bridge decks shall be sealed with one application of an approved penetrating concrete sealer in accordance with Sec 1053. The penetrating concrete sealer shall also be applied to the top surface of the concrete bridge approach slabs, roadway face, top of sidewalks, curbs, parapets, medians and barrier curbs. The surfaces of deck patching shall not be sealed unless the surface of the rest of the deck is being sealed. The surface of a Latex Modified Concrete overlay shall not be sealed. The surface of all other dense concrete overlays shall be sealed.

703.3.8.1 Equipment. Application equipment shall be as recommended by the manufacturer except as mentioned below. A low pressure, high volume method of application shall be used that will not atomize the silane. Hand pump sprayer shall not be used. The spray equipment, tanks, hoses, brooms, rollers, coaters, squeegees, etc. shall be free of foreign matter, oil residue and water prior to applying the treatment.

703.3.8.2 Cleaning and Surface Preparation. Surfaces which are to be treated shall meet the approved product's requirements for surface condition. Sealing shall not be done until all concrete construction or repair has been completed and cured to the requirements of the manufacturer. The contractor shall furnish the engineer with written instructions for the surface preparation requirements.

Amend Sec 703.3.8.2.1 through 703.3.8.6 to include the following: ***07/15***

703.3.8.2.1 Sealing shall be done after the bridge deck has been textured or diamond ground.

703.3.8.2.2 At a minimum, the surface shall be thoroughly cleaned to remove dust, dirt, oil, wax, curing components, efflorescence, laitance, coatings and other foreign materials. The manufacturer or manufacturer's representative shall approve the use of chemicals and other cleaning compounds to facilitate the removal of these foreign materials before use. The treatment shall be applied within 48 hours following surface preparation.

703.3.8.2.3 Cleaning equipment shall be fitted with suitable traps, filters, drip pans and other devices to prevent oil and other foreign material from being deposited on the surface.

703.3.8.3 Test Application. Prior to final application, the contractor shall treat a measured test coverage area on horizontal and vertical surfaces of the different components of the structure to be treated for the purpose of demonstrating the desired physical and visual effect on an application or of obtaining a visual illustration of the absorption necessary to achieve the specified coverage rate. In the latter case, the applicator shall use at least ½ gallon (1.9 liter) of treatment following the manufacturer's recommended method of application for the total of the test surfaces. Horizontal test surfaces shall be located on the deck and on the curb or sidewalk, and vertical test surfaces shall be located on a parapet or safety barrier curb so that the different textures are displayed.

703.3.8.4 Application. The sealer shall be applied by thoroughly saturating the concrete surfaces so that one gallon of material shall not be spread over more than 200 square feet.

703.3.8.4.1 The concrete surface temperature shall be between 35°F and rising and 100°F and falling.

703.3.8.4.2 At a minimum, the wet cure must be complete and the moisture content of the concrete must be at or below 8 percent as measured by a moisture meter.

703.3.8.4.3 Allow concrete to dry a minimum of 48 hours after any measurable precipitation.

703.3.8.4.4 The treatment shall be spread from puddles to dry areas.

703.3.8.4.5 If the applicator is unable to complete the entire application continuously, the location where the application was stopped shall be noted and clearly marked.

703.3.8.5 Protection of Adjoining Surfaces and the Public.

703.3.8.5.1 When applying the sealer, the contractor shall protect adjoining surfaces of the structure that are not to be sealed. The contractor shall also make provision to protect the public from overspray.

703.3.8.5.2 Asphalt and mastic type surfaces shall be protected from spillage and overspray. Any asphalt pavement damaged by the sealer will result in removal and replacement at the contractor's expense. Joint sealants, traffic paints and asphalt overlays may be applied to the treated surfaces 48 hours after the treatment has been applied. Adjoining and nearby surfaces of aluminum or glass shall be covered where there is possibility of the treatment being deposited on the surfaces. Plants and vegetation shall be protected from overspray by covering with drop cloths. Precautions shall be followed as indicated on the manufacturer's product and material safety data sheet.

703.3.8.6 Opening to Traffic. Traffic may be allowed on a deck when the material is tack free.

Delete Sec 703.3.9 and substitute the following: ***02/12***

703.3.9 Hot Weather Concreting. The contractor shall schedule placing and finishing of bridge deck concrete during hours in which the ambient temperature will be lower than 85 F. The mixed concrete when placed in the deck forms shall have a temperature no higher than 85 F, however, if the contractor starts the concrete placement at least 30 minutes after sundown and covers the concrete with wet burlap when it will not mar the surface, but before morning solar radiation dries the surface and implements, to the extent possible, precautionary measures for hot weather concreting recommended in ACI 305R 'Hot Weather Concreting', then the concrete temperature can be increased to 90 F.

SECTION 704 – CONCRETE MASONRY REPAIR

Delete Sec 704.4.1.7 and substitute the following: ***10/11***

704.4.1.7 Reinforcement Repair. Particular care shall be taken not to disturb or damage reinforcing bars. All exposed reinforcing bars shall be thoroughly cleaned by sand or hydro blasting. Cut or broken bars or bars with 25 percent or more cross sectional area lost shall be spliced 24 diameters on each side of the damage with new bars of the same size in accordance with Sec 706. Damaged existing epoxy coated reinforcement shall be repaired in accordance with Sec 710.

Amend Sec 704.5.4 to include the following: ***06/13***

704.5.4 Measurement of reinforcing steel replaced due to excess section loss will be made to the nearest 10 pounds.

Delete Sec 704.6 and substitute the following: ***06/13***

704.6 Basis of Payment. Accepted quantities of concrete masonry repairs will be paid for at the contract unit price for each of the pay items included in the contract. No direct payment will be made for epoxy sealing. Payment for accepted quantities of reinforcing steel replaced due to excess section loss will be paid for at the fixed contract unit price specified in Sec 109.15. No payment will be made for replacement of reinforcing steel cut or broken by the contractor.

SECTION 706 – REINFORCING STEEL FOR CONCRETE STRUCTURES

Delete Sec 703.3.3.3 and substitute the following: ***10/14***

706.3.3.3 Regardless of the type of splicing system that will be used, the total bar lengths for bars indicated in the bill of reinforcing steel are determined based on the end of the bars being located flush to the face of the construction joint. No additional payment will be made for any additional bar lengths required for the mechanical bar splices. Reinforcing bar lengths shown in the bill of reinforcing steel may require modification to accommodate the specific mechanical bar splice system that will be used. The contractor shall determine the actual reinforcing bar lengths to accommodate the manufacturer's recommendations for installation of the mechanical bar splices.

SECTION 712 – STRUCTURAL STEEL CONSTRUCTION

Delete Sec 712.5.1 and substitute the following: ***11/12***

712.5.1 Fit-up and Drifting. Truss spans, plate girders and continuous I-beams shall be supported to maintain required camber during erection. High-strength bolted field splices and primary connections, except for trusses and structures carrying live load erection stresses, shall have no less than one-half of the holes filled with a combination of fitting-up bolts and cylindrical drift pins. No more than 50 percent of this combination shall be fitting-up bolts. Splices and primary connections carrying erection traffic during erection or truss connections shall have no less than three-fourths of the holes filled with drift pins and bolts with no more than 50 percent of being fitting-up bolts. The specified ratio of pins to bolts shall apply to each element of the splice, for example, top flange, web and bottom flange of girders. Fitting up bolts shall be the same diameter as the high-strength bolts. High strength bolts may be used for fitting-up bolts, and may be left in place, as long as they are not damaged during erection. High strength bolts will be considered damaged and shall be replaced if they are tensioned past snug tight, used to draw two members together, driven into place with a hammer, or have any deformation of the threads. Drift pins shall be sized to provide a driving, tight fit that maintains structure geometry during erection. Reaming of the holes to aid in drifting the connections will not be permitted. Fitting-up bolts shall be placed uniformly to draw the entire splice tight. All fitting-up bolts and drift pins shall be properly installed before beginning high strength bolt installation. Holes that do not match shall be reamed only with approval from the engineer. Drifting that would distort the metal will not be permitted.

Delete Sec 712.5.3 and substitute the following: ***11/12; 03/14***

712.5.3 Anchor Bolts. Anchor bolt wells for superstructures shall be formed in the substructure units in accordance with the details shown on the plans utilizing permanently placed galvanized corrugated steel pipe in accordance with AASHTO M36 Type 1 avoiding direct metallic contact with other reinforcement. Other removable forming material may be used and shall not be left in place. Where permitted or required, the anchor bolt wells may be omitted, and in lieu thereof, holes drilled into the substructure without cutting any reinforcements. The anchor bolt holes shall be drilled in the exact location shown, to the required depth and perpendicular to the plane of the bridge seat. The drilled holes shall be at least 1 inch larger than the bolt diameter. When the anchor bolts are set in wells or holes, the wells hole shall be clean and dry prior to grouting with an expansive mortar in accordance with Sec 1066. Excess mortar forced out of the holes shall be removed. The location of anchor bolts in relation to the center of slotted holes provided in movable plates and shoes shall be varied to compensate for the movement of spans due temperatures above or below 60 F. Nuts on anchor bolts through moving parts of expansion bearings shall be adjusted to provide ample clearance for free movement of the span.

Delete Sec 712.6.2 and substitute the following: ***10/13***

712.6.2 Testing. Field welders shall be certified by a test facility with an established accredited American Welding Society (AWS) Certified Welder Program as defined in the current AWS Standard QC 4. Welders shall be certified per the current QC 7 Standard for AWS Certified Welders. The code of acceptance shall be AWS Bridge Welding Code D1.5 and qualifications range shall include the processes, positions, filler and base metal type as the work requires. Certification maintenance per applicable AWS Code of Acceptance shall be the responsibility of the certification holder. A copy of the current welder's certification from the AWS test facility shall be delivered to the engineer. The engineer may require recertification if there is specific reason to question the welder's ability.

Delete Sec 712.6.3 in its entirety and renumber accordingly: ***10/13***

Delete Sec 712.6.4 renumber and substitute the following: ***10/13***

712.6.3 Welding Procedures. Welding procedures shall be submitted for review prior to welding, at the engineer's request. The engineer may verify the quality of a certified welder at any time.

Delete Sec 712.7.2 and substitute the following: ***11/12***

712.7.2 Snug Tightness of Connections. Regardless of the method of final tightening used to install the fasteners, the joint and all fasteners shall first be brought to the snug tight condition. Snug tight will be defined as the tightness where all faying surfaces of the joint are in firm contact as attained by a few impacts of an impact wrench or the full effort of a person using an ordinary spud wrench. Following the initial snug tightening of the fitting-up bolts, the remaining holes shall be filled with high strength bolts and tightened to a snug tight condition. All final bolts completing the connection shall be high strength and required nominal diameter. Snug tightening shall progress systematically from the most rigid part of the connection to the free edges. Bolts shall be retightened in a similar manner as necessary until all bolts are simultaneously snug tight, and the section is fully compacted with the bolted parts of the joint in full contact. For Type 3 and Type 1 bolts that will be field coated, if a connection is not completely tightened within five days of snug tightening, the contractor shall remove five percent or five bolts (whichever

is less) of a given connection and conduct rotational capacity testing in accordance with Sec 1080 to verify nut lubrication. For bolted field splices, the amount of bolts specified for bolt removal shall apply to each element of the splice (top flange, web and bottom flange). If the rotational capacity test is unacceptable, all bolts shall be removed, inspected, relubricated and may then may be reinstalled. For galvanized bolts, the above condition shall be met as well as the threads of the bolts and nuts shall be inspected for galling prior to final tensioning. Any bolts or nuts with threads that are galled shall be removed and replaced.

SECTION 720 – MECHANICALLY STABILIZED EARTH WALL SYSTEMS

Delete Sec 720.3.4 and substitute the following: ***10/14***

720.3.4 The contractor will be solely responsible for the content of the design plans, details and computations that are submitted, and for the performance of the wall system. The contractor shall be solely responsible for ensuring that the information submitted by the manufacturer is in accordance with all contract plans and specifications and with the wall system used. Completed design plans shall contain all material, fabrication and construction requirements for erecting the wall system complete in place. The completed design plans shall show the longitudinal and lateral layout of the drainage systems used for the wall system. The contractor shall be responsible for the internal and external stability of the structure including compound stability. Overall global stability will be the responsibility of the engineer.

Delete Sec 720.4.2.2 and substitute the following: ***10/15***

720.4.2.2 Precast or cast-in-place coping shall be placed on large block wall systems in accordance with the design plans. Capstone may be used in lieu of coping whenever coping is specified on the design plans. When coping or capstone is used, the maximum distance between construction joints shall be 20 feet. The joints for coping or capstone should align with the vertical joints in the MSE wall face.

Delete Sec 720.4.7.2 and substitute the following: ***12/13***

720.4.7.2 The select granular backfill for structural systems shall be compacted in accordance with Sec 203, with the following exceptions:

(a) The minimum density shall be no less than 95 percent of maximum density, determined in accordance with AASHTO T 99.

(b) When the material used contains more than 30 percent retained on the 3/4-inch sieve, a method of compaction consisting of at least four passes by a heavy roller shall be used.

(c) The moisture content of the material prior to and during compaction shall be uniformly distributed throughout each layer. The placement moisture content shall be no lower than three percentage points less than the optimum moisture content and shall be no more than the optimum moisture content.

(d) Compaction within 3 feet of the back face of the wall system shall be achieved by at least three passes of a lightweight mechanical tamper, roller or vibratory system.

(e) The contractor shall ensure that runoff within the wall system construction site is directed away from the wall facing during construction, and that runoff from adjacent areas of the general construction site is directed such that runoff does not enter the wall system construction site.

(f) Class 1 geotextile material shall be placed between the select granular backfill for structural systems, and the retained backfill and over the top of the select granular backfill for structural systems to prevent piping of in-situ soil into the wall system.

(g) Tamping-type (sheep's foot) rollers shall not be used for compaction of the select granular backfill for structural systems.

Delete Sec 720.4.8.1 and substitute the following: ***10/15***

720.4.8.1 Wall systems shall be built in accordance with the dimensions and elevations specified on the plans and in accordance with the requirements of the system manufacturer. Alignments shall be maintained within the following dimensional tolerances:

Item	Tolerance

Final Horizontal Joint Gaps Between Adjacent Facing Panels (Large Block Walls)	± 1/8 in.
Final Vertical Joint Gaps Between Adjacent Facing Panels (Large Block Walls)	± 1/4 in.
Final Joint Gaps Between Adjacent Modular Block Units (Small Block Walls)	± 1/4 in.
Vertical and Horizontal Alignment of Facing Elements (All Wall Systems)	± 1/16 in. per ft
Soil Reinforcement Strip Elevations (All Wall Systems)	± 1 in.

SECTION 724 – PIPE CULVERTS

Delete Sec 724.1. and substitute the following: ***08/13***

724.1 Description. This work shall consist of providing pipe or pipe arch of the diameter or shape designated, laid upon a firm bed and backfilled as specified. Where appropriate this specification will also apply to pipe arches.

Delete Sec 724.1.1 and substitute the following: ***02/12; 08/13; 04/15***

724.1.1 The contract will specify either the type of pipe or the group of permissible types of pipe. If a group of permissible types is specified, the contractor may use any of the types listed within the specified group and size range as follows:

		Group A[b]	Group B[b]	Group C
Rigid Pipe		**Size**	**Size**	**Size**
Reinforced Concrete Culvert Pipe		ALL	ALL	ALL
Vitrified Clay Pipe		ALL	ALL	ALL
Flexible Pipe – Metal[a]		**Size**	**Size**	**Size**
Aluminum Coated Steel Pipe		ALL	ALL	ALL
Polymer Coated Steel Pipe		ALL	ALL	ALL
Aluminum Alloy Pipe		ALL	ALL	ALL
Bituminous Coated Steel Pipe		NA	NA	ALL
Zinc Coated Steel Pipe		NA	NA	ALL
Flexible Pipe - Thermoplastic		**Size**	**Size**	**Size**
Polypropylene Pipe	Double Wall	≤ 30”	≤ 30”	≤ 30”
	Triple Wall	30” – 60”	30” – 60”	30” – 60”
Polyethylene Pipe	Corrugated	≤ 24”	≤ 60”	≤ 60”
	Steel Reinforced	≤ 24”	≤ 60”	≤ 60”
Polyvinyl Chloride Pipe (PVC)		≤ 36”	≤ 36”	≤ 36”

[a] Metal Pipe used for storm sewer applications shall be Type IA or Type IR

[b] Pipe used for storm sewers under the influence of a pavement section or future anticipated influence of a pavement section which has a 3,500 ADT or greater shall be Group A pipe. Pipe used in other storm sewer applications shall be Group B. No other substitutions will be allowed.

Delete Sec 724.3.1 and substitute the following: ***08/13***

724.1.3 When Group A, Group B and Group C pipe are specified, two pipe diameters will be shown on the plans at those locations. The first dimension will indicate the diameter of pipe that shall be provided if the contractor elects to provide pipe for that location with a corrugated interior wall, and the second dimension provided in parenthesis will indicate the diameter of pipe that shall be provided if the contractor elects to provide pipe for that location with a smooth interior wall. Helical rib (Type IA) pipe may be considered to have varying hydraulic coefficients and may be substituted in accordance with FHWA HD-5 hydraulic

design of highway culverts considering the corrugation configuration at the joints. The specified diameters may be the same or different and will be dependent upon the design features for that pipe location. Regardless of which diameter of pipe is selected for a given location, the pipe flow line shall be maintained at the elevations shown on the plans.

Amend Sec 724.1.4 to include the following: ***08/13***

724.1.4 The contractor may elect to furnish pipe one size larger than specified so long as the minimum fill heights are met. No additional compensation shall be given for the larger diameter pipe or any related items necessary to construct the larger pipe.

Delete Sec 724.3.1 and substitute the following: ***08/13***

724.3.1 The contractor shall conduct either manual performance inspection or remote performance inspection along with performance reporting and evaluation as it relates to this specification.

Delete Sec 724.3.2 and substitute the following: ***08/13***

724.3.2 The contractor shall notify the Engineer at least five workdays before conducting a performance inspection. The inspection shall be performed no sooner than 30 days after the completion of the finished grade when not below pavement and after the completion of the aggregate base when any portion of the culvert pipe is below pavement. The condition of the culvert pipe shall allow for an accurate inspection. The contractor shall inspect the entire length of the pipe. The frequency of inspection shall be as follows:

a) 100% of locations for Group A pipe
b) 25% of locations for Group B. Locations to be determined by the engineer. Criteria for selection will include pipes under large fills or any locations of potential concern.
c) Group C pipe shall be inspected at the discretion of the engineer.
d) If issues are found with any pipe from the performance inspection the engineer may require that all pipe be inspected according to this specification.

Delete Sec 724.3.3 and substitute the following: ***08/13***

724.3.3 The actual inside diameter of flexible pipe products shall be determined for the purposes of measuring deflection by averaging nine equally spaced measurements at one location in the barrel of an unloaded pipe. If the pipe has a corrugated interior, the measurements shall be from the top of corrugation to top of corrugation as viewed from the inside of the pipe.

Amend Sec 724.3.4 to include the following: ***08/13***

724.3.4 The contractor shall furnish a video recording of each inspection. The recording shall identify the date and time of the inspection, a description of the culvert pipe, the location, and the viewing direction. The recording shall be for the entire run of the culvert pipe being inspected. The contractor shall provide sufficient enough source of light to allow all areas of concern to be readily observed on the video recording in a digital, reproducible format on one of the following media types: DVD, CD or other media type approved by the Engineer.

Delete Sec 724.3.4 renumber and substitute the following: ***08/13***

724.3.5 Manual Inspection. Perform a manual inspection by entering the culvert pipe to record video and to make measurements. Culverts should be entered only by inspection personnel trained in working with confined spaces and using procedures in full compliance with applicable State, Local, and Federal OSHA regulations. The manual inspection shall include the following at a minimum:

1) Measure the deflection of the culvert pipe to the nearest 1/4 inch. A minimum of three measurements shall be taken: vertically from the crown to invert (12 o'clock to 6 o'clock), and at 60 degrees from vertical (2 o'clock to 8 o'clock and 4 o'clock to 10 o'clock).
2) Measure crack width using a crack comparator, micrometer or a feeler gage capable of measuring 0.01 inch. Other measuring devices may be used if approved by the Engineer. Record the measurements and include them in the written inspection performance report including: For rigid culvert pipe, document the location, length, width, and greatest width of each crack exceeding .01 inch. For flexible culvert pipe (Corrugated Metal Pipe and Thermoplastic Pipe), document the location and length of all cracks.
3) For all culvert pipe, measure and record the widest gap at each joint in the run.
4) For culvert pipe with manufactured seams, measure the location, length, and greatest width of any separation at the seam.

5) Measure the location, length and greatest width of each crack and the widest gap at each culvert pipe entering a drainage structure or transition.

Delete Sec 724.3.5 renumber and substitute the following: ***08/13***

724.3.6 Remote Inspection. Perform a remote inspection by using a crawler mounted camera with low barrel distortion to record video and that has the capability to make measurements. In addition deflection shall be measured by either laser profiling and measuring technology or use of a mandrel capable of verifying deflection on a minimum of 9 points. Laser profiling and measurement technology must be certified by the company performing the work to be in compliance with the calibration criteria as per MoDOT TM 84. Reports shall be submitted by electronic media in a format approved by the Engineer.

Delete Sec 724.3.5.1 in its entirety: ***08/13***

Delete Sec 724.3.6 renumber and substitute the following renumbering subsequent sections accordingly: ***08/13***

724.3.7 Inspection Criteria. Based on the type of culvert pipe, in the measurements and acceptance criteria shall be in accordance with the table below. Also record the location of any other defect not listed in the table and describe the defect. Potential defects include, but are not limited to damaged coatings on corrugated metal pipe, racking, dents, protrusions, misalignment of line or grade, slabbing, and excessive corrugating of thermoplastic pipe. For each measurement location in a culvert pipe, record the length from the left end of the pipe according to roadway stationing.

Inspection Criteria				
Pipe Type	Measurement Equipment	Type of Measurement	Limitations	Required Action
Rigid Culvert Pipe	Manual: Video Camera Remote: Crawler mounted camera with crack measuring capability	Joint gaps	Soiltight in accordance with AASHTO PP 63-09	Seal joints with excessive gap
		Crack widths	Greater than .01 inch less than 0.10 crack	Note for future evaluation
			Greater than 0.1 inch crack	Unacceptable
Flexible Culvert Pipe with Hydraulically Smooth Interior	Manual: Video Camera Remote: Crawler mounted camera with crack measuring capability and laser profiler or Crawler mounted camera with crack measuring capability and 9 point minimum mandrel	Joint gaps	Soiltight in accordance with AASHTO PP 63-09	Seal joints with excessive gap
		Crack widths	None allowed	Unacceptable
		Deflection	Greater than 5% less than 7.5%	Replace deficient pipe or 50% of pay item for entire line
			Greater than 7.5%	Unacceptable
Flexible Culvert Pipe with Corrugated Interior	Manual: Video Camera Remote: Crawler mounted camera with crack measuring capability and mandrel	Joint gaps	Soiltight in accordance with AASHTO PP 63-09	Seal joints with excessive gap
		Crack widths	None allowed	Unacceptable
		Deflection	Greater than 5% less than 7.5%	Replace deficient pipe or 50% of pay item for entire line
			Greater than 7.5%	Unacceptable

Delete Sec 724.3.9 renumber and substitute the following: ***08/13***

724.3.10 Repairs. Required repairs shall be made at no additional cost to the Department and to the satisfaction of the Engineer. The contractor shall submit their required action plan including repair process and/or revised installation plan to the Engineer for approval at least 7 days before performing the repairs. The action plan shall provide written confirmation from the culvert pipe

manufacturer that the repair methods are appropriate. Any repairs shall have a performance evaluation conducted of the repaired portion of the culvert pipe and any culvert pipe potentially affected by the repair work 30 days after the repair has been made, at no additional cost to the Department.

Delete Sec 724.4.2 in its entirety and renumber accordingly: ***04/13***

Delete Sec 724.5.3 and substitute the following: ***04/13***

724.5.3 Unless specified otherwise, no direct payment will be made for the following:

(a) Beveling, skewing or additional work required in laying pipe with beveled or skewed ends.

(b) Work involved in elongating pipe.

(c) Any required backfilling, except as specified in Sec 206.6.3.

(d) Construction of bedding or for bedding material.

(e) Furnishing and installing plugs.

(f) Material or work required for placing couplings on exposed ends of pipe.

SECTION 725 – METAL PIPE AND PIPE ARCH CULVERTS

Delete Sec 725.1.3.2 and substitute the following: ***08/13***

725.1.3.2 The predominate soil type in the area of any metal pipe installation shall have a pH in the range of 5 to 9 (4 to 9 for polymer coated pipe) using AASHTO T-289 test method.

Amend Sec 725.1.3.3 and Sec 725.1.3.4 to include the following: ***08/13***

725.1.3.3 For bedding or backfill material that has greater than 35 percent passing the #200 sieve, the resistivity of the bedding or backfill shall be greater > 1500 ohm-cm (> 750 ohm-cm for polymer coated pipe) using AASHTO T 288 test method.

725.1.3.4 The contractor shall conduct any required pH and resistivity testing and report compliance to the Engineer at least 30 days prior to installation.

Delete Sec 725.2 and substitute the following: ***08/12***

725.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Corrugated Metallic-Coated Steel Culvert Pipe, Pipe-Arches and End Sections	1020
Bituminous Coated Corrugated Metal Culvert Pipe, Pipe Arch	1021
Corrugated Aluminum Alloy Culvert Pipe and Corrugated Aluminum Alloy Structural Plate	1024
Polymer Coated Corrugated Metal Culvert Pipe and Pipe Arches	1027

Delete Sec 725.4.1 through Sec 725.4.3 and substitute the following: ***08/13***

725.4.1 Bedding and Backfill Material. Bedding and backfill material shall meet the requirements of AASHTO M 145, A-1, A-2-4, A-2-5 or A-3. Bedding material shall have a maximum particle size of 1.25 inches. Backfill shall be free of organic material, stones larger than 1.5 inches or frozen lumps. Moisture content shall be in the range of optimum content to permit thorough compaction. For pipes with a corrugated exterior, backfill gradations shall have a maximum particle size that will permit filling of the corrugations. Flowable backfill, such as low strength mortar may also be used providing flotation resistance and adequate void fill coverage.

725.4.2 Foundation and Bedding Construction. A stable and uniform bedding shall be provided for the pipe and protruding features of the drainage structure. The middle of the bedding equal to one-third the pipe outside diameter should be loosely placed, while the remainder shall be compacted to a minimum 90 percent of maximum density based upon standard procter test. A minimum bedding depth of twice the corrugation depth shall be provided prior to placement of the pipe unless otherwise specified. When rock or unyielding material is present in the trench, a minimum bottom bedding of 6.0 inches shall be provided. If soft or unstable material is encountered the material shall be removed to a minimum depth of 10 inches below the bottom of the pipe and replaced with suitable granular material. Payment for any unsuitable material will be made per Sec. 206.

725.4.3 Backfill Construction. Structural backfill shall be placed and compacted in layers not exceeding a loose lift thickness of 8 inches and brought up evenly. The side to side differential shall not exceed 24.0 inches or one-third of the rise of the structure. Backfill shall continue to not less than 1.0 ft. above the top of the pipe. Structural backfill shall be worked into the haunch area and compacted by hand. All backfill shall be compacted to a minimum 90 percent standard density based upon standard procter test. Special compaction means may be necessary in the haunch area. Ponding or jetting structural backfill to achieve compaction shall not be permitted without the permission of the Engineer.

SECTION 730 – THERMOPLASTIC PIPE

Delete Sec 730.1.2 and substitute the following: ***08/13***

730.1.2 When furnishing thermoplastic pipe, the pipe shall meet the properties described in the appropriate section of this specification and be installed in accordance with the standard plans. When section properties or fill heights outside of the specification are required for use, a special design shall be prepared by the contractor for approval by the Engineer. The special design shall include all relevant engineering data, stub compression values, and be stamped by a professional engineer registered in the State of Missouri.

Delete Sec 730.2 and substitute the following: ***08/13***

730.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Metallic-Coated Steel End Sections	1020
Precast Concrete Flared End Sections	1032
Polyethylene Culvert Pipe	1047
Polypropylene Culvert Pipe	1041
Polyvinyl Chloride (PVC) Culvert Pipe	1028

Amend Sec 730.3.3 and Sec 730.3.3.1 to include the following: ***08/13***

730.3.3 Ultraviolet Protection.

730.3.3.1 If PVC pipe is specified in the contract or elected for use by the contractor, none of the PVC pipe shall be exposed to sunlight after installation. The minimum distance required to protect the exposed open end of a PVC pipe from sunlight will be one-half of the pipe diameter from the opening. The use of a different pipe material from the appropriate pipe group other than PVC is required in areas requiring ultraviolet protection.

Delete Sec 730.4.1 through Sec 730.4.3 and substitute the following: ***08/13***

730.4.1 Bedding and Backfill Material. Bedding and backfill material shall meet the requirements of AASHTO M145, A-1-a, A-1-b, A-2-4 or A-2-5. Bedding material shall have a maximum particle size of 1.25 inches. Backfill shall be free of organic material, stones larger than 1.5 inches or frozen lumps. Moisture content shall be in the range of optimum content to permit thorough compaction. For pipes with a corrugated exterior, backfill gradations shall have particle size that will permit filling of the corrugations. Flowable backfill, such as low strength mortar may also be used providing flotation resistance and adequate void fill coverage.

730.4.2 Foundation and Bedding Construction. A stable and uniform bedding shall be provided for the pipe and an protruding features of the drainage structure. The middle of the bedding equal to one-third the pipe outside diameter should be loosely placed, while the remainder shall be compacted to a minimum 90 percent of maximum density based upon standard proctor test. A minimum of 4.0 inches of bedding shall be provided prior to placement of the pipe unless otherwise specified. When rock, soft, unstable, or unyielding material is present in the trench bottom a 6.0 inches minimum foundation shall be provided in addition to bedding. Payment for any unsuitable material will be made per Sec. 206.

730.4.3 Backfill Construction. Structural backfill shall be placed and compacted in layers not exceeding a loose lift thickness of 8.0 inches and brought up evenly and simultaneously on both sides of the pipe to an elevation not less than 1.0 ft. above the top of the pipe. Structural backfill shall be worked into the haunch area and compacted by hand. All backfill shall be compacted to a minimum 90 percent standard density based upon standard proctor test. Special compaction means may be necessary in the haunch area. Ponding or jetting structural backfill to achieve compaction shall not be permitted without the permission of the Engineer.

SECTION 732 – FLARED END SECTIONS

Delete Sec 732.1.3 and substitute the following: ***08/13***

732.1.3 Safety slope end sections may be used with concrete, thermoplastic, or metal culvert pipe.

Amend Sec 732.1.4 through 732.1.6 to include the following: ***08/13***

732.1.4 A tapered sleeve may be required to join an end section to a run of pipe as outlined in the standard plans.

732.1.5 At the option of the contractor and at no cost to the Commission, the contractor may use a tapered sleeve to join thermoplastic pipe to flared end sections when not required by the plans.

732.1.6 At the option of the contractor and at no cost to the Commission, the contractor may use a one size larger flared end section when joining to thermoplastic pipe to aid fitment.

Delete Sec 732.5 and substitute the following: ***08/13***

732.5 Basis of Payment. The accepted quantity of flared end sections and safety slope end sections, complete in place, will be paid for at the contract unit price for each of the items included in the contract. When two different diameters of pipe are shown on the plans for a given location for Group B or Group C pipe, the contract unit price for the flared end section or safety slope end section that would be required for the larger diameter pipe will be used for payment purposes. No direct payment will be made for any excavation or bedding required for placement of an end section, toe walls or toe plates. Any damaged sections required to be replaced due to the contractor's actions shall be at the contractor's expense. Payment for tapered sleeves will be included in the contract unit price for pipe.

SECTION 805 – SEEDING

Delete Sec 805.4 and substitute the following: ***11/12***

805.4 Acceptance. Acceptance of permanent seeding will be made when seeded disturbed areas meet the requirements for final stabilization as defined in the current state operating permit for land disturbance. Inspection for acceptance will be made within 60 days after seeding, excluding seeding dates that fall between September 30 and March 1. Seeding that occurs between September 30 and March 1 will be inspected no earlier than May 1.

Delete Sec 805.5 and substitute the following and renumber accordingly: ***04/13***

805.5 Certification. The contractor shall certify the seed and seed mixture meets the contract requirements and be in accordance with Sec 805. The certification shall list the seed type, lot numbers, pure live seed, percent germination, and quantity used for each lot. In lieu of listing the lot specific information, the certification may include attached individual bag label analysis for all seed used.

SECTION 806 – POLLUTION, EROSION AND SEDIMENT CONTROL

Delete Sec 806 in its entirety and replace with the following: ***10/14***

806.1 Description. This work shall consist of furnishing, installing, maintaining and removing temporary pollution, erosion and sediment control measures; furnishing and placing permanent erosion control features; or a combination of both as shown on the plans or as directed by the engineer.

806.2 Schedule of Work. Prior to the preconstruction conference and the start of construction, the contractor shall submit schedules for the implementation of temporary pollution control and temporary and permanent erosion control work, as

applicable, for construction operations. The contractor's schedule shall address specifically the pollution and erosion control measures planned at all streams or other bodies of water. No work shall start until the pollution and erosion control schedules and methods of operations have been approved by the engineer. Any delay of the work resulting from failure to submit acceptable pollution and erosion control schedules and methods of operations will be considered nonexcusable.

806.3 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as herein.

806.4 Construction Requirements. The engineer will limit the surface area of erodible earth material exposed by clearing and grubbing or by excavation, borrow and fill operations in accordance with the following. The engineer may direct the contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other bodies of water. Such work may involve the construction of temporary berms, dikes, dams, sediment basins and slope drains, and use of temporary mulches, seeding or other control devices or methods as necessary to control erosion and pollution.

806.4.1 If erosion and sediment control measures, as shown on the plans, are not suitable due to site conditions, a suitable system of Best Management Practices (BMP) as defined by the applicable Missouri State Operating Permit for land disturbance activities and the Stormwater Pollution Prevention Plan (SWPPP), shall be applied as approved by the engineer.

806.4.2 The contractor shall exercise effective management practices throughout the life of the project to control pollution. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage or other harmful material shall not be discharged on or from the project. Temporary pollution control measures, such as storage and handling of petroleum products and other pollutants, shall be coordinated with temporary and permanent erosion and sediment control features specified in the contract to ensure economical, effective and continuous erosion and pollution control. These requirements will also apply to work within easements designated by the Commission.

806.4.3 The contractor shall incorporate all permanent erosion, sediment, and pollution control features into the project at the earliest practical time. Temporary measures shall be used to correct conditions that develop during construction which were not foreseen during the design stage, that are needed prior to installation of permanent pollution control features, or that are needed temporarily to control erosion and sediment that develops during normal construction practices, but are not associated with permanent control features on the project.

806.4.4 Installation of temporary control measures shall be scheduled to coincide with clearing and grubbing operations, but before grading operations begin. The project land area disturbance are shall not exceed one acre without installation of erosion and sediment controls. The total project land disturbance area shall not exceed 20 acres without written approval from the engineer.

806.4.5 The engineer may allow additional land disturbance acreage if appropriate BMP's including temporary seeding and mulching, have been applied to previously disturbed areas and the contractor has the resources to apply the BMP's to the expanded area.

806.4.6 Unless otherwise provided or approved in writing by the engineer, construction operations in streams or other bodies of water shall be restricted to those areas that must be entered for the construction of temporary or permanent structures. Streams or other bodies of water shall be promptly cleared of all falsework, piling, debris or other obstructions placed therein or caused by construction operations.

806.4.7 Fording of streams or other bodies of water with construction equipment will not be permitted, except as allowed by the engineer. Temporary bridges or other structures shall be used when frequent crossing of streams or other bodies of water is necessary. Unless otherwise approved in writing by the engineer, mechanized equipment shall not be operated in streams or other bodies of water except as may be required to construct channel changes and temporary or permanent structures. If a Corps of Engineer Section 404 or Department of Natural Resources Section 401 permit is applicable for a project, the permit requirements and conditions will prevail.

806.4.8 The contractor shall obtain all necessary permits to cover all project-associated activities on external sites that are not located on MoDOT right of way or easements. Project-associated activities includes borrow areas, plant sites, and staging areas. All costs associated with the permits and pollution control shall be at the contractor's expense, including providing, installing, maintaining, and removal of all erosion and sediment control devices, and final stabilization of disturbed areas.

806.4.9 In the event of conflict between these requirements and the pollution control laws, rules or regulations of other federal, state or local agencies, the more restrictive laws, rules or regulations will apply.

806.4.10 The contractor is encouraged to incorporate mulch from the clearing and grubbing operation into the BMP's on the project. BMP's may consist of compost filled socks, compost filter berms, soil protection cover or any other method as approved by the engineer.

806.4.11 Unless otherwise specified, or directed by the engineer, all temporary erosion and sediment control measures shall be removed by the contractor after permanent erosion and sediment control measures are established and the project has achieved final stabilization as defined in the SWPPP. Biodegradable erosion and sediment control materials may be allowed to be incorporated into the project in accordance with the SWPPP, as approved by the engineer. Rock from ditch checks and other temporary sediment devices may be repositioned to serve as ditch liner in accordance with the SWPPP, and as directed by the engineer.

SECTION 806.10 TEMPORARY BERMS

806.10.1 Description. This work shall consist of constructing and maintaining temporary berms at the top of slopes or transverse to the centerline of fills as shown on the plans.

806.10.2 Material. Type B berms shall consist of graded material from within the project limits, rock, or other suitable material approved by the engineer. Type C berms shall consist of rock with a predominant size between 4 inches and 12 inches.

806.10.3 Construction Requirements. Temporary berms shall be constructed and maintained to the approximate dimensions shown on the plans.

806.10.3.1 Type B Berms. Type B berms shall be machine compacted with a minimum of three passes over the entire width of the berm. Material removed from Type B berms shall be incorporated in the embankment when possible. The contractor shall remove and dispose of any excess or unsuitable material to a location approved by the engineer.

806.10.3.1.1 Type B berms shall drain to a compacted outlet at slope drain. On transverse berms, the top width of the berms may be wider and the side slopes flatter to allow equipment to pass over these berms with minimal disruption.

806.10.3.2 Type C Berms. Vegetative mulch, erosion control blanket or geotextile fabric shall be placed on the upslope of the Type C berm. The vegetative mulch shall be placed in such a manner that the final compacted thickness is 2 inches. The material for the vegetative mulch shall be in accordance with Sec 802. The straw layer erosion control blanket or geotextile fabric shall be removed and replaced as directed by the engineer.

806.10.4 Method of Measurement. Measurement of Type B and C berms will be made to the nearest linear foot.

806.10.5 Basis of Payment. The accepted quantities of Type B and C berms will be paid for at the contract unit price and will be considered full compensation for material, installation, maintenance, removal and any other hand work necessary to construct the berms. No payment will be made for the straw layer, erosion control blanket or geotextile fabric on the Type C berm. No payment will be made for any seeding and mulching needed after removal.

SECTION 806.20 TEMPORARY SLOPE DRAINS

806.20.1 Description. This work shall consist of furnishing, constructing, maintaining and removing temporary slope drains to carry water down slopes and to reduce erosion. The method selected shall be approved by the engineer prior to construction.

806.20.2 Construction Requirements. The contractor shall provide temporary, impermeable slope drains to carry water or water with suspended solids down fill slopes until permanent erosion control measures are established. The contractor shall provide temporary slope drains on fill slopes at approximately 500-foot intervals or as directed by the engineer. All temporary slope drains shall be adequately anchored to the slope to prevent disruption of flow. The inlet ends shall include a ditch check and be constructed to channel water into the temporary slope drain. Outlet ends shall have some means of dissipating the energy of the water to reduce erosion downstream and have the ability to capture sediment. After removal, the contractor shall restore the site of the slope drains to the satisfaction of the engineer.

806.20.3 Method of Measurement. Measurement of temporary slope drains will be made to the nearest linear foot.

806.20.4 Basis of Payment. The accepted quantities of temporary slope drains will be paid for at the contract unit price. Payment shall include furnishing, constructing, maintaining and removing temporary slope drains, and restoration of the slope drain sites. No payment will be made for any seeding and mulching needed after removal.

SECTION 806.30 TEMPORARY DITCH AND INLET CHECKS

806.30.1 Description. This work shall consist of furnishing, constructing, maintaining, removing and disposing of temporary ditch and inlet checks

806.30.2 Construction Requirements.

806.30.2.1 Rock Ditch Checks. Rock ditch checks shall be constructed in accordance with the plans, or as directed by the engineer, and shall have a minimum effective height of 18 inches. The predominant size of the rock used shall range between 4 inches and 12 inches.

806.30.2.2 Alternate Ditch Checks. Alternate ditch checks shall be constructed in accordance with the manufacturer's specifications, and as shown on the plans, or as directed by the engineer. Alternate ditch checks shall have a minimum effective height of 9 inches, shall follow guidance provided in the SWPPP, and shall perform to the level that meets or exceeds the requirement of the current Missouri Operating Permit.

806.30.2.2.1 Unless otherwise disallowed, the contractor has the option to construct rock ditch checks in lieu of alternate ditch checks. Rock ditch checks constructed in lieu of alternate checks shall have a minimum effective height of 18 inches. Spacing shall be increased, as determined by the engineer, to account for the additional height of rock ditch check. The toe-to-top capacity requirements shown on the plans will be used to determine the spacing.

806.30.2.3 Inlet Checks. Inlet checks shall be installed in accordance with the plans or as directed by the engineer to prevent sediment from entering drop inlets, manholes, and other openings to culverts and closed drainage systems.

806.30.2.3.1 Inlet checks shall be constructed in accordance with Sec 806.30.2.1, rock ditch checks, and shall completely surround the inlet or other structure, as indicated on the plans. Other allowable methods of protecting inlets will be listed in the SWPPP.

806.30.2.4 Curb Inlet Checks. Curb inlet checks shall consist of socks filled with rock, or other fillers of sufficient weight to keep the device in place. Curb inlet checks shall be installed in the gutter or as shown on the plans. Other proprietary devices may be used, as approved by the engineer.

806.30.3 Maintenance. The contractor shall monitor the condition of all temporary checks and repair or replace checks that are not functional. The contractor shall remove sediment in accordance with Sec 806.110. Alternate ditch checks shall be maintained in accordance with this provision and the manufacturer's specifications or as directed by the engineer.

806.30.4 Removal. All types of temporary checks shall remain in service until removal has been approved by the engineer. Removal shall be in accordance with Sec 806.4.11 and as stated herein. The contractor shall remove any sediment from the check, remove the check, and restore the area to match existing ground condition. When necessary, seeding and mulching shall be in accordance with Secs 802 and 805 respectively, and shall be considered incidental.

806.30.5 Method of Measurement.

806.30.5.1 Measurement of rock ditch checks will be made to the nearest linear foot as measured along the top of the check. Rock ditch checks constructed in lieu of alternate checks will be included in this measurement for payment. Inlet checks, except for curb inlet checks, will be included in this measurement for payment.

806.30.5.2 Measurement of alternate ditch checks will be made to the nearest linear foot as measured along the top of the check.

806.30.5.3 No measurement will be made for any portion of a check that exceeds the length necessary to adequately span the ditch as shown on the plans or as directed by the engineer.

806.30.5.4 Measurement of curb inlet checks will be made per each check.

806.30.6 Basis of Payment.

806.30.6.1 The accepted quantities of rock ditch checks, alternate ditch checks, inlet checks, and curb inlet checks will be paid for at the contract unit price for each pay item included in the contract. If the engineer determines unusual conditions warrant complete replacement of a check, payment will be made for the replacement check at the contract unit price.

806.30.6.2 Payment for sediment removal shall be in accordance with Sec 806.110.

SECTION 806.40 SEDIMENT BASINS

806.40.1 Description. This work shall consist of constructing and maintaining temporary or permanent sediment basins as shown on the plans or as directed by the engineer. This work shall include clearing and excavation to construct the basin, disposal

of excavated material and providing and installing rock or other stabilizing material as approved by the engineer. For temporary basins, removal, backfilling, and site restoration is also included in the work.

806.40.2 Construction Requirements. The sediment basin shall be an excavated or dammed storage area with defined side slopes. Inlet and outlet areas shall be lined with rock of sufficient size to withstand the water flow. In lieu of rock, other allowable liners may be used as described in the SWPPP. Outlets may be constructed with a riser pipe, surface skimmers, or stabilized spillway, or a combination of one or more of these features.

806.40.2.1 The inlet of a sediment basin shall be constructed with a wide cross-section and a minimum grade to prevent turbulence and to allow deposition of soil particles.

806.40.2.2 Sediment shall be removed and disposed in accordance with Sec 806.110, and before the depth reaches approximately one-half the original depth of the sediment basin in any part of the pool.

806.40.2.3 Temporary sediment basins shall remain in service until removal has been approved by the engineer. Removal shall be in accordance with Sec 806.4.11 and as stated herein. The contractor shall remove any sediment from the basin, backfill, compact all excavations, restore the area to match existing ground conditions, and seeding and mulching in with Secs 802 and 805 respectively.

806.40.3 Method of Measurement.

806.40.3.1 Measurement of excavation to construct sediment basin will be made to the nearest tenth of a cubic yard.

806.40.3.2 Measurement of rock placed to construct sediment basins will be made to the nearest tenth of a cubic yard.

806.40.4 Basis of Payment.

806.40.4.1 The accepted quantities for excavation to construct sediment basins will be paid for at the contract unit price. Payment includes clearing, excavation, removal, backfilling and final grading.

806.40.4.2 The accepted quantity for rock used to construct sediment basins will be paid for at the contract unit price. Payment shall include furnishing, placing, and removal of rock.

806.40.4.3 No direct payment will be made for seeding and mulching necessary to restore the area after removal.

806.40.4.4 Payment for sediment removal shall be in accordance with Sec 806.110.

SECTION 806.50 TEMPORARY SEEDING AND MULCHING

806.50.1 Description. This work shall consist of furnishing and applying fertilizer, seed, vegetative mulch or other acceptable cover, in disturbed areas authorized by the engineer. Temporary seeding and mulching is utilized to establish a quick ground cover that reduces erosion in disturbed areas where staging requires the area to be disturbed again at a later date, and for areas that are complete but current seasonal conditions are not favorable for applying permanent seeding. Finish grading will not be required except for areas that will not receive further grading prior to permanent seeding. Hydraulic seeding and fertilizing in accordance with Sec 805 will be permitted.

806.50.2 Construction Requirements. Seeding and mulching shall be a continuous operation on all cut and fillslopes, excess material sites and borrow pits during the construction process. All disturbed areas shall be seeded and mulched as necessary to control erosion. When a project is shown in the contract to be constructed in stages and operations in those staged areas are suspended for a significant amount of time, the contractor shall receive payment for temporary seed and mulch. When the engineer allows the contractor to disturb additional ground beyond the restrictions in Sec 806.4.4 solely to enhance the contractor's operation, the contractor shall not receive compensation for temporary seed or mulch, as required by the engineer, for ground cover for areas exceeding the restrictions in Sec 806.4.4.

806.50.2.1 The contractor shall provide permanent seeding and mulching as shown on the plans following temporary seeding. Any preparation of the seed bed that might be necessary prior to permanent seeding shall be considered incidental to temporary seeding.

806.50.2.2 Temporary seeding mixtures of cereal grains shall be applied at a minimum rate of 100 pounds per acre. All erodible seeded areas shall provide a minimum of 20 plants of the species planted per square foot on at least two random counts per acre in representative areas of the field. For areas with a large percentage of rock, the number of living plants shall be proportional to

the percentage of erodible surface, as determined by the engineer. The counts will be conducted 60 days after the species is planted.

806.50.2.3 Mulch placed over temporary seed mixtures shall be applied in accordance with Sec 802.

806.50.2.4 Fertilizer shall be applied at a rate of 40 pounds nitrogen (N) per acre.

806.50.2.5 Lime will not be required for temporary seeding.

806.50.3 Method of Measurement. Measurement of temporary seeding areas will be made to the nearest tenth of an acre. No measurement will be made for mulch.

806.50.4 Basis of Payment. The accepted quantities of temporary seeding will be paid for at the contract unit price per acre. Payment for fertilizer and mulch shall be included in the cost of temporary seeding.

SECTION 806.60 SEDIMENT TRAP.

806.60.1 Description. This work shall consist of constructing, maintaining and removing sediment traps as shown on the plans or as directed by the engineer.

806.60.2 Construction Requirements.

806.60.2.1 Sediment traps shall be constructed as shown on the plans or as directed by the engineer. Traps may require excavation, or placement of rock of sufficient size to impound water, or a combination of excavation and placement of rock.

806.60.2.2 Sediment traps shall be installed with clearing and grubbing operations or as directed by the engineer. The contractor shall monitor sediment levels and remove sediment in accordance with Sec 806.110.

806.60.2.3 Sediment traps shall remain in service until removal has been approved by the engineer. Removal shall be in accordance with Sec 806.4.11 and as state herein. The contractor shall remove any sediment from the trap, backfill, compact all excavations, and restore the area to match existing ground condition, and seeding and mulching in accordance with Secs 802 and 805 respectively.

806.60.3 Method of Measurement.

806.60.3.1 Measurement of excavation to construct sediment traps will be made to the nearest tenth of a cubic yard.

806.60.3.2 Measurement of rock placed to construct sediment traps will be made to the nearest tenth of a cubic yard.

806.60.4 Basis of Payment.

806.60.4.1 The accepted quantity for excavation to construct sediment traps will be paid for at the contract unit price. Payment includes clearing, excavation, removal, backfilling, and final grading.

806.60.4.2 The accepted quantity for rock used to construct sediment traps will be paid for at the contract unit price. Payment shall include furnishing, placing, and removal of rock.

806.60.4.3 No direct payment will be made for seeding and mulching necessary to restore the area after removal.

806.60.4.4 Payment for sediment removal will be in accordance with Sec 806.110.

SECTION 806.70 SILT FENCE

806.70.1 Description. This work shall consist of furnishing, installing, maintaining, and removing of a silt fence to control sediment along slopes and other designated areas. The quantity of silt fence shown on the plans may be increased or decreased, as directed by the engineer. The engineer may also modify the location as necessary to improve the effectiveness of the silt fence. Variations in quantity and location will not be considered as a change in work.

806.70.2 Material. When geotextile fabric is used, material shall be in accordance with Sec 1011. All other material shall be as specified in the SWPPP.

806.70.2.1 Posts. Wood, steel or synthetic posts may be used. Posts shall be of sufficient length, but no less than 4 feet, to ensure adequate embedment while fully supporting the fence and shall have sufficient strength to resist damage during installation and to support applied loads while in service.

806.70.2.2 Prefabricated Fence. Prefabricated fence systems may be used if the systems meet all of the above material requirements.

806.70.3 Construction and Maintenance Requirements.

806.70.3.1 Fabric Fence. The contractor shall install silt fence as shown on the plans and at other locations directed by the engineer. Fence construction shall be adequate to handle the stress from hydraulic and sediment loading. Fabric at the bottom of the fence shall be buried a minimum of 6 inches to prevent flow under the barrier. The trench shall be backfilled, and the soil compacted over the fabric. Fabric splices with a minimum 2-foot overlay shall be located only at a support post. Any installation method acceptable to the engineer will be allowed as long as the effectiveness and intent of the silt fence is achieved.

806.70.3.1.1 Post spacing shall not exceed 5 feet. Posts shall be driven a sufficient depth into the ground or placed on closer spacing as necessary to ensure adequate resistance to applied loads.

806.70.3.1.2 The silt fence shall be fastened securely to the upslope side of the post. When wire support fence is used, the wire shall extend into the trench a minimum of 2 inches.

806.70.3.2 Alternate Fence Types. Alternate silt fence types shall be in accordance with the SWPPP or as approved by the engineer.

806.70.3.3 Maintenance. The contractor shall monitor the condition of all fences and repair or replace fences that are not functional as long as the fences are necessary to contain sediment runoff. Any deficiencies shall be corrected by the contractor in accordance with the SWPPP. In addition, the contractor shall review the effectiveness of silt fences in areas where construction activities have changed the natural contour and drainage runoff. Where deficiencies exist, additional silt fences shall be installed as approved or directed by the engineer.

806.70.3.4 Sediment. The contractor shall remove and dispose of sediment in accordance with Sec 806.110. Segments of silt fence that receive heavy sediment loading may require a secondary silt fence or installation of other controls to adequately contain sediment.

806.70.3.5 Removal. Silt fence shall be removed in accordance with Sec 806.4.11 and as specified herein. The contractor shall remove and dispose of any excess silt accumulation along the fence, shall restore the area to match existing ground condition, and seeding and mulching in accordance with Secs 802 and 805 respectively.

806.70.4 Method of Measurement. Silt fence will be measured to the nearest linear foot from end to end of each separate installation.

806.70.5 Basis of Payment.

806.70.5.1 The accepted quantities of silt fence will be paid for at the contract unit price.

806.70.5.2 No direct payment will be made for seeding and mulching necessary to restore the area after removal.

806.70.5.3 Payment for sediment removal will be in accordance with Sec 806.110.

SECTION 806.80 TEMPORARY PIPE

806.80.1 Description. This work shall consist of installing and removing temporary pipe utilized to carry water under temporary roadways, silt fences, berms or other locations determined by the engineer and to prevent the contractor's equipment from coming in direct contact with water when crossing an active stream, intermittent streams created during heavy rainfalls or other bodies of water.

806.80.2 Material. Any pipe approved by the engineer may be used.

806.80.3 Construction Requirements. Installation of temporary pipe shall be in accordance with the specifications for permanent pipe and shall prevent water from causing erosion around the pipe. All backfill material for pipes shall be placed in 6-inch lifts and mechanically compacted. Compaction tests will not be required. Temporary pipe placed in intermittent or active streams shall be backfilled with clean rock of sufficient size to withstand normal stream flows.

806.80.4 Method of Measurement. Measurement of temporary pipe will be made to the nearest linear foot for those pipes specified on the plans.

806.80.5 Basis of Payment. The accepted quantities of temporary pipe will be paid for at the contract unit price for temporary pipes specified on the plans. No payment will be made for temporary pipes that the contractor chooses to install to facilitate construction. Unless provided as a pay item in the contract documents, no direct payment will be made for the placement and removal of the backfill material or rock.

SECTION 806.90 EROSION CONTROL BLANKETS AND TURF REINFORCEMENT MATS

806.90.1 Description. This work shall consist of furnishing and placing erosion control blankets (ECBs) and turf reinforcement mats (TRMs) on slopes or ditches for short-term or long-term protection of seeded areas at locations shown on the plans or as directed by the engineer.

806.90.2 Material. ECBs and TRMs shall be used as designated in the contract or as approved by the engineer. The contractor shall provide ECBs and TRMs of the type specified in the contract and shall provide a manufacturer's certification stating that they are in accordance with Sec 1011.

806.90.3 Construction Requirements. ECBs and TRMs shall be installed and maintained according to the manufacturer's recommendations.

806.90.4 Method of Measurement. Measurement of ECBs and TRMs will be made to the nearest square yard of surface area covered.

806.90.5 Basis of Payment. The accepted quantity of ECBs and TRMs will be paid for at the contract unit price for each of the pay items included in the contract. If ECBs and TRMs are used in lieu of other erosion control measures, payment will be made at the contract unit price for the pay items in the contract for the respective items that the blanket replaces.

SECTION 806.100 TEMPORARY STREAM CROSSING

806.100.1 Description. This work shall consist of constructing a temporary stream crossing to facilitate the movement of equipment across a stream.

806.100.2 Construction Requirements. The contractor shall be responsible for the design, installation, maintenance and removal of the temporary stream crossing and any structures installed for the construction of the temporary stream crossing. Appropriate measures shall be taken to maintain near normal downstream flows and to minimize flooding upstream. The temporary stream crossing shall be constructed to permit the free movement of the stream's aquatic life. Fill material, if allowed by the Corps of Engineer permit, shall be clean rock of sufficient size to withstand normal stream flows.

806.100.2.1 Prior to construction of the temporary stream crossing, all information shall be submitted to the engineer as needed for the issuance or modification of the Corps of Engineer permit. The contractor shall not begin construction on any temporary stream crossing without written permission from the engineer.

806.100.2.2 All approaches to the temporary stream crossing shall be maintained such that all storm water runoff is diverted to retention devices.

806.100.2.3 When the temporary stream crossing is no longer needed, the crossing shall be removed as soon as possible and the area shall be restored to pre-project conditions or to the satisfaction of the engineer.

806.100.3 Basis of Payment. No direct payment will be made for the design, installation, maintenance or removal of temporary stream crossings. The contractor shall be responsible for all costs, including damage and penalties.

SECTION 806.110 SEDIMENT REMOVAL.

806.110.1 Description. This work shall consist of removing and disposing of sediment from sediment control devices, such as ditch and inlet checks, sediment basins, sediment traps, silt fence, and other devices that accumulate sediment.

806.110.2 Construction Requirements. The contractor shall monitor sediment levels in all sediment control devices and remove sediment prior to the level reaching approximately one-half the design heights for checks and fences, and one-half the storage capacities for basins and traps. The engineer may require sediment removal from devices prior to levels reaching the specified limits.

806.110.2.1 The contractor shall dispose of the sediment in a location that does not allow the sediment to erode back into the sediment devices or to pollute streams or other bodies of water.

806.110.3 Method of Measurement. Measurement of sediment removal will be made to the nearest tenth of cubic yard.

806.110.3.1 No measurement will be made for sediment removal that accumulates due to the contractor's failure to complete erosion control measures in accordance with the SWPPP or as directed by the engineer. The engineer shall determine the volume of sediment that will be excluded from payment due to a lack of required erosion control measures.

806.110.3.2 No measurement will be made for removing any remaining sediment during final removal of the sediment control devices.

806.110.4 Basis of Payment. The accepted quantity of sediment removal will be paid for at the contract unit price.

SECTION 901 – HIGHWAY LIGHTING

Delete Sec 901.3 substitute the following: ***12/13***

901.3 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section/Specification
Concrete	501
Reinforcing Steel for Concrete	1036
Wood Poles for Power Supplies and Temporary Installation	1050
Electrical Conduit	1060
Electrical Conductors	1061
Pull and Junction Boxes	1062
High-Strength Bolts, Nuts and Washers	1080
Low-Carbon Steel Bolts, Nuts and Washers	1080
Galvanized Coating of Steel Lighting Poles and Appurtenances	1080
Lighting Equipment	1091
High-Strength Anchor Bolts	ASTM A 449
Structural Low Alloy Steel for Base Plates	AASHTO M 270, Grade 50 (ASTM A 709, Grade 50)
Stainless Steel Bolts, Screws and Washers	ASTM A 193, Grades B5, B6, B7 or B16
Stainless Steel Nuts	ASTM A 194
Circular Steel Pile Foundation	ASTM A 252, Grade 2 or ASTM A 500, Grade B/C
Steel H-Pile Foundation	ASTM A 709, Grade 36
Screw Anchor Foundation Shaft Helix Helix Core	 ASTM A 252, Grade 2 or ASTM A 500, Grade B/C ASTM A 575, Grade M 1010 or AASHTO M 270, Grade 36 (ASTM A 709, Grade 36) ASTM A 575, Grade M 1023 or AASHTO M 270, Grade 36 (ASTM A 709, Grade 36)
Connector Plates and Steel Closure Plates for Circular Pipes and Connector Plates for H-Pile and Screw Anchor Foundations	AASHTO M 270, Grade 36 (ASTM A 709, Grade 36)

Delete Sec 901.3.1 substitute the following: ***11/12***

901.3.1 Bolts, nuts and washers specified to be galvanized shall be galvanized in accordance with AASHTO M 232 (ASTM A 153), Class C, or mechanically galvanized in accordance with AASHTO M 298 (ASTM B 695) Class 55. Except for anchor bolts, galvanizing thickness shall not exceed 6 mils. For anchor bolts and nuts and for high strength bolts and nuts, except those in accordance with ASTM A325, the contractor shall furnish to the engineer a test report certified to be the last completed set of mechanical tests for each size in each shipment. For high strength bolts and nuts in accordance with ASTM A325, the contractor shall furnish to the engineer a copy of the manufacturer's inspection test report for each production lot or shipping lot furnished and shall certify the bolts furnished are in accordance with the specifications. Bolts and nuts in accordance with ASTM A 307 shall be accompanied by a manufacturer's statement that the bolts and nuts were manufactured in accordance with ASTM A 307.

Delete Sec 901.19.4 in its entirety and renumber accordingly: ***07/11***

SECTION 902 – TRAFFIC SIGNALS

Delete Sec 902.4 substitute the following: ***10/14***

902.4 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section/Specification
Concrete	501
Galvanized Coating of Traffic Signal Posts and Appurtenances	1080
High-Strength Bolts, Nuts and Washers	712
Low-Carbon Steel Bolts, Nuts and Washers	712
Structural Low Alloy Steel	712
Luminaires	901
Signs	903
Reinforcing Steel for Concrete	1036
Wood Poles for Power Supplies and Temporary Installations	1050
Electrical Conduit	1060
Electrical Conductors	1061
Pull and Junction Boxes	1062
Fiber Optic Interconnect	1092
Signal Equipment	1092
Nuts for Anchor Bolts	ASTM A 563, Grade C, D or DH or ASTM A 194, Grade 2 or 2H
Stainless Steel Bolts, Screws and Washers	ASTM A 193, Grades B5, B6, B7 or B16
Stainless Steel Nuts	ASTM A 194

Delete Sec 902.4.1 substitute the following: ***11/12***

902.4.1 Bolts, nuts and washers, except stainless steel, shall be galvanized in accordance with AASHTO M 232 (ASTM A 153), Class C or mechanically galvanized in accordance with AASHTO M 298 (ASTM B 695), Class 55. Except for anchor bolts, galvanizing thickness shall not exceed 6 mils. Anchor bolts shall have a minimum yield strength of 55,000 psi and a minimum elongation of 14 percent in 2 inches or 12 percent in 8 inches. For anchor bolts and nuts, and for high strength bolts and nuts, except those in accordance with ASTM A325, the contractor shall furnish to the engineer a test report certified to be the last completed set of mechanical tests for each size in each shipment. For high strength bolts and nuts in accordance with ASTM A325, the contractor shall furnish a copy of the manufacturer's inspection test report for each production lot or shipping lot furnished to the engineer and shall certify the bolts furnished are in accordance with the requirements specified. Bolts and nuts specified to meet ASTM A 307 shall be accompanied by a manufacturer's statement that the bolts and nuts were manufactured in accordance with ASTM A 307.

Delete Sec 902.16.1 through 902.16.7 to include the following: ***10/15***

902.16.1 Tracer Wire. All conduits shall contain a bare or green-jacketed No. 14 AWG stranded copper tracer wire. Tracer wire shall not be pulled into the controller cabinet or bases. An additional 6 feet of tracer wire shall be coiled in each pull box.

Tracer wire in pull boxes shall be capped, not electrically bonded to any ground wires, labeled "TRACER" and tagged in accordance with Sec 902.19.

902.16.2 Metal Conduit. All metal conduit ends shall be provided with a bushing to protect the cable from abrasion. All metal conduits shall be electrically bonded by conduit clamps and bare No. 6 AWG stranded copper wire. All metal conduits in the controller base shall be electrically bonded to the power company ground.

902.16.3 Polyvinyl Chloride and High-Density Polyethylene Conduit. A bare No. 6 AWG stranded copper ground wire shall be installed in all conduit, except PVC that contains only fiber optic cable, and shall be attached to the ground lug in signal posts, except as otherwise specified in this section. All bare ground wires shall be electrically bonded. All bare ground wires in the controller base shall be electrically bonded to the power company ground.

902.16.4 Conduit in Trench. Trenches shall be excavated to the width and depth necessary for conduit installation. All trenches shall be backfilled as soon as practical after the installation of conduit. Cinders, broken concrete and other hard or objectionable material that might cause mechanical damage to the conduit shall not be used for backfilling within 6 inches of the top of the conduit. The bottom of the trench shall be free of such material before the conduit is placed. Conduit shall not be placed without approval of the trench from the engineer. Backfill material shall be deposited in the trench in layers not exceeding 6 inches deep and each layer shall be compacted to the approximate density of the adjacent material by an approved method before the next layer is placed. Red burial tape imprinted with "CAUTION - BURIED CABLE BELOW" shall be installed in all trenches at approximately one-third to one-half of the depth of the trench. All disturbed areas shall be restored to the satisfaction of the engineer.

902.16.5 Pushed Conduit. If pushed conduit is specified, the conduit shall be installed without disturbing the existing surface. Pushed conduit may be placed by jacking, pushing, boring or other approved means.

902.16.6 Conduit in Median. If conduit in median is specified, the conduit shall be placed on the existing pavement prior to construction of the raised median. If conduit is to be placed in concrete traffic barrier, the conduit shall be held rigidly in place before placement of concrete.

902.16.7 External Conduit on Structure. For existing structures, or if provisions are not made in the plans for providing a conduit raceway in new structures as described in Sec 707, the conduit shall be external conduit on structure. Conduit on structure will include conduit on bridges, retaining walls or other structures, and shall be installed as shown on the plans or as directed by the engineer. The final location of all conduit and junction boxes shall be approved by the engineer before installation begins. Conduit shall not be attached to prestressed concrete girders or prestressed, precast concrete deck panels. The conduit shall be secured to the concrete with clamps at no more than 5-foot intervals. Concrete anchors shall be in accordance with federal specification FF-S-325, Group II, Type 4, Class I, and shall be galvanized in accordance with ASTM A 153, B 695-91 Class 50, or constructed of stainless steel. The minimum embedment in concrete shall be 1 3/4 inches. The supplier shall furnish a manufacturer's certification that the concrete anchors meet the required material and galvanizing specifications. If necessary to anchor the conduit to steel bridge members, the attachment method shall not involve drilling, grinding or welding. Attachment method to steel members shall be approved by the engineer. Junction boxes shall be installed as shown on the plans or as directed by the engineer. Junction boxes shall be surface-mounted and installed such that covers are accessible. If the conduit crosses a bridge expansion joint, a conduit expansion fitting shall be used. The expansion fitting shall provide a minimum movement in either direction as shown on the plans or as specified by the engineer. Junction boxes, expansion fittings and any hardware or material required for conduit installation shall be at the contractor's expense.

Delete Sec 902.24.2 substitute the following: ***04/13***

902.24.2 Measurement for the following items will be made per each:

(a) Signal heads and luminaires,

(b) Posts,

(c) Power supply assemblies, including all specified equipment,

(d) Traffic controller assemblies, including all specified equipment,

(e) System software, including installation,

(f) System master, including all specified items,

(g) Telemetry radios and antennas for wireless interconnect systems, including all specified equipment,

(h) Video detection systems, including all specified equipment,

(i) Pull boxes, including all specified material,

(j) Training, including all specified training,

(k) Modems, including all specified equipment,
(l) Splice cabinet, including all specified items,

And includes all necessary material, hardware, equipment and specified incidental items.

SECTION 903 – HIGHWAY SIGNING

Delete Sec 903.2.1 substitute the following: ***08/12***

903.2.1 Sign Posts and Tubular Steel Sign Supports.

Item	Section/Specification
Wood Posts	1050
Steel Pipe Posts	ASTM A 53, Grade B, or ASTM A 500, Grade B
Galvanizing of Steel Pipe Posts	ASTM A 53
Structural Steel Welding Electrodes	AWS A5.1 or AWS A5.5
Structural Steel Posts	AASHTO M270 Grade 50 or 50w
U-Channel Posts	ASTM A 499, Grade 60

Delete Sec 903.3.1.2 substitute the following: ***07/15***

903.3.1.2 Embedded Installations. Class B or B-1 concrete, or concrete of a commercial mixture meeting the requirements of Sec 501 shall be used for the footings for embedded-type sign posts, except as otherwise allowed herein. Posts shall be supported in proper position until the concrete or other approved material has set. Excavation and backfill shall be in accordance with Sec 903.3.1.1, except forming will not be required unless soil conditions warrant forming. Tops of footings shall be finished flush with the slope of the ground to the satisfaction of the engineer.

Amend Sec 903.3.1.2.1 through 903.3.1.2.2 to include the following: ***07/15***

903.3.1.2.1 In lieu of the concrete material requirements in Sec 903.3.1.2, the contractor may use a pre-packaged dry commercial concrete mixture that has a manufacturer's 28-day compressive strength rating of no less than 4,000 psi. The concrete shall be thoroughly mixed in accordance with the manufacturer's recommendations. Strength requirements shall meet or exceed Class B concrete as specified in Sec 501.

903.3.1.2.2 In lieu of concrete, the contractor may use a quick-setting polyurethane foam for the footings for embedded-type sign posts. The foam shall have a minimum compressive strength of 80 psi (550 kPa), in the direction of rise, when tested in accordance with ASTM D 1621, and shall have a minimum density of 4 pounds per cubic foot (65 kg/m^3) when tested in accordance with ASTM D 1622. Foam shall not be placed in water. Polyurethane foam shall be mixed in accordance with manufacturer's recommendations. Polyurethane foam will not be permitted if soil conditions are such that forming is necessary.

SECTION 1001 – GENERAL REQUIREMENTS FOR MATERIALS

Delete Sec 1001.3 substitute the following: ***12/13***

1001.3 A description of the classification of deleterious material may be found in MoDOT's EPG 106.3.2.71 on MoDOT's web site.

Amend Sec 1001.14 to include the following: ***05/13***

1001.14 PRODUCER QUALITY MANAGEMENT PLAN

1001.14.1 Scope. This specification covers the acceptance criteria for material items produced under the Producer Quality Management Plan (QMP). The producer shall develop a QM plan for MoDOT's acceptance as defined by one of the following:

a) Producer QC and membership in an industry recognized audit program.

b) Producer QC and independent QA testing.

1001.14.2 MoDOT shall perform audits including testing, inspection, and documentation review. QC testing, independent assurance testing, documentation, and conformance to product specifications may be subject to verification by MoDOT at the production facility or at the jobsite. MoDOT may audit the QMP of the producer at any time.

1001.14.3 QUALITY MANAGEMENT PLAN REQUIREMENTS. The producer's QMP shall include the minimum following requirements:

a) Frequency of QC sampling and testing.

b) Frequency of the producer's QA sampling and testing and identification of a third party testing firm if applicable.

c) Organizational structure of QC staff, job duties, and responsibilities including the identification of a QC manager.

d) Method of documenting product compliance. The producer shall provide documentation of the material meeting specification.

e) Type of material to be produced.

f) An independent dispute resolution testing firm (company name), contact person, address, and phone number.

g) A process for tracking deficient work and corrective actions in accordance with Sec 1001.14.8.

h) A process for addressing non-conforming work and corrective action requests in accordance with Sec 1001.14.9.

i) A list of hold points for QC in accordance with Sec 1001.14.10.

j) A list of MoDOT hold points in accordance with Sec 1001.14.10.

1001.14.4 Third Party Resolution. The third party shall be independent of the producer, contractor, MoDOT, consultants, and all project subcontractors or suppliers. All testing of material for dispute resolution shall be performed by a laboratory that is AASHTO Accreditation Program certified in the areas of the material being tested.

1001.14.5 Testing Personnel. Where applicable, testing shall be performed by individuals who are certified by the MoDOT Technician Certification program or an accredited laboratory.

1001.14.6 Record Retention. The producer shall maintain copies of the plant QMP, applicable AASHTO, ASTM, MoDOT, and/or LPA standards and approved production drawings. The records shall include information related to all components used to produce the final product such as aggregate tests, steel certifications and mill tests, PAL numbers, QC test results and other material component documentation such as the bill of lading for material used in the production of the finished product. Records related to QC tester qualifications shall be retained. Records shall be retained for a minimum of three years and provided to the engineer in electronic form upon request.

1001.14.7 PRODUCER QUALITY ASSURANCE. When required, QA testing by a third party shall be performed at the frequency required in each specification. Participation in an industry recognized auditing organization may be substituted for a third party QA testing.

1001.14.8 CONTROL OF DEFICIENT WORK. Deficient work is considered work that is found to be not specification compliant by QC. Deficient work may be corrected to be specification compliant as defined in the QMP. It is the responsibility of QC to identify, document, and correct deficient work. When QC personnel discovers deficient work that cannot be corrected the work becomes non-conforming. For non-conforming work, QC shall submit a Non-Conformance Report (NCR) to the engineer and contractor for acceptance or rejection.

1001.14.9 CONTROL OF NON-CONFORMING WORK. Non-conforming work are items that are not compliant with the specifications and have gone through the QC process undiscovered or uncorrected. When non-conforming work is identified by QC, independent QA, MoDOT QA testing, or auditing of the contractor, a solution will be proposed by the producer in writing and approved or rejected by both the engineer and contractor.

1001.14.9.1 Reoccurring non-conforming work shall be addressed by the producer and Construction and Materials Division by one of the following methods:

a) The producer develops a corrective action plan.

b) Alteration of the QMP by the producer with the engineer's approval.

c) Review producer's QC results with producer's associated independent organization. Producer to be re-audited by independent organization.

1001.14.10 HOLD POINTS

1001.14.10.1 Hold points are events that require approval prior to continuation of work. Hold points occur at definable stages of work or progress phases when the succeeding work depends on acceptance of the preceding work. QC staff shall provide complete inspection reports and checklists to MoDOT personnel prior to all MoDOT hold points.

1001.14.10.2 QC hold points are established by the QMP for compliance verification prior to any MoDOT hold point. At a minimum, a QC hold point shall occur just prior to or simultaneous with each MoDOT hold point.

1001.14.10.3 A list of MoDOT hold points will be determined by the engineer. The engineer may make changes to the MoDOT hold point list at any time. Following a MoDOT hold point inspection, all non-conforming work identified by MoDOT shall be corrected prior to continuing work and a new hold point shall be scheduled.

1001.14.10.4 MoDOT may waive hold points at any time. Waivers will be in writing sent to the producer as soon as possible from the engineer.

SECTION 1003 – AGGREGATE FOR SEAL COATS

Delete Sec 1003.2.1 through Sec 103.2.4 and substitute the following: ***10/14***
Delete Sec 1003.2.1 and substitute the following: ***04/15***

1003.2.1 When tested in accordance with AASHTO T 96, the percentage of wear shall not exceed 50 percent. The sum of the percentages of all deleterious substances shall not exceed 2.0 percent for Grade A aggregate, 4.0 percent for Grade B or 8.0 percent for Grade C aggregate, and the aggregate shall meet the following criteria:

Property	**Grade A1 & A2 Aggregate**	**Grade B1 & B2 Aggregate**	**Grade C Aggregate**
Deleterious rock, percent by weight, max	2.0	4.0	8.0
Shale, percent by weight, max	0.5	0.75	1.0
Other foreign material, percent by weight, max	0.5	0.5	0.5
Two fractured faces, percent, min	100	100	100
Thin, elongated particles, ASTM D 4791, 5:1, percent, max[a]	10	N/A	N/A
Micro-Deval, AASHTO T 327, percent, max	18	20	N/A

[a]Test material retained on the No. 4 sieve.

1003.2.2 The aggregate shall be in accordance with the following requirements for the grade specified in the contract:

Sieve Size	**Grade A1 Aggregate**	**Grade A2 Aggregate**	**Grade B1 Aggregate**	**Grade B2 Aggregate**	**Grade C Aggregate**
	Percent Passing by Weight	**Percent Passing by Weight**	**Percent Passing by Weight**	**Percent Passing by**	**Percent Passing by**

				Weight	Weight
1/2"	100	100	100	100	100
3/8"	97-100	100	95-100	100	95-100
1/4"	--	97-100	--	95-100	--
No. 4	0-25	--	0-30	--	0-35
No. 8	--	0-30	--	0-30	--
No. 200[a, b]	0-1.0	0-1.5	0-2	0-2.5	0-2

[a]The percent passing the No. 200 sieve may be increased by 1.0 percent provided the aggregate is pre-coated with bituminous material.
[b]These values may be raised by 0.5% at the destination to account for handling provided the material meets this gradation at the source.

1003.2.3 Crushed stone shall be obtained from rock of uniform quality. Rock from individual ledges and gravel tested for initial source approval shall meet the following criteria:

Property	Grade A1 & A2 Aggregate	Grade B1 & B2 Aggregate	Grade C Aggregate
Absorption, AASHTO T 85, percent, max	2.0	4.0	4.0

1003.2.4 Lightweight aggregate shall be in accordance with the following requirements for the grade specified in the contract:

Property	Grade A1 & A2 Aggregate	Grade B1 & B2 Aggregate	Grade C Aggregate
Absorption, ASSHTO T 85, percent, max	n/a	n/a	n/a
Los Angeles Abrasion for Lightweight Aggregate, MoDOT Test Method TM 78, percent, max	50	50	50

SECTION 1005 – AGGREGATE FOR CONCRETE

Delete Sec 1005.2.1 and substitute the following: ***12/11***

1005.2.1 All coarse aggregate for concrete shall consist of sound, durable rock, free from objectionable coatings and frozen and cemented lumps. The percentage of deleterious substances shall not exceed the following values, and the sum of percentages of all deleterious substances, exclusive of Items 5 and 6, shall not exceed 6.0 percent. For crushed stone, the percentage of wear shall not exceed 50 when tested in accordance with AASHTO T 96.

Deleterious Material	Percent by Weight
Deleterious Rock	6.0
Shale	1.0
Chert in Limestone	4.0
Other Foreign Material	0.5
Material Passing No. 200 Sieve Gradations D & E	2.5[a]
Thin or Elongaged	5.0

[a] Value may be raised to 3.0 percent, providing the material passing the #200 sieve in the fine aggregate is less than or equal to 1.0 percent.

Delete Sec 1005.2.4 and substitute the following: ***04/13***

1005.2.4 Coarse aggregate for concrete for structures, except as specified in Sec 1005.2.5, may be gravel or crushed stone. Coarse aggregate for Class B, B-1, B-2, MB-2 or Seal concrete shall be in accordance with either Gradation D or E. Coarse aggregate for Class A-1 concrete shall be in accordance with Gradation E.

Gradation D	Percent by Weight
Passing 1-inch sieve	100
Passing 3/4-inch sieve	85-100
Passing 3/8-inch sieve	15-55
Passing No. 4 sieve	0-10

Gradation E	Percent by Weight
Passing 3/4-inch sieve	100
Passing 1/2-inch sieve	70-100
Passing 3/8-inch sieve	30-70
Passing No. 4 sieve	0-20
Passing No. 8 sieve	0-6

Amend Sec 1005.4 to include the following: ***06/13***

1005.4 Lightweight Aggregates.

1005.4.1 Lightweight aggregates shall be prepared by expanding, calcining, or sintering argillaceous material such as clay, shales, and slates.

1005.4.2 Grading. The grading shall be uniform and conform to the requirements given in Table I.

1005.4.3 Unit Weight. The unit weight of lightweight aggregates shall not exceed the following:

Dry, Loose Weight, Max. lb/cu ft	
Fine Aggregate	70
Coarse Aggregate	55

1005.4.3.1 Uniformity of Weight. If the unit weight of any shipment of lightweight aggregate when tested in accordance with AASHTO T 19 is found to vary by more than 10 percent from that of the sample submitted for source approval, the aggregate shipment may be rejected.

1005.4.4 Soundness. When tested in accordance with AASHTO T 104, the loss of lightweight fine or coarse aggregate in 5 cycles of the accelerated soundness test shall not exceed 8 percent if sodium sulfate is used or 10 percent if magnesium sulfate is used.

1005.4.5 Drying Shrinkage. The drying shrinkage of concrete specimens prepared and tested in accordance with AASHTO M 195, shall not exceed 0.07 percent.

1005.4.6 Sampling. Samples of fine and coarse aggregate shall be furnished by the contractor for source approval. Other samples shall be taken from shipments at intervals specified by the engineer.

Table I
Grading Requirements for Lightweight Aggregate

		Percent Passing Sieve Sizes									
Grade	**Size**	**1 1/2"**	**1"**	**3/4"**	**1/2"**	**3/8"**	**No. 4**	**No. 8**	**No. 16**	**No. 50**	**No. 100**
Fine Aggregate											
	No. 4 to 0	---	---	---	---	100	85-100	---	40-80	10-35	5-20
Coarse Aggregate											
1	1" to 1/2"	100	90-100	20-55	0-10	0-5	---	---	---	---	---
2	1" to No. 4	100	95-100	---	25-60	---	0-10	0-5	---	---	---
3	3/4" to No. 4	---	100	90-100	---	20-55	0-10	0-5	---	---	---
4	1/2" to No. 4	---	---	100	90-100	40-70	0-15	0-5	---	---	---
5	3/8" to No. 8	---	---	---	100	85-100	10-30	0-10	0-5	---	---

SECTION 1007 – AGGREGATE FOR BASE

Delete Sec 1007.2.1 substitute the following: ***08/13***

1007.2.1 Type 1 aggregate for base shall consist of crushed stone, sand and gravel or reclaimed asphalt or concrete. The aggregate shall not contain more than 15 percent deleterious rock and shale. The fraction passing No. 40 sieve shall have a maximum plasticity index of six. Any sand, silt and clay and any deleterious rock and shale shall be uniformly distributed throughout the material.

Delete Sec 1007.3.1 substitute the following: ***08/13***

1007.3.1 Type 5 aggregate for base shall consist of crushed stone, sand and gravel or reclaimed asphalt or concrete. The aggregate shall not contain more than 15 percent deleterious rock and shale. The fraction passing the No. 40 sieve shall have a plasticity index not to exceed six. Any sand, silt and clay, and any deleterious rock and shale shall be uniformly distributed throughout the material.

SECTION 1010 – SELECT GRANULAR BACKFILL FOR STRUCTURAL SYSTEMS

Delete Sec 1010.3.1 substitute the following: ***12/11***

1010.3.1 To ensure proper functioning of the structure, the backfill material used for structural applications shall be in accordance with the following:

Sieve Size	Percent Passing by Weight
4-inch	100
No. 40	0-60
No. 200	0-10 *

* May be increased to 15% if gradation sample is obtained from the compacted backfill material.

Delete Sec 1010.3.4 and substitute the following: ***02/12***

1010.3.4 The angle of internal friction for the backfill material shall be no less than 34 degrees. No testing will be required whenever 80 percent of the particle sizes are greater than 0.75 inch or whenever the backfill material consists entirely of crushed stone. When testing is required, testing shall be in accordance with one of the tests specified below.

Delete Sec 1010.3.6 and 1010.3.7 substitute the following: ***12/11***

1010.3.6 For select granular backfill other than crushed stone the organic content of the backfill material shall be less than or equal to one percent and shall be measured in accordance with AASSHTO T 267 for material finer than the No. 10 sieve.

Delete Sec 1010.4.1.1 and substitute the following: ***12/11; 11/12***

1010.4.1.1 When metallic soil reinforcements are used, the backfill material shall be in accordance with the electrochemical requirements as follows:

Requirement	Test Method
Resistivity > 2000 ohm-cm	AASHTO T 288
pH of 5-10**	AASHTO T 289
Chlorides ≤ 100 ppm	AASHTO T 291
Sulfates ≤ 200 ppm	AASHTO T 290*

* Water soluble sulfates shall be tested in accordance with AASHTO T 290 Method A-Gravimetric Method with the following modifications: Per section 13, follow subsection 13.1 through 13.3 as stated in the test procedure. Transfer 250 ml of extracted sample to a 400-ml plastic beaker and place in a 90 C oven for 30 minutes. A blank should be run concurrently with the test sample using 250 ml of DI water. After 30 minutes, add 10 ml of barium chloride (100g/L) to test sample and blank. Place test sample and blank back into a 90 C oven and let samples digest for 12 to 24 hours. Filter through a

retentive paper, wash the precipitate thoroughly with hot DI water, place the paper and contents in a weighted porcelain crucible, and slowly char and consume the paper without inflaming. Ignite at 1000 C for 2 hours, cool in a desiccator, and determine the mass as grams of barium sulfate. Subtract the blank and convert grams of barium sulfate to mg/kg of sulfate ion content.
** Use pH of 5-9 for aluminized soil reinforcement.

Amend Sec 1010.4.1.3 and to include the following: ***12/11***

1010.4.1.3 Resistivity shall be tested by the contractor in accordance with AASHTO T 288. Resistivity result will be defined by the minimum resistivity noted during the test. Resistivity shall be tested a minimum of once per 30,000 tons, by the Contractor and a minimum of once by quality assurance representing the engineer. Minimum sample frequency is per project, per source, per product. For samples that do not meet specifications a split sample shall be obtained from the source stockpile for final comparison testing. Contact the State Construction and Materials Engineer for acceptance.

Delete Sec 1010.5.1 and substitute the following: ***12/11***

1010.5.1 The contractor shall furnish to the engineer written certification that the backfill material provided complies with the applicable sections of this specification. Test results in the certification shall be within one year from the start of construction of each wall. Copies of all test results for tests performed to ensure compliance with this specification shall be furnished to the engineer. The engineer will assure a minimum of one complete set of quality assurance tests for each complete certification supplied by the contractor, within the same time constraints.

SECTION 1011 – GEOTEXTILE

Delete Sec 1011.3.5 and Sec 1011.3.6 and substitute the following: ***10/14***

1011.3.5 Erosion Control Blankets. Erosion control blankets (ECB) shall be certified by the manufacturer to meet the following criteria:
.

ECB Type	Netting Type	Longevity	Slopes	Soil Type
Type 1	Single, Quickly degradable	45-60 days	3:1 or flatter	Clay
Type 2	Single Photodegradable	12 months	3:1 or flatter	Sandy
Type 3	Double Photodegradable	12-18 months	2:1 or flatter	Clay
Type 4	Double Photodegradable	24 months	2:1 or flatter	Sandy
Type 5	Double Photodegradable	36 months	1:1 or flatter	Any

1011.3.6 Turf Reinforcement Mats. Turf reinforcement mats (TRM) shall be certified by the manufacturer for open flow channels and shall meet the following calculated shear stress:

TRM Type	Calculated Shear Stress (lbs/ft^2)
Type 1	3.5 – 6
Type 2	6.1 – 8
Type 3	8.1 – 10
Type 4	10.1 or greater

SECTION 1015 – BITUMINOUS MATERIAL

Delete Sec 1015.5and substitute the following: ***04/13***

1015.5 Application Temperatures for Bituminous Material.

Bituminous Material	Temperature, Degrees Fahrenheit			
	Spraying		Mixing	
	Min	Max	Min	Max
Asphalt Binder				
PG 46-28	260	325	----	----
All Other Grades	285	350	275	350
Liquid Asphalt RC-MC				
Grade				
30	70	150	50	110
70	100	180	90	140
250	150	220	130	170
800	180	260	170	210
3000	210	290	200	240
Asphalt Emulsions				
RS-1	70	140	----	----
RS-2	125	185	----	----
SS-1	70	160	70	160
SS-1h	70	160	70	160
CRS-1	125	185	----	----
CRS-2	125	185	----	----
CSS-1	70	160	70	160
CSS-1h	70	160	70	160
EA-90P	130	180	----	----
CRS-2P	130	180	----	----
CHFRS-2P	130	180	----	----

[a] The minimum mixing temperature shall be lowered to 200 when a warm mix technology, as approved by the engineer, is used.

Delete Sec 1015.20.5 and substitute the following: ***10/14***

1015.20.5 Emulsified Asphalt Non-polymer emulsified asphalt shall be in accordance with AASHTO M 140 or AASHTO M 208, for the type and grade specified in the contract.

Delete Sec 1015.20.5.1 and substitute the following: ***04/13; 10/14***

1015.20.5.1 Polymer Modified Asphalt Emulsion – Seal Coat. Bituminous material for polymer modified asphalt shall be in accordance with the following:

Polymer Modified Asphalt Emulsion				
Test [a]	**CRS-2P**		**EA-90P**	
	Min	**Max**	**Min**	**Max**
Viscosity, SSF @ 50 C	100	400	100	400
Storage Stability Test[b], 24 hour, percent	----	1	----	1
Classification Test	Pass	----	----	----
Particle Charge Test	Positive	----	----	----
Sieve Test, percent	----	0.3	----	0.3
Demulsibility, 0.02 N $CaC1_2$, percent	----	----	30	----
Distillation:				
Oil distillate by volume of emulsion, percent	----	3	----	3
Residue from distillation[c], percent	65	----	65	----
Tests on Residue from Distillation:				
Penetration,25 C, 100 g, 5 sec	100	200	100	200
Ductility, 4 C, 5 cm/minute, cm	30	----	25	----
Ash[d], percent	----	1	----	1
Float Test at 60 C, sec	----	----	1200	----
Elastic Recovery[e], percent	58	----	58	----

[a]All tests shall be performed in accordance with AASHTO T 59 except as noted.

[b]In addition to AASHTO T 59, upon examination of the test cylinder, and after standing undisturbed for 24 hours, the surface shall show no appreciable white, milky colored substance and shall be a homogeneous brown color throughout.
[c]AASHTO T 59 shall be modified to maintain a 399 F ± 10 F maximum temperature for 15 minutes.
[d]Percent ash shall be determined in accordance with AASHTO T 111, *Ash in Bituminous Material*.
[e]Elastic recovery shall be determined as follows. Condition the ductilometer and samples to be treated at 50 F. Prepare the brass plate, mold and briquet specimen in accordance with AASHTO T 51. Keep the specimen at the specified test temperature of 50 F for 85 to 95 minutes. Immediately after conditioning, place the specimen in the ductilometer and proceed to elongate the sample to 20 cm at a rate of pull of 5 cm/min. After the 20 cm elongation has been reached, stop the ductilometer and hold the sample in the elongated position for 5 minutes. After 5 minutes, clip the sample approximately in half by means of scissors or other suitable cutting devices. Let the sample remain in the ductilometer in an undisturbed condition for one hour. At the end of this time period, retract the half sample specimen until the two broken ends touch. At this point note the elongation (x) in cm. Calculate the percent recovery by the following formula:

$$\% \text{ Recovery} = \frac{20 - X}{20} \times 100$$

Polymer Modified Asphalt Emulsion		
Test [a]	**CHFRS-2P**	
	Min.	**Max.**
Viscosity, SFS @ 50 C	100	400
Storage Stability Test, 24 hour, percent	---	1.0
Demulsibility, 35 ml 0.8% dioctyl sodium sulfosuccinate, percent	60	---
Sieve Test, percent	---	0.10
Particle Charge Test	Positive	
Distillation [b]		
Oil Distillate, by volume of emulsion, percent	---	0.5
Residue from distillation, percent	65	---
Tests on Residue from Distillation:		
Polymer content, weight, percent (solids based)	3.0	---
Softening Point, C	54	
Float test at 60 C, s	1800	---
Penetration, 25 C, 100 g, 5 s	80	130
Viscosity @ 60 C, Poise	1300	---
Solubility in Trichloroethylene, percent	95	---
Elastic Recovery [c] @ 10 C , percent	65	---

[a]All tests shall be performed in accordance with AASHTO T-59 except as noted.
[b]AASHTO T59 shall be modified to maintain a 177 ± 5 C maximum temperature to be held for 20 minutes. Complete the total distillation in 60 ± 5 minutes from the first application of heat.
[c]Elastic recovery shall be determined as follows. Condition the ductilometer and samples to be treated at 10 C. Prepare the brass plate, mold, and briquet specimen in accordance with AASHTO T 51. Keep the specimen at the specified test temperature of 10 C for 85 to 95 minutes. Immediately after conditioning, place the specimen in the ductilometer and proceed to elongate the sample to 20 cm at a rate of pull of 5 cm/min. After the 20 cm elongation has been reached, stop the ductilometer and hold the sample in the elongated position for 5 minutes. After the 5 minutes, clip the sample approximately in half by means of scissors or other suitable cutting devices. Let the sample remain in the ductilometer in an undisturbed condition for one hour. At the end of this time period, retract the half sample specimen until the two broken ends touch. At this point note the elongation recovery (X) in cm. Calculate the percent recovery by the following formula:

$$\% \text{ Recovery} = \frac{20 - X}{20} \times 100$$

Amend Sec 1015.20.5.1.1 to include the following: ***10/14***

1015.20.5.1.1 Polymer Modified Asphalt Emulsion – Tack Coat. Bituminous material for polymer modified asphalt shall be in accordance with the following:

Slow Setting Polymer Modified Asphalt Emulsion[a]					
		SS-1HP		**CSS-1HP**	
Test on Emulsion	**Method**	**Min.**	**Max.**	**Min.**	**Max.**
Viscosity, Saybolt Furol @ 25°C (77° F),s	AASHTO T 59	20	100	20	100
Particle Charge Test		Negative		Positive	
Storage Stability Test[b], 24 hr, Percent	AASHTO T 59	--	1	--	1
Sieve Test, Percent	AASHTO T 59	--	0.5	--	0.5
Residue by Distillation[c], Percent	AASHTO T 59	57		57	
Oil Distillate By Distallation, Percent	AASHTO T 59	--	--	--	--
Test on Residue from Distillation					
Penetration 25° C, 100 g, 5 s	AASHTO T 49	40	90	40	90
Elastic Recovery[d], 20 cm, 5 cm/min, 60 min, %	AASHTO T 301	30	--	30	--
Solubility in Trichloroethylene[e], %	AASHTO T 44	97.5	--	97.5	--

[a] The emulsified asphalt shall be in accordance with Sec 1015.20.5 of the 2011 Missouri Standard Specifications for Highway Construction, except as indicated above, and shall be modified with a styrene-butadiene diblock or triblock copolymer or a styrene butadiene rubber.

[b] In addition to AASHTO T 59, upon examination of the test cylinder, and after standing undisturbed for 24 hours, the surface shall show no appreciable white, milky colored substance and shall be homogeneous brown color throughout. The storage stability test may be waved provided the asphalt emulsion storage tank at the project site has adequate provisions for circulating the entire contents of the tank, provided satisfactory field results are obtained.

[c] AASHTO T 59 shall be modified to use a lower distillation temperature of 177° C (350° F).

[d] AASHTO T 301 shall be modified to allow the residue to be obtained from distillation as long as the distillation temperature is modified as stated above. The test on residue shall be conducted at a temperature of 10° C (50° F).

[e] In lieu of performing AASHTO T 44, AASHTO T 111, Ash in Bituminous Material

SECTION 1018 – FLY ASH FOR CONCRETE

Delete Sec 1018.2.1 and substitute the following: ***04/13***

1018.2.1 Class C fly ash shall meet either (a) or (b) of the following requirements:

(a) The 7-day Strength Activity Index with Portland cement shall be at a minimum of 85 percent of the control.

(b) The Calcium oxide content shall be 23 percent, minimum.

Amend Sec 1018.2.1.1 and include the following: ***04/13***

1018.2.1.1 All Class C fly ash shall have a minimum Strength Activity Index with Portland cement of 85 percent of the control at 28 days.

Delete Sec 1018.2.2 and substitute the following: ***06/13***

1018.2.2 The percent each of silicon dioxide (SiO_2), aluminum oxide (Al_2O_3) and iron oxide (Fe_2O_3) shall be reported in addition to the total of the three.

Delete Sec 1018.2.3 and substitute the following: ***04/13***

1018.2.3 Loss on Ignition shall not exceed 1.5 percent unless supplies provide test data verifying performance and durability in fly ash concrete applications for sources exceeding this requirement.

SECTION 1019 – CEMENT

Delete Sec 1019.2.1 and substitute the following: ***07/11***

1019.2.1 Portland Cement. All Portland cement shall be in accordance with AASHTO M 85 with the following modifications:

(a) Specific surface, fineness, for all Type I Portland cements shall not exceed 420 m^2/kg using Air permeability test. Maximum fineness limits do not apply if the sum of C3S + 4.75C3A is less than or equal to 90.

(b) When slag cement is used as an inorganic processing addition, loss on ignition shall be corrected in accordance with ASTM C 114 and reported on mill test reports.

Delete Sec 1019.2.3 and substitute the following: ***07/11; 06/13***

1019.2.3 Blended Hydraulic Cement. All blended hydraulic cement shall be in accordance with Type IP, IS, IL or IT of AASHTO M 240 with the following modification that chemical composition shall be provided and tolerances checked in accordance with Section 7.1.1 of AASHTO M240 and allowable constituent amounts of Type IP, IS, IL and IT cements are within the specified limits listed below:

(a) Type IP cement shall have a pozzolan constituent up to 25 percent by mass of the blended cement. Type IP cements, in which the pozzolan constituent is metakaolin or silica fume, shall be a maximum of 15 or 8 percent, respectively.

(b) Type IS cement shall have a slag cement constituent up to 25 percent by mass of the blended cement.

(c) Type IL cement shall have a limestone constituent up to 15 percent by mass of blended cement.

(d) Type IT cement shall have a slag cement, limestone and pozzolan constituent up to 40 percent by mass of the ternary blended cement. The maximum constituent requirements shall be in accordance with Sec 1019.2.3 (a), (b) and (c) in some combination up to 40 percent.

SECTION 1026 – REINFORCED CONCRETE CULVERT PIPE

Delete Sec 1026.3.6 and substitute the following: ***04/13***

1026.3.6 Modified or Special Designs. The manufacturer may request approval of modified designs that differ from the designs in Section 7.1, AASHTO M 170; or special designs for sizes and loads beyond those shown in Tables I to V of AASHTO M 170; or special designs for pipe sizes that do not have steel reinforcement areas shown in Tables II to V of AASHTO M 170. Modified or special designs will not be permitted for pipe diameters greater than 36 inches under earth fills greater than 51 feet. Modified or special designs shall be in accordance with AASHTO M 242.

Amend Sec 1026.3.6.1 through 1026.3.6.2 to include the following: ***04/13***

1026.3.6.1 Design Acceptance. The manufacturer shall submit to the engineer four copies of the pipe design, shop drawings and installation procedures all signed and sealed by a professional engineer registered in the State of Missouri. The pipe design, shop drawings and installation procedures shall be accepted in writing prior to the fabrication of the reinforced concrete pipe.

1026.3.6.1.1 Pipe designs may be based on either the indirect design method or direct design method and shall be in accordance with the current AASHTO LRFD Bridge Design Specifications.

1026.3.6.1.2 Designs shall provide all variables required to support computations. Designs based on the indirect design method shall provide test results in accordance with Section 9 of AASHTO M 242 with at least three specimens being tested under the three-edge-bearing method for both the D-Load to produce a 0.01-inch crack and the D-load to produce the ultimate load. The computations of D-loads shall be included in the designs for both the indirect design method and direct design method.

1026.3.6.1.3 Shop drawings reflecting design and stress details shall included complete details required for reinforced concrete pipe fabrication including wall thickness, concrete design strength, the type, size and placement of reinforcement, and inside and outside dimensions.

1026.3.6.1.4 The installation procedure shall include bedding and compaction details.

1026.3.6.2 Pipe Acceptance. Acceptance of pipe designed by the indirect design method shall be in accordance with Section 4.1.2 of AASHTO M 242. Acceptance of pipe designed by the direct design method shall be in accordance with Section 4.1.1 of AASHTO M 242 by testing against the D-Load to produce the formation of a 0.01-inch crack, which was provided in the previously submitted and accepted design.

SECTION 1028 – POLYVINYL CHLORIDE CULVERT PIPE

Delete Sec 1028.3 and substitute the following: ***08/13***

1028.3 Material. All corrugated PVC culvert pipe, couplings and fittings shall be in accordance with ASTM F 949 for 46 psi stiffness, except as follows.

Delete Sec 1028.3.1 and substitute the following: ***08/13***

1028.3.1 Section properties shall be within the following limits:

Minimum					
Nominal Size S (in.)	Effective Pipe Wall Area A_{eff} (in.^{2}/in.)	Pipe Wall Centroid to Inside Face y^c (in.)	Pipe Wall Moment of Inertia I (in.^{4}/in.)	Area Ratio[a] A_{eff}/A_g	Extreme Fiber Ratio[b] y_c/c
12	0.134	0.213	0.0059	0.814	0.622
15	0.149	0.257	0.0111		
18	0.195	0.309	0.0185		
24	0.235	0.406	0.0415		
30	0.284	0.523	0.0828		
36	0.347	0.634	0.1445		

[a] A_g equal gross area of pipe wall per unit length of pipe (in.^{2}/in.)
[b] c equals the distance from the pipe wall centroid to the outermost fiber (in.)

Delete Sec 1028.3.5 in its entirety: ***08/13***

SECTION 1029 – FABRICATING PRESTRESSED CONCRETE MEMBERS FOR BRIDGES

Delete Sec 1029.6.14 and 1029.6.15 and substitute the following: ***05/12***

1029.6.14 Surface Finish, I-Girders Surface finish shall be in accordance with Sec 703.3.5.8, except that no cracks of any kind in post-tensioned members shall be filled before the stressing is completed. The engineer will determine the kind, type and extent of cracks and surface defects, such as honeycomb and chipped edges or corners, that will be tolerated. Repairs may be permitted

with mortar in accordance with Sec 703.3.2.9. Commercially available patching material may be used if approved by the engineer. The top surface of members shall be scored transversely to a depth of approximately 1/4 inch with a wire brush, stiff broom or other approved method. A 3-inch wide strip across the top flange of the member shall be smooth finished to accurate top flange depth at each camber point designated on the plans. No laitance shall remain on surfaces to be embedded in concrete. After removal of hold-down devices, holes shall be plugged. If the method for plugging these holes is not shown on the shop drawings, written approval of the proposed method shall be obtained from the engineer. Exposed reinforcing steel shall be thoroughly cleaned of all concrete before delivery of members. The portions of girders to be embedded in the diaphragms at supports shall be roughened by sandblasting or other approved methods to provide suitable bond between girder and diaphragm. Mechanical benders, without the use of heat, shall be used to bend the strands on girders.

1029.6.15 Surface Finish, Tee Girders. Surface finish shall be in accordance with Sec 703.3.5.8, except that no cracks of any kind in post-tensioned members shall be filled before the stressing is completed. The engineer will determine the kind, type and extent of cracks and surface defects, such as honeycomb and chipped edges or corners, that will be tolerated. Repairs may be permitted with mortar in accordance with Sec 703.3.2.9. Commercially available patching material may be used if approved by the engineer. The top surface of members shall be scored transversely to a depth of approximately 1/8 inch. A 6-inch square area at each end and at each camber point designated on the plans, centered on each stem, shall be smooth finished to accurate top flange depth. Laitance on surfaces to be embedded in concrete shall be removed by sandblasting, waterblasting or other approved methods. After removal of hold down devices, holes shall be plugged. If the method for plugging these holes is not shown on the shop drawings, written approval of the proposed method shall be obtained from the engineer. Exposed reinforcing steel shall be thoroughly cleaned of all concrete before delivery of members. The portion of girders to be embedded in the diaphragms at supports shall be roughened by sandblasting or other approved methods to provide suitable bond between girder and diaphragm. Mechanical benders, without the use of heat, shall be used to bend the strands on girders.

Delete Sec 1029.8 and substitute the following: ***5/12; 08/12***

1029.8 Marking. Each precast unit shall be identified with the date, manufacturer and identification number. Markings may be indented on the unit or painted thereon with waterproof paint, and shall be located as shown on the plans or as directed by the engineer.

Table I
Dimensional Tolerances – I–Girders, Solid Slab Beams, Voided Slab Beams, Box Girder Beams and Miscellaneous Prestress Units

Length of Beam	±1/8 inch per 10 feet of beam length, but no greater than 3/4 inch
Width (Flanges, Web and Fillets)	+3/8 inch, -1/4 inch
Depth (Flanges, Web and Fillets)	±1/4 inch
Depth (Overall)	+1/2 inch, -1/4 inch
Horizontal Alignment - I-Girders and Miscellaneous Prestressed Units (Deviation from a straight lineto face of web at mid depth)	Length/8 in tenths of an inch max., all lengths
Horizontal Alignment - Solid Slab, Voided Slab and Box Girder Beams (Deviation from a straight line to face of slab/web)	1/4 inch max., to 40-foot lengths 3/8 inch max., 40 to 60-foot lengths 1/2 inch max., 60 to 80-foot or greater lengths 5/8 inch max, 80 to 100-foot lengths
Camber (Deviation from design camber within 7 days of strand release)	±1/2 inch, to 80-foot lengths ±1 inch, greater than 80-foot lengths ±1 1/2 inch, greater than 120-foot lengths
Stirrup Bars (Projection above top of beam)	± 3/4 inch
Stirrup Bars (Longitudinal spacing)	± 2 inches
Tendon Position- I-Girders and Miscellaneous Prestressed Units	± 1/4 inch center of gravity of strand group and individual tendons
Tendon Position - Solid Slab, Voided Slab and Box Girder Beams	± 1/8 inch center of gravity of strand group and individual tendons
Position of Deflection Points for Deflected Strands	± 6 inches, longitudinal
Position of Lifting Devices	± 6 inches, longitudinal
Side Inserts (Centerline to centerline and centerline to end)	± 1/2 inch

Coil Inserts (Centerline to centerline and centerline to end)	± 2 inches horizontal, except must be 3 inches or more from end of beam and within reinforcement cage of bent, ±1 inch vertical
Slab Drain Inserts	± 1/2 inch from designated location, engineer may approve location ± 6 inches from design, multiple inserts for single drain must be within ± 1/2 inch of vertical line
Exposed Beam Ends (Deviation from square or designated skew)	± 1/4 inch horizontal, ± 1/8 inch vertical per foot of beam height
Bearing Area (Deviation from plane)	±1/8 inch
Bearing Plates (Centerline to centerline)	±1/8 inch per 10 feet of beam length, but no greater than 3/4 inch
Bearing Plates (Centerline to end of beam)	±1/2 inch
Diaphragm Hole Location	±1 1/2 inches for centerline of group ±1/2 inch within group
Scupper holes, blockouts and voids	Placed as close as possible to design location after reinforcement steel and strands are properly located

Table II **Dimensional Tolerances – Tee Girders**	
Length of Beam	± 1/8 inch per 10 feet of beam length, but not greater than 1/2 inch
Width (Overall)	± 1/4 inch
Depth (Overall)	± 1/4 inch
Flange Thickness and Stem Thickness	± 1/8 inch
Horizontal Alignment (Deviation from a straight line to face of each web)	1/4 inch max., to 40-foot lengths 3/8 inch max., 40 to 60-foot lengths 1/2 inch max., 60-foot or greater lengths
Camber (Deviation from design camber within 7 days of strand release)	± 1/2 inch, to 80-foot lengths ± 1 inch, greater than 80-foot lengths
Stirrup Bars (Projection above top of beam)	± 3/4 inch
Stirrup Bars (Longitudinal spacing)	± 2 inches
Tendon Position	± 1/8 inch center of gravity of strand group and individual tendons
Strand Projection	± 1 inch
Diagonal Tolerance	± 1/4 inch
Position of Deflection Points for Deflected Strands	± 6 inches, longitudinal
Position of Lifting Devices	± 6 inches, longitudinal
Side Inserts (Centerline to centerline and centerline to end)	± 1/2 inch
Coil Inserts (Centerline to centerline and centerline to end)	± 2 inches horizontal, except must be 3 inches or more from end of beam and within reinforcement cage of bent, ± 1 inch vertical
Exposed Beam Ends (Deviation from square or designated skew)	± 1/4 inch horizontal, ± 1/8 inch vertical per foot of beam height
Bearing Area (Deviation from plane)	± 1/8 inch
Bearing Plates (Centerline to centerline)	± 1/8 inch per 10 feet of beam length, but not greater than 3/4 inch
Bearing Plates (Centerline to end of beam)	± 1/2 inch
Center of Stem to Outside Edge of Top Flange	± 1/8 inch
Center to Center Distance Between Stems	± 1/8 inch
Stem End to End of Top Flange	± 1/4 inch
Diaphragm Hole Location	± 1 1/2 inches for centerline of group

	± 1/2 inch within group
Scupper holes, blockouts and voids	Placed as close as possible to design location after reinforcement steel and strands are properly located

Table III
Dimensional Tolerances – Deck Panels

Length	+ 1/8 inch, -1/2 inch
Width	± 1/4 inch
Depth	± 1/8 inch
Stirrup Bars (Projection above top of panel)	± 1/4 inch
Stirrup Bars (Longitudinal spacing)	± 1 inch
Tendon Position	± 1/8 inch center of gravity of strand group and individual tendons
Strand Projection	± 1 inch
Diagonal Tolerance	± 1/4 inch
Scupper holes, blockouts and voids	Placed as close as possible to design location after reinforcement steel and strands are properly located
Warpage of corner (one corner out of plane of other three)	Be 1/16 in./ft times the distance from the nearest adjacent corner
Bowing or camber, concave or convex, of any part of a flat surface	Shall not exceed length of bow in inches divided by 360, with maximum of 3/4 inch; and differential bowing or camber between the adjacent members of the same design shall not exceed 1/4 inch
Scupper holes, blockouts and voids	Placed as close as possible to design location after reinforcement steel and strands are properly located

SECTION 1032 – PRECAST CONCRETE FLARED END SECTIONS

Amend Sec 1032.3.1 through 1032.3.4.3 to include the following: ***01/16***

1032.3.1 Acceptance Criteria. Acceptability of end sections for all diameters will be determined by the results of such material tests as required in Sec 1026.3, by crushing tests on concrete cores or cured concrete cylinders, and by inspection of the finished end sections, including quantity and placement of reinforcement, to determine the conformance with the design and the freedom from defects.

1032.3.2 Certification. When allowed by the engineer, end sections from approved plants will be accepted based on certification, manufacturer quality control documentation and tests on samples as required by the engineer in accordance with Sec 1026.

1032.3.3 Standard Reinforcement. Flared end sections, utilizing rebar or cold drawn steel wire, shall be in accordance with Sec 1026 for Class II pipe or higher classes of pipe.

1032.3.4 Steel Fibers. Steel fibers may be used in lieu of standard reinforcement. Steel fibers shall be in accordance with ASTM A820.

1032.3.4.1 Design. The amount of steel fibers required in the flared end shall be determined through proof of design testing accordance with ASTM C1765, Section 9, for Class III pipe of the same diameter. Proof of design documentation shall be provided to the engineer upon request.

1032.3.4.2 Mix Verification. Proof of design testing shall be performed every three years. Additional proof of design testing shall be performed when the type of steel fiber is changed or when the dosage rate of the steel fibers is changed.

1032.3.4.3 Workmanship. All protruding steel fibers shall be removed from the flared end prior to shipping.

SECTION 1033 – PRECAST DRAINAGE UNITS

Delete Sec 1033.2 and substitute the following: ***05/13***

1033.2 Acceptance. Unless otherwise specified, the basis for acceptance shall be in accordance with Sec 1001.14 and AASHTO M 199.

Amend Sec 1033.2.1 through Sec 1033.2.7 to include the following: ***05/13***

1033.2.1 Lot Size Definition. A lot is defined as one day's production.

1033.2.2 Quality Control. The producer QM plan shall define quality control testing and inspection frequencies and shall include the following minimum requirements.

1033.2.2.1 Compressive strength of cylinders or cores shall be taken at a minimum of once per lot in accordance with AASHTO M 199. Compressive strength testing may also be performed to control handling and curing operations. Cylinders shall be cured in accordance with AASHTO T23 field curing procedures.

1033.2.2.2 Air and slump of fresh concrete shall be taken a minimum of once per lot.

1033.2.2.3 Aggregate gradation, absorption and deleterious shall be checked a minimum of once per month per aggregate source in accordance with Sec 1005.

1033.2.2.4 Absorption samples shall be taken and tested in accordance with AASHTO M199 a minimum of once every four months. Each sample shall be a piece broken, core drilled from the wall, having a thickness equal to the wall and free of visible cracks.

1033.2.2.5 Steel placement shall be checked and documented for each unit.

1033.2.2.6 Finished dimensions shall be checked and documented for each unit.

1033.2.2.7 Pull out testing of steps and ladders shall be checked in accordance with AASHTO M199.

1033.2.2.8 All equipment used for testing shall be maintained and calibrated in accordance with AASHTO R18 or equivalent program.

1033.2.2.9 Concrete plant(s) shall be calibrated and monitored in accordance with producer's QMP.

1033.2.3 Quality Assurance. The QMP shall reference an industry organization or define independent QA testing frequencies including the following:

Tested Property[a]	Test Method	Independent QA
Air	T152	Twice a year
Slump	T119	Twice a year
Coarse Aggregate Deleterious	TM71	Twice a year
Coarse Aggregate Absorption	T85	Twice a year
Compressive Strength	T22	Twice a year
Absorption (per mix)	T280	Once a year
[a] All samples shall be taken at the precast plant		

1033.2.4 MoDOT Hold Points:

1033.2.4.1 Prior to shipping, producers shall notify MoDOT and obtain a MoDOT identification number(s).

1033.2.4.2 Repair methods and completion of repairs for non-conforming work shall be approved by the engineer and contractor.

1033.2.5 MoDOT Quality Assurance and Auditing. The engineer may perform MoDOT Quality Assurance testing or audit the producer's QMP, documentation and production at any time, which may include coring of the precast units and the producer's expense.

1033.2.6 Deficient Work. A procedure addressing deficient work shall be in accordance with Sec 1001.14.

1033.2.6.1 Filling of form tie cavities and repair of other defects shall be in accordance with Sec 703.

1033.2.7 Non-Conforming Work. A procedure addressing non-conforming work shall be in accordance with Sec 1001.14.

SECTION 1036 – REINFORCING STEEL FOR CONCRETE

Delete Sec 1036.4.1 and substitute the following: ***03/14***

1036.4.1 Epoxy coated reinforcing steel shall be in accordance with ASTM A 775/A 775M except as otherwise specified herein or shown on the plans.

SECTION 1039 – EPOXY RESIN MATERIAL

Delete Sec 1039.40.2 and substitute the following: ***10/11***

1039.40.2 General Requirements. The epoxy shall be furnished as a system in accordance with the requirements of ASTM C 881, Type IV, and Grade 3 and as described herein. When a cartridge dispensing system is used the epoxy shall have a gel time as stated in ASTM C 881 paragraph 5.2.

Delete Sec 1039.40.3 and substitute the following: ***10/14***

1039.40.3 Pull Test. The epoxy bonding agent shall exhibit good bonding properties between the anchored product and the existing concrete and shall cure in less than 24 hours or manufacturer's recommendation. For acceptance on the qualified list, Resin Anchor Systems shall be tested in accordance with MoDOT Test Method TM 74. The ultimate minimum pull-out load shall be in accordance with the following table. When tested in accordance with ASTM E 488 the minimum embedment for each size anchor shall be determined and the minimum ultimate pullout loads shall be in accordance with the following table:

Pull-Out Specification Requirements	
Diameter of Threaded Rod or Reinforcing Bar	**Minimum Ultimate Pullout Strength**
1/2"	9,800 lbs
5/8"	15,500 lbs
3/4"	20,400 lbs
7/8"	27,500 lbs
1"	33,600 lbs

SECTION 1040 – GUARDRAIL, END TERMINALS, ONE-STRAND ACCESS RESTRAINT CABLE AND THREE-STRAND GUARD CABLE

Delete Sec 1040.3 and Sec 1040.3.1 and substitute the following: ***08/12***

1040.3 Steel Beam Guardrail. Guardrail beams shall be of the class and type shown on the plans. Guardrail beams shall be in accordance with AASHTO M 180, Type 1 or Type 2.

1040.3.1 Test Specimens. Test specimens for mechanical properties, irrespective of the galvanization method, shall be prepared and tested in accordance with ASTM A 653.

Delete Sec 1040.3.5 and substitute the following: ***11/12***

1040.3.5 Brand Registration and Guarantee. The manufacturer shall submit a brand registration and guarantee, and current test results indicating compliance with this specification prior to delivery of any material. Once the brand registration and guarantee is approved, the manufacturer's name will be added to the qualified list of guardrail fabricators.

Delete Sec 1040.8 and substitute the following: ***11/12***

1040.8 Repair of Galvanizing. Galvanized material shall be handled in a manner to avoid damage to the surface. No field punching, drilling, cutting or welding will be permitted after galvanizing. Any galvanized material on which the spelter coating has been damaged will be rejected or may be repaired in accordance with Sec 1081, with approval from the engineer.

TABLE I - Certification Requirements

Item	Galvanizing Standard	Steel Grade	Other
Wood Post and Blocks	-	-	a
Steel Posts, Plates and Brackets	AASHTO M 111	AASHTO M 270, Grade 36	b
Plastic Blocks	-	-	g
Guardrail Beam	Sec 1040.3	Sec 1040.3	b, c
Bolts, Nuts and Washers	AASHTO M 232	ASTM A 307	
End Terminals Systems	-	-	f
End Anchors			
- Tubes	AASHTO M 111	ASTM A 500/ASTM A 501	b
- Transition Cap Rail	AASHTO M 111	AASHTO M 270, Grade 36	b
One-Strand Access Restraint Cable			
- Cable	AASHTO M 30	AASHTO M 30	b
- Hardware	AASHTO M 232	AASHTO M 102/ ASTM A 220	b
Three Strand Guard Cable			b
- Cable	AASHTO M30	AASHTO M 30 & AASHTO M 269	d
- Hardware	AASHTO M 232	AASHTO M 102/ ASTM A 220	d d
- Cast Steel Components	AASHTO M 232	AASHTO M 103	
- Malleable Iron Castings	AASHTO M 232	ASTM A 47	e
- Anchor Brackets	AASHTO M 111	AASHTO M 270	
- Cable Brackets	AASHTO M 111	AASHTO M 270, Grade 36	d
- Hook and Hex Bolts	AASHTO M 232	ASTM A 307	
- Hook Nuts	AASHTO M 232	ASTM A 563	
- Hooked Anchor Studs	AASHTO M 232	AASHTO M 314	

(a) Certification shall state that the material is in accordance with Sec 1050 and shall include a listing of the material supplied and a certified test report as detailed in Section 7.2 of AWPA, Standard M2, attesting to complete compliance with this specification.

(b) Certification shall include, or have attached, specific results of laboratory tests for physical and chemical properties from samples representative of the material.

(c) Shall have Brand Registration and Guarantee on file.

(d) All threaded parts of compensating cable end assemblies and hooked anchor studs shall be in accordance with ASTM F 568.

(e) All fittings for cable bracket, except the cable wedge, shall be in accordance with AASHTO M 232 or AASHTO M 298.

(f) Certification shall state the name of the manufacturer and that the units furnished are identical in material and design as those tested for performance in accordance with Sec 606.30.

(g) Certification shall state that the materials furnished are identical in chemistry, mechanical properties and geometry as those that passed the NCHRP 350 crash test, and as those that were approved by the Missouri Department of Transportation.

SECTION 1041 – POLYPROPYLENE CULVERT PIPE

Delete Sec 1041.1 through Sec 1041.3.1 and substitute the following: ***08/13***

1041.1 Scope. This specification covers polypropylene culvert pipe intended for use in the construction of culverts, sewers and similar uses.

1041.2 Basis of Acceptance. Acceptance of polypropylene culvert pipe will be based upon the pipe being in accordance with this specification. Pipe shall be provided from an approved manufacturer, and will be accepted based on certification, identification markings and results from tests required by the engineer.

1041.3 Material. All polypropylene culvert pipe, couplings and fittings shall be in accordance with ASTM F 2736 for double wall and ASTM F 2764 for triple wall, except as follows.

1041.3.1 Section properties shall be within the following limits:

		Minimum						**Maximum**
	Nominal Size S (in.)	Effective Pipe Wall Area A_{eff} (in.^{2}/in.)	Pipe Wall Centroid to Inside Face y_c (in.)	Pipe Wall Moment of Inertia I (in.^{4}/in.)	Area Ratio[a] A_{eff} / A_g	Extreme Fiber Ratio[b] y_c / c	Inside Diameter D_i (in.)	Outside Diameter D_o (in.)
Double Wall	12	0.168	0.445	0.0314	0.803	0.586	11.97	14.65
	15	0.216	0.537	0.0538	0.821	0.687	14.85	17.81
	18	0.217	0.569	0.0747	0.777	0.549	17.82	21.42
	24	0.241	0.710	0.1318	0.723	0.558	23.85	28.34
	30	0.248	0.882	0.2732	0.661	0.475	29.70	35.81
Triple Wall	30	0.324	1.107	0.4416	0.676	0.681	29.70	35.81
	36	0.315	1.363	0.4808	0.653	1.000	35.39	41.62
	42	0.452	1.208	0.5554	0.817	0.797	41.38	47.72
	48	0.348	1.535	0.9460	0.542	0.980	46.92	54.14
	60	0.541	1.627	1.2088	0.739	0.812	58.65	67.17

[a] A_g equals gross area of pipe wall per unit length of pipe (in^2/in.).
[b] c equals the distance from the pipe wall centroid to the outermost fiber (in.).

Delete Sec 1041.3.3 and substitute the following: ***08/13***

1041.3.3 Field joints of polypropylene pipe shall provide circumferential and longitudinal strength to maintain the pipe alignment, prevent separation of pipe and prevent infiltration of fill material. Coupling bands, if used, shall be of the same base material as the pipe. Prior to use, the design of coupling bands and fastening devices shall be submitted to and approved by Construction and Materials. Final acceptance of coupling bands and fastening devices will be based on field performance.

Delete Sec 1041.3.5 in its entirety: ***02/12;08/13***

Delete Sec 1041.3.6 in its entirety: ***08/13***

Delete Sec 104.4.6 and substitute the following: ***08/13***

1041.4.6 Sampling of Material. Random sampling of the pipe will be conducted by the engineer to verify if the pipe and material are in accordance with these specifications. Samples of polypropylene pipe will be obtained from fabricated culvert sections in accordance with ASTM F 2736 or ASTM F 2764 at a frequency determined by the engineer.

SECTION 1042 – HIGHWAY SIGN MATERIAL

Delete Sec 1042.2.7 thru 1042.2.7.3 and substitute the following: ***02/12; 04/13***

1042.2.7 Retroreflective Sheeting. Retroreflective sheeting shall be in accordance with latest versions or ASTM D 4956 and AASHTO M 268, except as noted herein. Color and luminance values for all MoDOT types of reflective sheeting shall be in accordance with ASTM D 4956. Retroreflective sheeting shall have sufficient adhesion, strength and flexibility such that the sheeting can be handled, processed and applied according to the manufacturer's recommendations without appreciable stretching,

tearing, cracking or other damage. Adhesive performance for retroreflective sheeting shall be in accordance with ASTM D 4956. The sheeting surface shall be in condition to be readily screen processed and compatible with transparent overlay films, plus recommended transparent and opaque screen process colors. The retroreflective sheeting manufacturer shall furnish information as to the type of solvent or solvents that may be used to clean the surface of the sheeting without detrimental loss of performance and durability. Retroreflective sheeting having a datum mark on the surface shall be oriented vertically. ASTM D 4956 Type IX, XI or AASHTO M 268 Type C or D retroreflective sheeting applied as legend and border for specific signing applications, without a datum mark on the surface of the sheeting, shall be evaluated for rotational sensitivity per AASHTO M 268, Section 3.3. Retroreflective sheeting products that do not meet the rotational sensitivity requirements of Section 3.3 shall follow guidelines detailed in AASHTO M 268 Section 3.3.1 and fabricated per AASHTO M 268 Section 3.3.2.

1042.2.7.1 ASTM D 4956 Type I, Class 1 retroreflective sheeting shall be enclosed lens glass-bead or prismatic sheeting.

Delete Sec 1042.2.7.2 and substitute the following: ***04/13***

1042.2.7.2 Background sheeting applied to flat sheet and extruded panel signs shall be in accordance with ASTM D 4956 Type IV, Class 1. All yellow, orange and red sheeted signs shall be fabricated with ASTM D 4956 Type IX, XI or AASHTO M 268 Type C or D fluorescent yellow, fluorescent orange and prismatic red sheeting respectively. Retroreflective sheeting shall be high intensity that is an unmetallized micro prismatic reflective material.

1042.2.7.3 Retroreflective sheeting applied as legend and border shall be in accordance with ASTM D 4956, Type IX, XI or AASHTO Type C or D, Class 1.Retroreflective sheeting shall be an unmetallized cube corner microprismatic reflective material.

Amend Sec 1042.2.7.5 to include the following: ***04/13***

1042.2.7.5 Reflective sheeting for temporary traffic control devices and delineators shall be in accordance with Sec 1063 and Sec 1065 respectively.

Delete Sec 1042.2.7.3.1 thru 1042.2.7.3.2 in their entirety: ***02/12***

Delete Sec 1042.2.8 thru 1042.2.8.3 in their entirety and renumber accordingly: ***02/12***

Delete Sec 1042.3 thru 1042.3.1 and substitute the following: ***02/12***

1042.3 Sign Fabrication. A sign shall consist of aluminum flat sheets or extruded panels retroreflectorized on the face side with all letters, numerals, symbols, borders, corners and route shields mounted on the face, and shall include all necessary mounting devices shown on the plans. Signs equal to or greater in width than six feet are considered structural (ST) and shall be fabricated on extruded panels. Signs less than six feet in width will be considered sheet (SH) signs and shall be fabricated with flat sheet. Any exceptions to these fabrication standards will be indicated on the plans.

1042.3.1 All signs shall be of the highest quality with consistent daytime and nighttime color and retroreflectivity throughout the sign and produced as follows.

Delete Sec 1042.3.1.2 and substitute the following: ***02/12***

1042.3.1.2 All materials used to fabricate a sign legend, including retroreflective and non-retroreflective sheeting, used for background, letters, numerals, arrows, symbols, borders and other features of the sign message shall be from a single manufacturer.

Delete Sec 1042.3.2 thru 1042.3.4 and substitute the following: ***02/12***

1042.3.2 Nuts on panel bolts used to connect extruded panels together to form a structural sign shall be torqued to 220 - 230 inch-pounds.

1042.3.3 Signs will be accepted on certification from the manufacture assuring all fabrication and sheeting specifications are in compliance with all applicable requirements specified herein. Periodic shop inspections of sign fabrication will be made at the discretion of MoDOT, to include contractor furnished signs for MoDOT projects. Routine shop inspections will include inspection and sampling of materials, inspection of treatment and fabrication processes, and of any signs completed at time of inspection. Inspections on delivered signs for maintenance operations will be conducted for quality assurance purposes by the appropriate district inspectors. Signs may be rejected at the fabrication shop and/or upon delivery based on unsatisfactory workmanship and/or material applications or based on any aspect of the product that is not in accordance with the specifications. The contractor will be charged with the transportation costs of sign inspectors for trips from Jefferson City, Missouri to which the

inspectors must travel for signs provided to MoDOT projects. Transportation costs will be deducted by the Commission from monies due the contractor.

1042.3.4 Signs shall be packaged and shipped according to the reflective sheeting manufacture's recommendations. Signs fabricated and shipped to MoDOT for maintenance operations shall be shipped in accordance with manufacture's recommendations and in a manner that meets the requirements of the engineer. All signs shall include decals indicating sign production date, lot number of reflective sheeting used in the production of sign and other information necessary for proper sign fabrication. Upon shipment of signs to MoDOT, certifications shall be submitted thereafter to Construction and Materials. Required paperwork shall include a certification statement indicating signs meet all applicable requirements herein to include aluminum standard and extruded panel, reflective sheeting (manufacturer, series and color), and hardware certifications. Material quantities, such as square foot of flat sheet, extruded panels, if produced, reflective sheeting and a shipping list of all signs shall be included in the certification packet.

SECTION 1043 – FENCE MATERIAL

Delete Sec 1043.5.1 and substitute the following: ***12/13***

1043.5.1 Sampling Sampling of material shall be in accordance with the MoDOT's EPG 106.3.1.

SECTION 1044 – POST FOR MARKERS AND DELINEATORS

Delete Sec 1044.4.1.2 and substitute the following: ***11/12; 12/13***

1044.4.1.2 Coating. Posts shall be galvanized in accordance with ASTM A 653, G90. The corner weld shall be zinc coated after the scarfing operation. The steel shall also be coated with a chromate conversion coating and a clear organic polymer topcoat. Both the interior and the exterior of the post shall be galvanized.

SECTION 1047 – POLYETHYLENE CULVERT PIPE

Delete Sec 1047.1 and substitute the following: ***08/13***

1047.1 Scope. This specification covers polyethylene culvert pipe used for the construction of culverts and other uses specified in the contract documents.

Delete Sec 1047.3 through Sec 1047.3.2 and substitute the following: ***08/13***

1047.3 Material. Polyethylene culvert pipe, couplings and fittings shall be in accordance with AASHTO M 294 for corrugated or AASHTO MP 20 steel reinforced. In case of conflict with AASHTO M 294 or AASHTO MP 20, these specifications shall govern.

Delete Sec 1047.3.1 and substitute the following: ***04/15***

1047.3.1 Section properties shall be within the following limits:

	Corrugated						
	Minimum						Maximum
Nominal Size S (in.)	Effective Pipe Wall Area A_{eff} (in.^{2}/in.)	Pipe Wall Centroid to Inside Face y_c (in.)	Pipe Wall Moment of Inertia I (in.^{4}/in.)	Area Ratio[a] A_{eff} / A_g	Extreme Fiber Ratio[b] y_c / c	Inside Diameter D_i (in.)	Outside Diameter D_o (in.)
12	0.163	0.382	0.0313	0.699	0.494	12.02	14.60
15	0.202	0.413	0.0465	0.768	0.447	14.83	17.82
18	0.209	0.569	0.0653	0.749	0.554	17.83	21.42
24	0.233	0.669	0.1317	0.667	0.552	23.71	27.98
30	0.2330	0.757	0.2415	0.816	0.448	29.46	34.98
36	0.294	1.058	0.3153	0.683	0.588	35.44	41.92

42	0.331	1.140	0.5395	0.693	0.564	40.98	48.18
48	0.323	1.095	0.4682	0.681	0.543	47.12	54.34
60	0.438	1.477	0.8150	0.751	0.766	58.90	66.97

[a] A_g equals gross area of pipe wall per unit length of pipe (in^2/in.).
[b] c equals the distance from the pipe wall centroid to the outermost fiber (in.).

	Steel Reinforced			
	Minimum			Maximum
Nominal Size S (in.)	Wall Steel Area A ($in.^2$/ft)	Wall Steel Moment of Inertia I ($in.^4$/in.)	Rib Radius of Gyration r (in.)	Rib Width/ Thickness Ratio b/t
24	0.348	0.00063	0.144	8.97
30	0.344	0.00086	0.170	10.03
36	0.404	0.00122	0.187	10.36
42	0.461	0.00152	0.195	9.91
48	0.379	0.00218	0.257	11.90
60	0482	0.00352	0.290	11.88

1047.3.2 The pipe shall be Type S and not be perforated unless specified otherwise.

Delete Sec 1047.3.5 in its entirety and renumber subsequent sections accordingly: ***08/13***

SECTION 1048 – PAVEMENT MARKING MATERIAL

Delete Sec 1048.1 and substitute the following: ***07/15***

1048.1 Scope. This specification covers Type 1 and Type 2 preformed pavement marking tape, preformed removable pavement marking tape, preformed short-term pavement marking tape, drop-on glass beads, temporary raised pavement markers, epoxy pavement marking paint, acrylic copolymer fast dry pavement marking paint and waterborne pavement marking paint.

SECTION 1048.90 – HIGH BUILD WATERBORNE PAVEMENT MARKING PAINT

Delete Sec 1048.90.1 and substitute the following: ***07/15***

1048.90.1 Description. Waterborne pavement marking paint shall be capable of receiving and holding glass beads for producing retroreflective pavement marking.

SECTION 1048.100 – STANDARD WATERBORNE PAVEMENT MARKING PAINT

Delete Sec 1048.100.1 and substitute the following: ***07/15***

1048.100.1 Description. Standard waterborne pavement marking paint shall be capable of receiving and holding glass beads for producing retroreflective pavement marking.

SECTION 1049 – PRECAST CONCRETE BOX CULVERT

Delete Sec 1049.1 and 1049.2 and substitute the following: ***05/13***

1049.1 Scope. This specification covers precast concrete box culverts.

1049.2 Acceptance. The basis of acceptance will be with producer's QMP in accordance with Sec 1001.14.

Amend Sec 1049.2.1 to include the following: ***05/13***

1049.2.1 Lot Size Definition. A lot is defined as one day's production.

1049.2.2 Quality Control. The producer QMP shall define quality control testing and inspection frequencies and shall include the following minimum requirements.

1049.2.2.1 Compressive strength of cylinders or cores shall be taken at a minimum of once per lot in accordance with ASTM C1577. Compressive strength testing shall also be performed to control handling and curing operations. Cylinders shall be cured in accordance with AASHTO T23 field curing procedures.

1049.2.2.2 Air and slump of fresh concrete shall be taken a minimum of once per lot.

1049.2.2.3 Aggregate gradation, absorption and deleterious shall be checked a minimum of once per month per aggregate source in accordance with Sec 1005.

1049.2.2.4 Steel placement shall be checked and documented for each unit.

1049.2.2.5 Finished dimensions shall be checked and documented for each unit.

1049.2.2.6 All equipment used for testing shall be maintained and calibrated in accordance with AASHTO R18 or equivalent program.

1049.2.2.7 Concrete plant(s) shall be calibrated and monitored in accordance with the producer's QMP.

1049.2.3 Quality Assurance. The QMP shall reference an industry organization or define independent QA testing frequencies including the following:

Tested Property[a]	Test Method	Independent QA
Air	T152	Twice a year
Slump	T119	Twice a year
Coarse Aggregate Deleterious	TM71	Twice a year
Coarse Aggregate Absorption	T85	Twice a year
Compressive Strength	T22	Twice a year
Absorption (per mix)	T280	Once a year
[a] All samples shall be taken at the precast plant		

1049.2.4 MoDOT Hold Points.

1049.2.4.1 MoDOT shall verify steel placement prior to concrete pour.

1049.2.4.2 Prior to shipping, producers shall notify MoDOT and obtain a MoDOT identification number(s).

1049.2.4.3 Repair methods and completion of repairs for non-conforming work shall be approved by the engineer.

1049.2.5 MoDOT Quality Assurance and Auditing. The engineer may perform QA testing and audit the producer's QMP, documentation and production at any time, which may include coring of the precast units at the producer's expense.

1049.2.6 Deficient Work. A procedure addressing deficient work in accordance with Sec 1001.14.

1049.2.6.1 Filling of form tie cavities and repair of other defects shall be in accordance with Sec 703.

1049.2.7 Non-Conforming Work. A procedure addressing non-conforming work in accordance with Sec 1001.14.

Delete Sec 1049.3.6 and substitute the following: ***05/13***

1049.3.6 Concrete Mixture. Concrete shall be a minimum of 5,000 psi in accordance with ASTM C1577 and the mix design shall be approved by the engineer. Admixtures or blends may be used with approval from engineer.

Delete Sec 1049.4 and substitute the following: ***05/13***

1049.4 Design. Except as otherwise specified herein, precast concrete box sections for the culvert shall be in accordance with ASTM C 1577. Designs shall be submitted to the inspecting District.

Delete Sec 1049.4.2 and substitute the following: ***05/13***

1049.4.2 Special Designs. The producer shall request approval of any modified and special designs which differ from the designs in ASTM C 1577. The request for such modified and special designs shall fully describe any deviations from those standards, including a drawing showing wall thickness, concrete design strength, the type, size and placement of reinforcement, and inside or outside dimensions of both of the box sections.

Delete Sec 1049.5.1 and 1049.5.2 and substitute the following: ***05/13***

1049.5.1 Curing. Curing shall be in accordance with Sec 1026 until the concrete has developed the specified compressive strength.

1049.5.2 The producer shall ensure that the placing, finishing and consolidating of concrete is in accordance with their producer quality management plan. Temperatures shall be maintained to prevent detrimental effects to precast production and the following:

a) Concrete placed in cold weather shall be protected from freezing during the curing period by the use of a heated, weatherproof enclosure. Concrete shall not be placed on or against reinforcing steel or other surfaces with temperatures lower than 35 °F. No concrete shall be placed when the enclosure ambient temperature is below 35 °F.

The temperature of the mixed concrete when placed shall be no higher than 90 °F. The forms and reinforcing steel shall be cooled by acceptable methods to an ambient temperature of 90 °F or lower.

Amend Sec 1049.5.3 to include the following: ***05/13***

1049.5.3 Permissible Variations. Dimensions, position of reinforcement, area of reinforcement and haunch dimensions shall be in accordance with ASTM C1577.

1049.6 Marking. The following information shall be legibly marked on each box section by indentation, waterproof paint or other approved means. Box section span, rise, maximum and minimum design earth cover and specification designation.

a) Date of manufacture.
b) Name or trademark of the manufacturer.
c) Indicator required by the QC program.
d) Sample Identification Number.
e) Station where the unit will be installed.
f) Each section shall be clearly marked on either the inner or the outer surface during the process of manufacture. In addition, the word "top" shall be lettered with waterproof paint on the inside of the top surface.

1049.7 MoDOT Identification Number. The producer shall contact the engineer, a minimum of one business day, prior to shipping precast products. The engineer shall assign a specific MoDOT identification number for each size and type of product in the shipment.

1049.7.1 Prior to delivery to the jobsite, the source, intermediate agent, shipper or contractor's representative shall notify the inspecting District by fax or electronically a minimum of one business day or earlier, prior to the impending shipment of precast material. This notification shall include a shipping form (Precast Shipping Form) and will include, at minimum, the following:

a) Contract Number and Project Number.
b) Receiving Purchaser/Contractor.
c) Type and quantity of material.
d) Date of expected delivery to the jobsite.
e) Manufacturer's name.
f) Stationing or structure number on precast unit, if applicable.

1049.7.2 The precast unit shall be clearly and permanently marked by the precaster with the ID number in accordance with Sec 1049.7 prior to shipment. Requests for alternate precast labeling shall be submitted to the inspecting District for approval. Material without proper identification number shall not be permitted for use on a project.

1049.8 Delivery. A bill of lading or delivery receipt for each shipment shall be furnished to the engineer at the destination point. The bill of lading shall contain an itemized statement of the sizes and lengths of precast units with the corresponding designated

MoDOT identification number provided to the manufacturer for each size and type of precast unit for that shipment. The bill of lading shall contain a certified statement. The certified statement shall be signed by an authorized representative of the manufacturer and shall state the following:

"This certifies that the precast products in this shipment are in accordance with MoDOT specifications."

SECTION 1050 – LUMBER, TIMBER, PILING, POSTS AND POLES

Delete Sec 1050.2.1 and 1050.2.2 and substitute the following: ***04/13***

1050.2.1 Posts and Blocks for Guardrail. Posts and blocks for guardrail shall be rectangular, standard rough sawn and of the size and length shown on the plans. Posts and blocks shall be pressure treated in accordance with Sec 1050.6. All framing and boring shall be completed before treatment. Douglas Fir shall be "Dense No. 1 Structural Grade" in accordance with Paragraph 131-bb of the current *Standard Grading Rules for West Coast Lumber*. Southern Pine shall be "No. 1 Dense Grade" in accordance with Paragraph 406 of the current *Standard Grading Rules for Southern Pine Lumber*.

1050.2.2 Posts for Fence. Posts for fence shall be round and of the sizes and lengths shown on the plans. Posts shall be pressure-treated in accordance with Sec 1050.6. Allowable tolerances for size and length will be as follows:

Fence Post Tolerances	
Dimension	**Tolerance**
≤ 4-inch diameter	+1/2, No minus tolerance
> 4-inch diameter	+1 inch, No minus tolerance
All Lengths (any diameter)	No limit on over length, Minus 1 inch

Delete Sec 1050.2.3 and 1050.2.4 and substitute the following: ***04/13***

1050.2.3 Posts for One-Strand Access Restraint Cable. Posts for one-strand access restraint cable may be round or rectangular, as shown on the plans. Round posts shall be in accordance with Sec 1050.2.2. Rectangular posts shall be standard rough sawn and of the grade specified in Sec 1050.2.2.1. All posts shall be in accordance with Sec 1050.6.

1050.2.4 Posts for Signs. Posts for signs shall be rectangular, rough sawn or surfaced four sides (S4S), with square cut ends, and shall be of the grade, size and length shown on the plans. Posts shall be pressure-treated in accordance with Sec 1050.6. Other preservatives and wood species shall be in accordance with applicable AWPA Standards. If framing and boring is completed after pressure treatment, field treatment shall be in accordance with Sec 1050.7.

Amend Sec 1050.2.4.1 and 1050.2.4.2 to include the following: ***04/13***

1050.2.4.1 Permanent. Project sign posts shall be treated to Use Category (UC) 4B.

1050.2.4.2 Temporary. Post for temporary use shall be treated to UC 4A.

Delete Sec 1050.3.3 and substitute the following: ***04/13***

1050.3.3 Treatment. If treatment is specified, lumber and timber shall be pressure-treated in accordance with Sec 1050.6.

Delete Sec 1050.4.1 and 1050.4.2 and substitute the following: ***04/13***

1050.4.1 Electric Substation and Services Poles. Electric substation and service poles shall be of the length and class specified in the contract documents, and shall be in accordance with ANSI O5.1. Poles shall be pressure treated in accordance with Sec 1050.6. Poles may be gained and drilled in the field after treatment. Areas exposed shall be treated in accordance with Sec 1050.7 before cross-arms or equipment are mounted.

1050.4.2 Span Wire Assembly Poles. Span wire assembly poles shall be of the length specified in the contract and shall be in accordance with ANSI 05.1, Class IV, unless otherwise specified. The poles shall be pressure treated in accordance with Sec 1050.6. All poles shall have a minimum diameter of 6 3/4 inches, measured at the top of the pole.

Delete Sec 1050.5.2 and 1050.6 and substitute the following: ***04/13***

1050.5.2 Chemical Treatment. Piles shall be pressure treated in accordance with Sec 1050.6. Framing and boring will not be required before treatment. Exposed untreated areas resulting from framing of treated piling shall be field treated in accordance with Sec 1050.7. Untreated piles for use in unexposed locations or in temporary bridges shall be of the species approved by the engineer.

1050.6 Timber Preservatives Pressure preservative treatment shall be in accordance with current AASHTO Standard M-133.

Delete Sec 1050.6.1 thru 1050.6.4 in their entirety and renumber accordingly: ***04/13***

Delete Sec 1050.6.6 in its entirety: ***04/13***

Delete Sec 1050.7 and substitute the following: ***04/13***

1050.7 Care After Treatment. Care shall be taken in handling pressure-treated material to avoid damage. Cant hooks, peavies, pickaroons and end cant hooks shall not be used on the side surfaces of treated material. All handling of treated round stock with pointed tools shall be confined to the ends. If damaged material is permitted for use by the engineer, or framing at site is required, remediation following current AWPA Standard M4 shall be followed.

Delete Sec 1050.10 and substitute the following: ***04/13***

1050.10 Acceptance. Acceptance of material will be based on satisfactory supplier's certification or inspection agency certifications, and upon results of any tests deemed necessary by the engineer at destination to ascertain compliance with these specifications.

TABLE I

Circumferences and Diameters of Timber Piles, (in.)

Length ft	Class A 3 ft From Butt				Tip		Class B 3 ft From Butt				Tip		Class C 3 ft From Butt				Tip	
	Min		Max		Min		Min		Max		Min		Min		Max		Min	
	Cir	Dia	Cir	Dia	Cir	Dia	Cir	Dia	Cir	Dia	Cir	Dia	Cir	Dia	Cir	Dia	Cir	Dia
Up to 50	47	15	57	18	28	9	38	12	63	20	25	8	38	12	63	20	25	8
Over 50	47	15	57	18	25	8	41	13	63	20	22	7	38	12	63	20	22	7

SECTION 1052 – MECHANICALLY STABILIZED EARTH WALL SYSTEM COMPONENTS

Delete Sec 1052.1 and substitute the following: ***05/13***

1052.1 This specification covers material requirements for metallic soil reinforcement, non-metallic soil reinforcement, concrete facing panels for large block wall systems, and concrete blocks for small block wall systems that are supplied as part of mechanically stabilized earth wall systems. All precast items shall be in accordance with Sec 1001.

Delete Sec 1052.10.3 and substitute the following: ***11/12***

1052.10.3 Reinforcement Mesh. Metallic soil reinforcement mesh shall be in accordance with the specifications of the manufacturer of the wall system and the contract documents. The minimum grade of steel for strips and connection devices shall be either AASHTO M 270 Grade 36, ASTM A 1011 Grade 50 or ASTM A 463 Grade 50. Welding shall be in accordance with AASHTO M 55.

Delete Sec 1052.10.5 and substitute the following: ***11/12***

1052.10.5 Galvanizing and Aluminizing. All soil reinforcement material shall be either galvanized or aluminized. Galvanized soil reinforcement shall be in accordance with AASHTO M 111. Aluminized soil reinforcement shall be in accordance with ASTM A 463 Aluminized Type 2-100, SS, Grade 50, Class 2. Fasteners, including bolts, nuts and washers, shall be galvanized

in accordance with AASHTO M 232. All connection devices shall be galvanized in accordance with either AASHTO M 111 or M 232.

Delete Sec 1052.30 and 1052.30.1 and substitute the following: ***05/13***

SECTION 1052.30 MSE PANEL AND SOUND WALLS

1052.30.1 Scope. This specification covers the concrete facing panels used as part of mechanically stabilized earth wall systems and sound wall systems.

Amend Sec 1052.30.2 to include the following and renumber subsequent Secs accordingly: ***05/13***

1052.30.2 Acceptance.

1052.30.2.1 Lot Definition. A production lot will be defined as a group of panels and precast posts that will be represented by a single compressive strength sample, and shall consist of either 40 panels and or precast posts or a single day's production, whichever is less.

1052.30.2.2 Quality Control. The QMP shall define QC testing and inspection frequencies including the following.

1052.30.2.3 Compressive strength of cylinders or cores shall be taken at least once a lot in accordance with AASHTO M199. Compressive strength testing may also be performed to control handling and curing operations. Cylinders shall be cured in accordance with AASHTO T23 field curing procedures. For field cure compressive strength samples sufficient cylinders shall be cured in the same manner as the panels and precast posts and tested in accordance with AASHTO T22, shall represent the initial strength of the concrete. In addition, a set of cylinders shall be cured in accordance with AASHTO T23 and tested at 28 days. The average compressive strength of these cylinders, when tested in accordance with AASHTO T22, shall represent the compressive strength of the production lot.

1052.30.2.4 Air content testing shall be performed in accordance with AASHTO T152 or AASHTO T196. Air content samples shall be taken at the beginning of each day's production and at the same time as compressive samples are taken to ensure compliance with this specification.

1052.30.2.5 Slump testing shall be performed in accordance with AASHTO T119. The slump shall be determined at the beginning of each day's production and at the same time as the compressive strength samples are taken.

1052.30.2.6 Aggregate gradation and quality shall be checked at least once a month per aggregate source to ensure compliance with the specifications.

1052.30.2.7 Steel placement shall be checked for each unit.

1052.30.2.8 All equipment used for testing shall be maintained and calibrated in accordance with AASHTO R18 or equivalent program.

1052.30.2.9 QC shall ensure the concrete plant is calibrated, monitored, and maintained in a manner sufficient to provide uniform compliant concrete.

1052.30.2.10 Quality Assurance. The QMP shall reference an industry organization or define independent QA testing frequencies including the following:

Tested Property[a]	Test Method	Independent QA
Air	T152	Twice a year
Slump	T119	Twice a year
Coarse Aggregate Deleterious	TM71	Twice a year
Coarse Aggregate Absorption	T85	Twice a year
Compressive Strength	T22	Twice a year
[a] All samples shall be taken at the precast plant		

1052.30.2.11 MoDOT QA and Auditing. The engineer may perform MoDOT QA testing or audit the producer's QMP, documentation and production at any time, which may include coring of the precast units at the producer's expense.

1052.30.2.12 Other Criteria. Concrete facing panels, coping and precast posts will not be accepted if any of the following defects in physical characteristics are found: imperfect molding, honeycombing or open texture concrete, cracked or severely

chipped panels and precast posts, soil reinforcement attachment devices improperly installed/damaged, lifting inserts not useable, exposed reinforcing steel, and color variation on the front face of the panel due to excess form oil or other reasons.

Amend Sec 1052.30.3.3 and 1052.30.4 to include the following: ***05/13***

1052.30.3.3 Steel Reinforcement. Reinforcement shall be in accordance with Sec 1036.

1052.30.4 Design. Shop drawings shall be approved by the Bridge Division when the MSE wall is constructed in conjunction with a bridge abutment.

Delete Sec 1052.30.4.1 and substitute the following: ***05/13***

1052.30.4.1 The concrete shall be an approved MoDOT mix that is air-entrained, with a minimum compressive strength of 4,000 psi at 28 days. No additional admixtures will be permitted unless approved by the engineer.

Delete Sec 1052.30.5 through Sec 1052.30.5.2 and substitute the following: ***05/13***

1052.30.5 Manufacturing.

1052.30.5.1 Casting. The panels and precast posts shall be cast in such a manner that the acceptance criteria of this specification are met. Soil reinforcement connection devices shall not be in contact with or attached to the reinforcing steel in the concrete facing panels.

1052.30.5.2 Curing. One of the following methods shall be used. Curing as recommended by the wall designer. Curing membrane, in accordance with Sec 1055, may be applied and if used shall be left intact until the strength requirements are met. Steam and moisture curing methods shall be in accordance with Sec 1029.

Delete Sec 1052.30.5.3 and substitute the following: ***05/13***

1052.30.5.3 Tolerances.

Amend Sec 1052.30.5.3.1 through Sec 1052.30.5.3.4 to include the following: ***05/13***

1052.30.5.3.1 Panel and Post Systems. Shall be in accordance with approved shop drawings. Any variations from the approved shop drawings such as dimensions, materials, or finish must be approved by the wall manufacturer. Post dimensions for sound walls shall be within 1/4 inch in width and depth and within one inch along the length dimension.

1052.30.5.3.2 Panel Dimensions. Panel connection devices shall be within one inch of the specified dimension. The panel face and thickness dimensions shall be within 1/8 inch of the specified dimension. All other dimensions or items shall be within 1/4 inch of the specified dimensions.

1052.30.5.3.3 Panel Squareness. Squareness, as determined by the difference between the two diagonals, shall not exceed 1/2 inch.

1052.30.5.3.4 Panel Surface Finish. Surface defects on smooth formed surfaces measured over a length of 5 feet shall not exceed 1/8 inch. Surface defects on the textured-finish surfaces, measured over a length of 5 feet, shall not exceed 3/8 inch.

Delete Sec 1052.30.5.4 and substitute the following: ***05/13***

1052.30.5.4 Other Criteria. Concrete facing panels, coping and precast posts will not be accepted if any of the following defects in physical characteristics are found: imperfect molding, honeycombing or open texture concrete, cracked or severely chipped panels and precast posts, soil reinforcement attachment devices improperly installed/damaged, lifting inserts not usable, exposed reinforcing steel, and color variation on the front face of the panel due to excess form oil or other reasons.

Delete Sec 1052.30.5.5 in its entirety: ***05/13***

Delete Sec 1052.30.7 and substitute the following: ***05/13***

1052.30.7 MoDOT Identification Number. When the manufacturer contacts the engineer one business day, or earlier, in advance of shipping precast products the engineer will assign a specific MoDOT identification number for each size and type of product in the shipment.

Amend Sec 1052.30.7.1 to include the following: ***05/13***

1052.30.7.1 Prior to delivery to the jobsite, the source, intermediate agent, shipper or contractor's representative shall notify the inspecting District by fax or electronically a minimum of one business day, or earlier, prior to the impending shipment of precast material. This notification shall include a shipping form (Precast Shipping Form) and will include, at minimum, the following:

a) The specific contract number.
b) Receiving Purchaser/Contractor.
c) Line number for which the material will be used.
d) Type and quantity of material.
e) Date of expected delivery to the jobsite.
f) Manufacturer's name.
g) Stationing or structure number on precast unit, if applicable.
h) Panel type, quantity and wall number for MSE panels.

1052.30.7.2 Upon approval, the precaster will receive an identification number. The precast unit shall be clearly and permanently marked by the precaster with the ID number as required by appropriate 1000 specification prior to shipment. Requests for alternate precast labeling shall be submitted to the inspecting District for approval. Material without proper identification number(s) will not be permitted for use on a project.

Delete Sec 1052.30.9 and substitute the following: ***05/13;08/13***

1052.30.9 Documentation. Copies of test results for all required tests, and any other supporting documentation shall be in accordance with Sec 1001.14.

Delete Sec 1052.30.9.1 through Sec 1052.30.9.3 in their entirety: ***05/13***

Delete Sec 1052.30.10 and substitute the following: ***05/13***

1052.30.10 Delivery. A bill of lading or delivery receipt shall be furnished to the engineer at the destination point. The bill of lading shall contain an itemized statement of the sizes and lengths of precast units with the corresponding MoDOT identification number provided to the manufacturer for each size and type of precast unit for that shipment. The bill of lading shall contain a certified statement. The certified statement shall be signed by an authorized representative of the manufacturer and shall state the following:

"This certifies that the precast products in this shipment are in accordance with MoDOT specifications."

Delete Sec 1052.30.10.1 through Sec 1052.10.3 in their entirety: ***05/13***

Delete Sec 1052.40.1 through Sec 1052.40.2.1 and substitute the following: ***05/13***

1052.40.1 Scope. This specification covers the concrete blocks used as part of small block mechanically stabilized earth wall systems. Wet cast blocks shall be produced in accordance with Sec 1052.30. Dry cast blocks shall be produced at stated below.

1052.40.2 Acceptance. Acceptance will be based upon manufacture test results compliant with the following requirements.

1052.40.2.1 Freeze Thaw Testing. The concrete blocks shall be tested for freeze-thaw durability in accordance with ASTM C1262. Freeze-thaw durability shall be based on tests from five specimens made with the same material, concrete mix design, manufacturing process and curing method conducted not more than 18 months prior to delivery. Test results will be required for each project.

Delete Sec 1052.40.1.1 and Sec 1052.40.1.2 in their entirety: ***05/13***

Delete Sec 1052.40.2.2 and substitute the following: ***05/13***

1052.40.2.2 Units that are not exposed to deicing salts shall be in accordance with the following testing requirements. When tested in water, the weight loss of each of five test specimens at the conclusion of 100 cycles shall not exceed 1.0 percent of its initial weight; or the weight loss of each of four of the five test specimens at the conclusion of 150 cycles shall not exceed 1.5 percent of its initial weight.

Amend Sec 1052.40.2.3 to include the following: ***05/13***

1052.40.2.3 Test results for units that are exposed to deicing salts shall be tested in a 3 percent saline solution and shall be in accordance with the following:

a) When tested in 3 percent saline solution the weight loss of each of five test specimens at the conclusion of 40 cycles shall not exceed 1.0 percent of the initial weight; or the weight loss of each of four of the five test specimens at the conclusion of 50 cycles shall not exceed 1.5 percent of its initial weight.

1052.40.2.4 Compressive Strength. Acceptance of the compressive strength of the concrete blocks will be based on production lots in compliance with ASTM C140. Acceptance of the compressive strength of a production lot will occur if the compressive strength test results is equal to or greater than the design strength at 28 days. The engineer of record shall evaluate and approve acceptance of deviations below design strength.

1052.40.2.5 Absorption. The manufacturer shall sample and test units based on production lots for absorption in accordance with ASTM C140.

1052.40.2.6 Dimensional Tolerances. Concrete blocks shall be manufactured within the following tolerances:

a) The length and width of each concrete block shall be within 1/8 inch of the specified dimension.
b) The height of each concrete block shall be within 1/16 inch of the specified dimension.
c) When a broken face finish is used, the dimension of the front face shall be within one inch of the theoretical dimension of the concrete block.

1052.40.2.7 Other Criteria. All concrete blocks shall be sound and free of cracks or other defects that would interfere with the proper placement of the blocks or significantly impair the strength or permanence of the construction. At the time of the delivery to the work site the concrete blocks shall:

a) A maximum water absorption of 5 percent
b) Minor cracks incidental to the usual method of manufacture or minor chipping resulting from shipment and delivery will not be grounds for rejection. Minor cracks will be defined as cracks that are no wider than 1/64 inch and no longer than 25 percent of the block height.
c) Any exposed face of a concrete block shall be free of chips, cracks or other imperfections when viewed from a distance of 30 feet under diffused lighting. Up to 5 percent of a shipment may contain slight cracks or small chips no larger than one inch.

1052.40.2.8 Concrete blocks shall not be accepted if any of the requirements specified above or the following defects in physical characteristics are found:

a) Defects indicating imperfect molding.
b) Defects indicating honeycomb or open texture concrete.
c) Cracked or severely chipped blocks.
d) Color variation on front face of blocks.

1052.40.3 Material.

1052.40.3.1 Concrete. Concrete material, proportioning, air entraining, mixing, slump and transporting of concrete shall be in accordance with Sec 501, except as noted in this section. Coloring pigments, integral water repellants, finely ground silica and other constituents shall be previously directed as suitable for use and shall be in accordance with applicable ASTM standards, or evidence shall be provided to prove the product is not detrimental to the durability of the concrete blocks or any material customarily used in masonry construction.

1052.40.3.2 Aggregate. Fine and coarse aggregate for the concrete mixture shall be in accordance with Sec 1005, except that the requirements for gradation and percent passing the No. 200 sieve will not apply.

Delete Sec 1052.40.4 and substitute the following: ***05/13***

1052.40.4 Design. The concrete mixture shall have a minimum compressive strength of 4,000 psi at 28 days. The design including all contents of the mixture and curing method shall be submitted to the engineer for approval prior to use.

Delete Sec 1052.40.5 through Sec 1052.40.5.2 and substitute the following: ***05/13***

1052.40.5 Manufacturing

1052.40.5.1 Finish Color. Color and finish shall be as shown on the plans. If no color or finish is specified on the plans, the contractor shall provide a color and finish to the engineer for approval.

Delete Sec 1052.40.6 and substitute the following: ***05/13***

1052.40.6 Certification. The manufacturer of the concrete blocks shall certify that the concrete blocks are in accordance with this specification. This certification, copies of test results for all required tests, and any other supporting documentation shall be provided to the engineer prior to the material being shipped to the construction site.

Delete Sec 1052.40.7 through Sec 1052.408.6. in their entirety: ***05/13***

SECTION 1053 – CONCRETE SEALER

Delete entire Section and replace with the following: ***07/15***

1053.1 Scope. This specification covers concrete sealers for the protection of concrete against damage from de-icing chemicals.

1053.2 Manufacturer and Brand Name Approval. Prior to approval and use of concrete sealers, the manufacturer shall submit to Construction and Materials a certified test report from an approved testing laboratory showing specific test results conforming to the requirements of these specifications. The certified test report shall also contain the manufacturer's name, product brand name, lot number and date of manufacture. Upon approval from the engineer of this certified report, further test will not be required, except as hereinafter noted, of that manufacturer for that brand name. Once approved, the manufacturer and brand name will be added to a qualified products list(QPL). New certified test results shall be submitted any time the manufacturing process or the sealer formulation is changed, and may be required by the engineer when sampling and testing of material offered for use indicates nonconformance to any of the requirement herein specified. ASTM and AASHTO specifications, when referenced, control only the physical and chemical properties of the material.

1053.3 Penetrating Concrete Sealer.

1053.3.1 The sealer shall be a alkyltrialkoxysilane, with low oligomer and polymer compound content. The chemical composition shall meet the following requirements:

Property	Specification
Purity	95% minimum monomer by weight
Solvent	Less than 5% by weight
Residue	Less than 2% by weight
Density	Per the manufacturer's recommendation
Flash Point	ASTM D93: greater than 125 degrees F
Dry Time	ASTM D1640 Sec 7.5.1: One hour or less

1053.3.1.1 The ASTM D1640 test shall be performed on a concrete surface. This concrete shall be a mix design called for in Sec 1053.3.2. The application rate shall be the same rate specified in Sec 703.

1053.3.2 The sealer shall meet the following performance criteria based on a single application at the application rate specified in Sec 703. MoDOT reserves the right to verify any qualification tests at their expense on any field application. Test specimens shall be produced using either the MoDOT Class B-2 concrete in accordance with Sec 501 or the concrete mix specified by the test being performed.

Test	Test Method	Duration	Max Absorption / Cl^-
Water Immersion	ASTM C642	48 hours	0.5 percent by weight (mass)
Water Immersion	ASTM C642	50 days	1.5 percent by weight (mass)
Salt Water Ponding (based on non-abraded specimen)	AASHTO T259	90 days	80% min reduction in Cl^- absorption & 0.50 lbs/cu yd Cl^- at a depth of 1/2" - 1" max

1053.3.3 The sealer shall not permanently stain, discolor or darken the concrete. Application of the sealer shall not alter the surface texture or form a coating on the concrete surfaces.

1053.3.4 The sealer shall not leave residue on glass, painted metal or automobiles.

1053.3.5 The sealer shall not reduce the bond of pavement markings or reduce the skid resistance of the surface being sealed. Any sealer determined to have these adverse effects will be removed from the pre-qualified list.

1053.3.6 The sealer shall be delivered to the project in unopened containers with the manufacturer's label identifying the product and with the seal(s) intact. Each container shall be clearly marked by the manufacturer with the following information:

(a) Manufacturer's name and address.

(b) Product name.

(c) Date of manufacture and expiration date.

(d) Lot identification.

(e) Storage requirements.

SECTION 1055 – CONCRETE CURING MATERIAL

Delete Sec 1055.2.2.2 through 1055.2.2.4 and substitute the following: ***04/13***

1055.2.2.2 Type 1-D Curing Compounds. Type 1-D liquid membrane-forming curing compounds shall be in accordance with ASTM C 309 for Type 1-D, clear or translucent with fugitive dye.

1055.2.2.3 Type 2 Curing Compounds. Type 2, liquid membrane-forming curing compounds shall be in accordance with ASTM C 309 for Type 2, white pigmented.

1055.2.2.4 Bridge Curing Compounds. Bridge curing compounds shall be liquid membrane-curing compounds in accordance with ASTM C 309 for Type 1-D or Type 2 and shall be designated to be dissipating. All bridge curing compounds shall be manufactured such that the curing compounds may be removed prior to dissipation.

SECTION 1056 – CONCRETE TINTING AND STAINING MATERIAL

Delete entire Section and replace with the following: ***04/13***

SECTION 1056

CONCRETE TINTING AND STAINING MATERIAL

Delete Section Title 1056.10 and substitute the following: ***04/15***

SECTION 1056.10 CONRETE TINTING MATERIAL

1056.10.1 Description. This work item shall consist of providing a concrete tinting material to aesthetically color concrete as shown on the plans.

1056.10.2 Material Requirements. This material shall consist of a homogeneous mixture mineral oxide pigment of an approved tint with such other additives as deemed necessary by the manufacturer. The tinting material shall conform to the specification outlined on ASTM C979. The material shall be free from oil, grease, dirt and nonferrous particles. The tinting material shall not contain any material that might promote oxidation of the iron particles if exposed to air and moisture, or that might have any detrimental effect on concrete. The contractor shall supply the engineer with a manufacturer's certification indicating that the material supplied is in accordance with this specification.

1056.10.3 Construction Requirements. The contractor shall incorporate the tinting material into the concrete through mixing with the aggregate, cementitious material and water in accordance with the manufacturer's recommendation. The dry shake method; whereby the tinting material powder, combined with dry cement and sand, is sprinkled onto the concrete and worked into the surface through finishing; shall not be allowed.

SECTION 1056.20 CONCRETE STAINING MATERIAL

1056.20.1 Description. This work item shall consist of providing a field concrete stain to aesthetically color concrete exteriors as shown on the plans.

1056.20.2 Material Requirements. The material shall be two-coat, pigmented acrylic resin system which penetrates into the concrete surface to provide water repellency, semi-opaque aesthetic color and salt resistance and shall form a breathable film allowing trapped moisture vapor to safely migrate through the coating without blistering or peeling. The contractor shall supply the engineer with a manufacturer's certification indicating that the material supplied is in accordance with this specification.

1056.20.3 Construction Requirements. The concrete surface shall be fully cured a minimum of 28 days prior to application of the aesthetic concrete stain. The absence of moisture in the concrete surface shall be verified with standard test ASTM D4263. Pressure washing with a minimum of 3,000 psi shall be used to remove all foreign matter, form oils, waxes, curing compounds, laitance, efflorescence and dirt. Sand blasting will not be permitted for cleaning. The cleaned surface shall be free of blemishes, discolorations, surface voids and conspicuous form marks to the satisfaction of the engineer. The concrete stain shall be adequately mixed within its container until homogenous in color. Application of the stain shall be in accordance with the manufacturer's recommendations including allowable ambient conditions. Application of the stain will not be allowed during rain. All manufacturers' safety precautions shall be submitted to the engineer prior to work and followed during staining.

SECTION 1057 – MATERIAL FOR JOINTS

Delete Sec 1057.6 and substitute the following: ***12/11***

1057.6 Preformed Fiber Expansion Joint Filler. Preformed fiber expansion joint filler material shall be in accordance with AASHTO M 213. Percent asphalt content shall be tested in accordance with AASHTO T 42 or 164 with the following modifications: Oven dry test strips at 104 ± 3 C for one hour. Cool and weigh approximately 50 g into an extraction bowl. Cover test portion in the bowl with a chlorinated solvent, such as trichloroethylene, and allow sufficient time for solvent to soak the test portion. Follow test procedure outlined in AASHTO T 164 section 12.3 and 12.4, except discard extract and washings. Carefully transfer extracted test strips and scrap residue from the filter ring into a tared weighing pan. Oven dry at 104 ± 3 C for one (1) hour and cool in a desiccators. Calculate the percent asphalt content by weight on an oven dry basis per ASTM D 545 subsection 7.5.4. In cases of dispute, AASHTO T 42 test results will control.

Delete Sec 1057.8 and substitute the following: ***12/11; 05/12***

1057.8 Plastic Joint Compound for Vitrified Clay and Concrete Pipe. Plastic joint compound shall be a homogeneous blend of bituminous or butyl rubber material, inert filler and suitable solvents or plasticizing compounds thoroughly mixed at the factory to a uniform consistency suitable for sealing joints of vitrified clay and concrete pipe. The physical requirements of the compound shall be in accordance with ASTM C 990. Trowel grade material shall conform to the following requirement:

Bitumen, soluble in soluble chlorinated solvent, such as Trichloroethylene, percent by weight, min	45
Ash, percent by weight	15-50
Penetration, standard cone, 150 g, 5 sec, 25 C – use 12 ounce can, d mm	110-275

Primer, as recommended by the manufacturer, shall be used with extruded rope or flat tape types, if required to maintain the material in position while pipe sections are being joined.

Delete Sec 1057.9 and substitute the following: ***05/12***

1057.9 Tubular Joint Seal. Tubular joint seal shall be manufactured from extruded closed-cellular rubber, the base polymer being a blend of nitrile and vinyl meeting the physical requirements of ASTM D 1056, Type 2, Class C, Grade 1, and the chemical resistance requirements of ASTM C990. The seal shall be a single continuous part conforming to the joint shape. The outer surface shall be completely covered with a natural skin. The cross-sectional diameter and installation shall be in accordance with the manufacturer's recommendations for the size of pipe being placed.

Delete Sec 1057.12 and substitute the following: ***12/11***

1057.12 Documentation. All material specified in this section shall include certification showing representative test results of the material and certify that the material supplied is in accordance with these specifications.

SECTION 1058 – POLYETHYLENE SHEETING

Delete Sec 1058.2 and 1058.3 and substitute the following: ***12/11***

1058.2 Polyethylene Sheeting for Curing. Polyethylene sheeting for curing Portland cement concrete shall be white and shall be in accordance with ASTM C 171.

1058.3 Polyethylene Sheeting as a Bond Breaker. Polyethylene sheeting for use as a bond breaker between a bridge approach slab and a granular base shall be in accordance with ASTM E 1745 Performance Class A.

SECTION 1062 – PULL AND JUCTION BOXES

Amend Sec 1062.5 to include the following: ***04/15***

1062.5 Certification and Acceptance. The contractor shall furnish a manufacturer's certification that the material supplied, excepting material made from cast-in-place concrete, is in accordance with these specifications.

SECTION 1063 – TEMPORARY TRAFFIC CONTROL DEVICES

Delete Sec 1063.3 and substitute the following: ***04/13***

1063.3 Channelizers and Tubular Markers. All channelizers and tubular markers shall be manufactured from a non-metallic material, pigmented and molded of a Highway Orange color throughout and stabilized against fading by ultraviolet or other light rays by the incorporation of adequate inhibitors. Tubular markers shall be applied with reflective sheeting meeting either ASTM D 4956 Type 4 or 5. Drum-like channelizers shall be closed-top and applied with either ASTM D 4956 Type 3 or 4 reflective sheeting. Trim-line channelizers shall be applied with white sheeting meeting either ASTM D 4956 Type 3 or 4 and fluorescent orange in accordance with Sec 1042.2.7.3. All retroreflective marking on channelizers and tubular markers shall be in accordance with ASTM D 4956, Supplemental Requirements, Section S2. Retroreflective marking on cones will not be required.

Delete Sec 1063.4.1.2 and substitute the following: ***04/13***

1063.4.1.2 Sign Sheeting. All signs shall have a retroreflectorized background. Retroreflective sheeting shall be in accordance with Sec 1042, Type 4 or fluorescent orange and yellow, as shown on the plans. Sheeting shall be applied to the sign substrate in accordance with the manufacturer's recommendations and the surface shall be free of air bubbles, wrinkles or other blemishes as determined by the engineer.

Delete Sec 1063.4.2.1 and substitute the following: ***04/13***

1063.4.2.1 Sign Substrate. Sign and overlay blanks shall consist of either white, yellow, fluorescent orange and/or pink microprismatic retroreflective sheeting sealed to a heavy-duty coated fabric or vinyl material. The sheeting shall have a minimum coefficient of retroreflection, expressed as candelas per footcandle per square foot, as shown below, when measured in accordance with ASTM E 810 and shall meet the minimum color requirements in accordance with MGS-04-01L specification. The color specifications shall be in accordance with ASTM D 4956. Material shall be submitted by the manufacturer to NTPEP for a minimum exposure time of one year. Results shall be published by NTPEP and available for MoDOT review. For all NTPEP test decks, weathered material shall be within the color specification limits. Heat and impact resistance of the sheeting shall be in accordance with the latest version of ASTM D 4956.

Delete Sec 1063.4.6 and substitute the following: ***04/13***

1063.4.6 Advance Warning Rails. Advanced warning rails shall be supplied as a system of three rails as shown on the plans. The rail system may be post mounted or mounted on portable structures**.** When used on post mounted signs, the advance warning rails shall consists of substrate of high-density polyethylene plastic. The rail wall thickness shall be 1/4 in. with white and orange reflective sheeting in accordance with Sec 1042.2.7.3, and shall be applied as shown on the plans.

SECTION 1064 – TEMPORARY TRAFFIC BARRIER

Delete Sec 1064.2.2.1 and substitute the following: ***10/15***

1064.2.2.1 All material, in the manufacturing of three-loop type F temporary concrete barrier, shall be in accordance with the following specifications:

Item	Specification
Reinforcing Steel for Concrete	AASHTO M 31, Grade 60
Connection Rod	A36 Steel
Anchor Bolts	ASTM A307
Connection Rod Assembly	AASHTO M 183
Retainer Bolt and Nut	SAE Grade 8
Asphalt Pin	A36 Steel
Thrie Beam	Nested 12 Gage or 10 Gage
Thrie Beam Bolts	ASTM A307

SECTION 1065 – DELINEATORS

Delete Sec 1065.4 and substitute the following: ***11/12***

1065.4 Retroreflective Sheeting. The retroreflective sheeting shall be in accordance with ASTM D 4956 Type 5 or 8 requirements. Retroreflective sheeting shall be permanently affixed to the body of the delineator and follow guidelines in accordance with Sec 1042.2.7 for application of sheeting. Manufacturer's certification shall be provided for delineator sheeting.

SECTION 1067 – TRUNCATED DOMES

Amend Sec 1067.4 and include the following: ***12/11***

1067.4 Acceptance. All material shall be obtained from a source indentified on the Qualified List (QL) designated for this specification.

SECTION 1073 – JOINT MATERIAL FOR STRUCTURES

Delete Sec 1073.4 and substitute the following: ***02/12; 05/12***

1073.4 Strip Seal. Strip seals shall be in accordance with ASTM D 5973 and the following additional requirements.

SECTION 1080 – STRUCTURAL STEEL FABRICATION

Delete Sec 1080.2 and 1080.2.1 and substitute the following: ***03/14***

1080.2 Material. Except as amended by Sec 1080.2.4, all material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section / Specification
Shear Connectors	1037
Paint for Structural Steel	1045
Coating of Structural Steel	1081
Structural Carbon Steel	AASHTO M 270, Grade 36 ASTM A 709, Grade 36
Structural Low Alloy Steel	AASHTO M 270, Grade 50 ASTM A 709, Grade 50 AASHTO M 270, Grade 50W ASTM A 709, Grade 50W
Quenched and Tempered Alloy Steel	AASHTO M 270, Grade HPS 50W ASTM A 709, Grade HPS 50W AASHTO M 270, Grade HPS 70W ASTM A 709, Grade HPS 70W ASTM A 709, Grade 100/100W
Low Carbon Steel Bolts and Nuts	ASTM A 307
High Strength Bolts, Nuts and Washers	ASTM A 325 ASTM A 490 ASTM F 436

	ASTM A 563 AASHTO M 292
Cold Finished Carbon Steel Shafting	AASHTO M 169
Carbon Steel Forgings	AASHTO M 102 Class F
Alloy Steel Forgings	AASHTO M 102 Class G
Gray Iron Castings	AASHTO M 105 Class 50
Malleable Iron Castings	ASTM A 47
Carbon Steel Castings	AASHTO M 103 Grade 485-275
Galvanized Coatings	AASHTO M 111 AASTHTO M 232 Class C ASTM B 695 Class 55
Lead for Bearing Pads	ASTM B 29
Identification of Metals	ASTM A 6

1080.2.1 Galvanized Bolts. Bolts, nuts and washers specified to be galvanized shall be galvanized in accordance with the requirements of AASHTO M 232, Class C or shall be mechanically galvanized in accordance with ASTM B 695, Class 55. Except for anchor bolts, galvanizing thickness shall not exceed 6 mils. Fasteners installed prior to the completion of shop blast cleaning will not require galvanizing. The thickness of the zinc coating for galvanized bolts shall be measured on the wrench flats and top of the bolt head. For mechanically galvanized bolts, the significant surfaces as referenced in ASTM B 695 shall be the entire bolt surface, excluding the underside of the surface of the head and the shank surface between the threaded portion and the underside of the head. The thickness of the zinc coating on the galvanized nuts shall be measured on the wrench flats. For mechanically galvanized nuts, the significant surfaces shall be all surfaces of the nut excluding the threads. The thickness of the zinc coating on galvanized washers shall be measured on both sides. The significant surfaces on mechanically galvanized washers shall be all surfaces of the washer.

Delete Sec 1080.2.5 through 1080.2.5.2 and substitute the following: ***03/14***

1080.2.5 High Strength Fastener Assemblies. In addition to the requirements of Sec 712.2, high strength bolts, nuts and washers shall meet the following requirements. The contractor shall furnish a manufacturer's certification showing results of tests performed. Identification in accordance with the appropriate AASHTO/ASTM specifications shall be maintained by container markings which shall match identifying numbers on the certifications and be traceable to the certified mill test reports. High strength fastener assemblies shall be galvanized unless used with unpainted weathering steel or specifically indicated otherwise by the contract documents. When high strength bolts are used with weathering steel, the fasteners shall be Type 3. ASTM A 490 bolts shall be installed black, tensioned and then cleaned and coated with the coating system as specified on the plans. The cleaning and the zinc coating shall not be applied by any process, which can cause hydrogen embrittlement. All certification testing requirements and mill test reports referenced in the following sections shall be in accordance with Sec 106.

1080.2.5.1 Bolts. All bolts shall be in accordance with ASTM A 325 except when ASTM A 490 bolts are specified on the plans. If the contractor elects to use load indicator bolts, only a hex head will be permitted. The type of head used shall be consistent throughout the entire structure, unless otherwise approved by the engineer.

1080.2.5.1.1 Proof Load Tests. Proof load tests in accordance with ASTM F 606 Method 1 shall be performed. Minimum test frequency shall be in accordance with ASTM A 325.

1080.2.5.1.2 Wedge Tests. Wedge tests on full size bolts, in accordance with ASTM F 606, paragraph 3.5 shall be performed. If bolts are to be galvanized, tests shall be performed after galvanizing. Minimum test frequency shall be in accordance with ASTM A 325.

1080.2.5.2 Nuts. All nuts shall be in accordance with AASHTO M 292 as applicable or ASTM A 563, except as follows.

Delete Sec 1080.2.5.2.2 and substitute the following: ***03/14***

1080.2.5.2.2 Overtapping. Nuts to be galvanized shall be tapped oversize the minimum amount required for proper assembly. The amount of overtap in the nut shall be such that the nut will assemble freely on the bolt in the coated condition and shall be in accordance with the mechanical requirements and the rotational-capacity test requirements of ASTM A 563. The overtapping requirements of ASTM A 563 will apply, except these limits shall be considered maximum values instead of the minimum, as currently shown.

Delete Sec 1080.2.5.2.4 through 1080.2.5.3 and substitute the following: ***03/14***

1080.2.5.2.4 Proof Load Tests. Proof load tests in accordance with ASTM F 606 shall be performed. Minimum test frequency shall be in accordance with ASTM A 563 or AASHTO M 292. If nuts are to be galvanized, tests shall be performed after lubricating.

1080.2.5.2.5 Weathering Steel. When Type 3 fasteners are specified for use with weathering steel, nuts shall be in accordance with ASTM A 563 and shall be grades C3 or DH3.

1080.2.5.3 Washers. All washers shall be in accordance with ASTM F 436. Hardness testing shall be performed on galvanized washers. The coating shall be removed prior to taking hardness measurements.

Delete Sec 1080.2.5.4.1 and substitute the following: ***03/14***

1080.2.5.4.1 Test Methods. Except as modified herein, the rotational-capacity test shall be performed in accordance with ASTM A 325.

Delete Sec 1080.2.5.4.5 and substitute the following: ***03/14***

1080.2.5.4.5 Required Tension. The tension reached at the above rotation shall be equal to or greater than 1.15 times the required installation tension. The installation tension and the tension for the turn test for ASTM A 325 and ASTM A 490 bolts shall be as follows:

Required Bolt Tensions									
Diameter, in.	**1/2**	**5/8**	**3/4**	**7/8**	**1.00**	**1-1/8**	**1-1/4**	**1-3/8**	**1-1/2**
ASTM A 325									
Req. Installation Tension, kips	12	19	28	39	51	56	71	85	103
Turn Test Tension, kips	14	22	32	45	59	64	82	98	118
ASTM A 490									
Req. Installation Tension, kips	15	24	35	49	64	80	102	121	148
Turn Test Tension, kips	17	28	40	56	74	92	117	139	170

Delete Sec 1080.2.9 and substitute the following: ***03/14***

1080.2.9 Identification of Metals. The steel shall be stamped or stenciled and color striped with paint at the mill. Heat numbers shall be steel stamped or stenciled with paint at the mill. Separate markings and color codes shall be in accordance with ASTM A 6. The characteristic color stripes shall be placed on each part cut from the mill piece. For steels not covered by ASTM A 6, the fabricator shall furnish the engineer the color coding in writing before fabrication begins. Heat numbers shall be painted on all principal pieces and these pieces shall be so noted on the shop drawings. Principal pieces for this requirement shall include all beams, flanges, webs, splice plates, cover plates, bearings, bearing stiffener plates, load bearing members of end diaphragms, pin plates, hanger plates and others as may be directed by the engineer. Principal pieces shall include individual plates of all truss members, truss gusset plates, splice plates and floorbeam connection angles. The color code and heat number markings shall be placed on the material such that the markings are visible throughout the work of fabrication. Loss of identification on pieces or items will be cause for rejection of the pieces or items.

Delete Sec 1080.4.5 and substitute the following: ***03/14***

1080.4.5 Bolting and Fasteners. All fasteners, such as bolts, nuts and washers, that bolt directly to the weathering grade structural steel, including fasteners located in areas of the structure to be partially coated and fasteners for expansion device supports and similar items shall be high strength weathering fasteners with atmospheric corrosion resistance and weathering

characteristics comparable with the A 709 weathering steel. Bolts shall be in accordance with ASTM A 325 , Type 3. Nuts shall be in accordance with the requirements of ASTM A 563 and shall be Grades C3 or DH3. Washers shall meet the requirements of ASTM F 436, Type 3. All other requirements of Secs 712 and 1080 relating to high strength fastener assemblies and fastener assembly installation shall remain in effect. Fasteners for slab drain brackets may be plain uncoated assemblies in accordance with Sec 1080.2.5 and coated in accordance with Sec 1080.4.5.1.

Delete Sec 1080.4.7 and substitute the following: ***03/14***

1080.4.7 Bearings and Anchor Bolts. Steel bearings, plate steel for elastomeric and PTFE bearings, structural steel for POT bearings, anchor bolts, sole plates, masonry plates and associated items shall be in accordance with ASTM A 709 Grade 50W. Anchor bolt nuts shall be heavy hexagon nuts in accordance with ASTM A 563, Grades C3 or DH3. The exposed surfaces of all bearings for weathering steel structures under expansion joints shall be shop primed and field coated with the complete System H in accordance with Sec 1080.4.4 and 1081.

SECTION 1081 – COATING OF STRUCTURAL STEEL

Delete Sec 1081.2 and substitute the following: ***07/15***

1081.2 Systems of Coatings. The required system and color or choice of systems and color will be specified on the plans. Each coat of the specified system shall be applied to all structural steel, unless the contract specifically delineates otherwise. The system and color of coating to be shop-applied shall be shown on the shop drawings. All coatings shall comply with local VOC (Volatile Organic Compound) regulations where the paint is applied. The system and color shall not vary for any portion of the entire structure, including material for field repairs and shall be compatible products of a single manufacturer. The contractor shall coordinate the various items of work to ensure compliance with the requirements of this section. Approved material specifications and dry film thickness for the coating systems shall be as indicated in the following table:

Paint Systems for Structural Steel		
System G (High Solids, Inorganic Zinc Silicate-Epoxy-Polyurethane)		
Coating	**Section**	**Dry Film Thickness, mils**
Prime Coat	1045.3	3.0 min. to 6 max.
Epoxy Intermediate Coat	1045.4	3.0 min. to 5 max.
Polyurethane Finish Coat, Gray or Brown	1045.5	2.0 min. to 4 max.
System H (High Solids, Inorganic Zinc Silicate-Waterborne Acrylic Intermediate-Waterborne Acrylic Finish)		
Coating	**Section**	**Dry Film Thickness, mils**
Prime Coat	1045.3	3.0 min. to 6 max.
Waterborne Acrylic, Intermediate Coat	1045.6	2.0 min. to 4 max.
Waterborne Acrylic, Finish Coat, Gray or Brown	1045.6	2.0 min. to 4 max.
System I (High Solids, Inorganic Zinc Silicate-Polysiloxane)		
Coating	**Section**	**Dry Film Thickness, mils**
Prime Coat	1045.3	3.0 min. to 6 max.
Polysiloxane Finish Coat	1045.7	3.0 min. to 6 max.
Calcium Sulfonate System		
Coating	**Section**	**Dry Film Thickness, mils**
Calcium Sulfonate Rust Penetrating Sealer	1045.10.2	1.0 min.
Calcium Sulfonate Primer	1045.10.3	4.0 min.
Calcium Sulfonate Topcoat	1045.10.4	5.0 min.
Aluminum & Gray Epoxy-Mastic Primer		
Coating	**Section**	**Dry Film Thickness mils**
Aluminum Epoxy-Mastic Primer	1045.8	5.0 min.
Gray Epoxy-Mastic Primer	1045.9	5.0 min

Delete Sec 1081.3.3 and substitute the following: ***07/15***

1081.3.3 Limits of Coating Application. Unless otherwise indicated on the plans, the application of the intermediate and finish coats for Systems G and H, and the application of the finish coat for System I, hereinafter referred to as field coats, shall be applied to the structure within the following limits.

Delete Sec 1081.3.3.1.1 and substitute the following: ***07/15***

1081.3.3.1.1 The intermediate field coat for beam and girder spans shall be applied to the surfaces of all structural steel, except that areas of steel to be in contact with concrete shall not receive the intermediate coat. The intermediate coat shall also be applied to the bearings, except where bearings will be encased in concrete. The finish coating for beam and girder spans shall include the facia girder or beams. The limits of the facia girders or beams shall include the bottom of the top exterior flanges, top of the bottom exterior flanges, the exterior web area, the exterior face of the top and bottom flange and the bottom of the bottom flange. Areas of steel to be in contact with concrete shall not receive the finish coat. The finish coat shall also be applied to the exterior bearings, except where bearings will be encased in concrete.

Amend Sec 1081.3.3.1.4 and substitute the following: ***10/11***

1081.3.3.1.4 Straps for steel stay-in-place forms shall be removed in areas where field coating shall be required in accordance with this Specification. Flame cutting will not be permitted. The contractor shall take care not to damage the structure or the shop coating during strap removal. Any damage to the shop coating as a result of the contractor's operations shall be repaired by the contractor in accordance with this Specification. Any damage to the rest of the structure shall be repaired as approved by the Engineer.

Amend Sec 1081.3.3.1.5 and include the following: ***07/15***

1081.3.3.1.5 When System I is specified on the plans for beam and girder spans, a System G intermediate coat shall be applied similarly in accordance with Sec 1081.3.3.1.1 intermediate field coating requirements except that an intermediate coat will not be required to be applied to the beams and girders where the System I finish coat is to be applied. The contractor shall have the option to substitute the System I finish coat in place of a System G intermediate coat.

Amend Sec 1081.3.3.2.4 and substitute the following: ***10/11***

1081.3.3.2.4 Straps for steel stay-in-place forms shall be removed in areas where field coating shall be required in accordance with this Specification. Flame cutting will not be permitted. The contractor shall take care not to damage the structure or the shop coating during strap removal. Any damage to the shop coating as a result of the contractor's operations shall be repaired by the contractor in accordance with this Specification. Any damage to the rest of the structure shall be repaired as approved by the Engineer.

Delete Sec 1081.4.2 and substitute the following: ***12/11***

1081.4.2 Systems of Protective Coatings. All structural steel shall be recoated by the contractor in the field using one of the complete systems, including prime coats, in accordance with Sec 1081.2, unless noted otherwise. Recoating of structural steel, including surface preparation, weather conditions, application, touch-up and protection, shall be in accordance with all requirements of Sec 1081.3 unless in conflict with Sec 216, which shall control.

Delete Sec 1081.5.1 and Sec 1081.5.2 and substitute the following: ***12/11***

1081.5.1 Scope. This specification covers the field preparation of structural steel surfaces to be overcoated, disposal of paint residues and power washing water, furnishing and applying the specified coatings, protection and drying of the coatings, furnishing protection from coating spatter or disfigurement and final cleanup.

1081.5.2 System of Protective Coatings. All exposed and accessible surfaces of structural steel and steel bearings shall be coated with the Calcium Sulfonate paint system in accordance with Sec. 1081.2 unless otherwise noted. The color of the topcoat shall be as shown on the plans. Overcoating of structural steel shall be in accordance with all requirements of Sec 1081.3 except surface preparation and unless in conflict with Sec 216, which shall control.

Delete Sec 1081.5.3.1.2 and substitute the following: ***10/14***

1081.5.3.1.2 Water for Power Washing. The water used for power washing shall be clean, potable water, free from contaminants. Non-hazardous wastewater shall be collected and disposed of in accordance with all applicable state, local and federal clean water regulations. Wastewater determined to be hazardous waste in accordance with Sec 1081.5.3.1.3 shall be collected and disposed of in accordance with Sec 1081.5.3.1.3. The wastewater shall not be discharged onto the ground or into

waters of the state without a permit. If no permit is obtained, the wastewater shall be collected and transported to a qualified wastewater plant or other facility that can dispose of it in accordance with applicable wastewater regulation. Water collected from the power washing operation shall not be reused in the power washing operation.

Delete Sec 1081.5.5 and substitute the following: ***12/11***

1081.5.5 Identification. At the completion of the final coating application, the contractor shall, stencil in black paint on the structure the number of the bridge, the words "OVERCOATED – Calcium Sulfonate" and the month and year the coating was completed. The letters shall be capitals approximately 3 inches high. The legend shall be stenciled on the outside face of an outside girder near each end of the bridge as directed by the engineer.

SECTION 1092 – SIGNAL EQUIPMENT

Delete Sec 1092.1 and substitute the following: ***10/11; 07/15***

1092.1 Signal Heads. Signal heads shall meet the following requirements:

(a) All signal heads shall be weatherproof and black in color in accordance with Sec 1092.1.1. All indications shall be 12 inches unless specified otherwise.

(b) All signal indications in conventional signal heads shall be illuminated with LED modules. All LED modules, shall be in accordance with ITE Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement dated Jun 27, 2005, shall be Intertek ETL verified and shall be in accordance with the following:

(1) The lens of each green indication shall be clear. If a polymeric lens is supplied, a surface coating shall be applied to provide abrasion resistance.

(2) The LED modules shall not contain Aluminum Gallium Arsenide (AlGaAs).

(3) The LED modules shall provide constant light output under power. Modules with dimming capabilities shall have the option disabled or shall be set on a non-dimming operation.

(4) Module shall be labeled with "Manufactured in conformance with the ITE LED Circular Signal Supplement".

(5) Provided with spade adapters.

(c) All arrow LED modules shall be in accordance with ITE Vehicle Traffic Control Signal Heads. Light Emitting Diodes (LED) Vehicle Arrow Traffic Signal Supplement dated July 1, 2007, shall be Intertek ETL verified and shall be in accordance with the following.

(1) Be omni-directional
(2) The lens of each green arrow indication shall be clear
(3) Module shall be labeled with "Manufactured in conformance with the ITE LED Vehicle Arrow Traffic Signal Supplement"
(4) Provided with spade adapters

Delete Sec 1092.1.6 and substitute the following: ***07/15***

1092.1.6 Pedestrian LED Countdown Signal Heads. Pedestrian LED countdown signal heads shall include two LED signal modules, one indicating a "WALKING PERSON" and "UPRAISED HAND" icon and the second a two digit numeric pedestrian change interval countdown display to inform pedestrians of the number of seconds remaining in the pedestrian change interval and any array of LEDs and related power supplies and any required lenses which, when connected to appropriate power, provides a single pedestrian signal indication and a countdown signal in a single housing unit. LED pedestrian signal countdown heads shall be in accordance with ITE specifications and standards for Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules dated August 4, 2010 and the following:

(a) Pedestrian LED countdown signal head housings shall be constructed of a black, one-piece, 0.250-inch thick, polycarbonate material as shown on the plans. The housing shall include an integral mounting bracket designed for mounting on the side of the pole on all makes of signal poles with a terminal compartment and minimum 5-position, double-row terminal block.

(1) The door, lens and any openings in the housing shall have gaskets or seals to exclude dust and moisture from the inside of the compartment.

(2) Lenses shall be constructed of polycarbonate material and reduce glare.

(3) Lenses shall be hard coated or otherwise made to comply with the UV material exposure effects of the Society of Automotive Engineers (SAE) J576.

(4) Lenses shall be a replaceable part, without the need to replace the complete LED signal housing.

(5) Pedestrian LED countdown signal head housing shall be provided with a manufactured, preformed rectangular visor or screen-type louver.

(b) Indications on LED signal modules shall be ITE Class 3 for icons and countdown display digits Icon and countdown modules shall be Intertek ETL verified and be in accordance with the following:

(1) The LED module lenses shall use transparent film or materials with similar characteristics.

(2) Modules, conforming to this specification, shall be labeled with the following statement, "Manufactured in Conformance with the ITE Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules".

(3) Modules with dimming capabilities shall have the option disabled or shall be set on a non-dimming operation.

(4) LED signal modules displaying ITE Class 3 icons shall be constructed such that both the "WALKING PERSON" icon and the "UPRAISED HAND" icon are displayed from the same module on the same rectangular surface area. The illumination of one icon shall not result in the illumination of the other icon.

(5) Supplied with spade adapters.

(c) If the pedestrian change interval is interrupted or shortened as part of the transition into a preemption sequence the countdown pedestrian signal display should be discontinued and go dark upon activation of the preemption transition.

(d) The countdown learning cycle shall only be initiated after the initial installation, a return from a power failure greater than 2 seconds, a repeated demand to change programming, or after preemption. During the learning cycle, the countdown display shall remain blank. The learning cycle shall not last more than two complete cycles.

Delete Sec 1092.4.1.6 and substitute the following: ***10/13***

1092.4.1.6 Solid State Controllers. This section describes the general specifications for actuated solid state controllers. If requested by the engineer, the contractor shall provide a prototype controller for testing and evaluation.

(a) Each controller shall be solid state keyboard entry and the circuit design shall use microprocessor techniques.

(b) Timing shall be accomplished in a digital manner by counting the 60 hertz power supply frequency. Timing circuits, interval and phase switching functions shall be accomplished by solid state circuitry. Removing, changing wires or using any tools to make timing interval adjustments shall not be necessary. The controller shall indicate the right of way conditions of the phase timing interval in effect, detector or actuation on each phase and memory conditions or demand on each phase for vehicles and pedestrians by use of status lights or display panels. The controller shall be capable of flashing yellow arrow operation without any external devices or special software upgrades.

(c) Opening and closing of signal lamp circuits shall be performed by plug-in solid state load switches, rated at no less than 10 amperes and loaded at a maximum of 6.7 amperes, located external to the controller. All load switch jacks shall be completely wired to field output terminal strips. Actuated and pretimed controllers shall have a minimum of twelve load switch jacks. Each load switch shall provide three independent circuits with "on" indicator lamps and shall comply with the latest revision of NEMA Standards Publication TS.

(d) Each controller assembly shall contain a conflict monitor external to the controller circuitry conforming to NEMA Standards Publication TS and be capable of monitoring flashing yellow arrow operation on any channel. The monitor shall cause immediate transfer to flashing operation when conflicting or absent indications occur or when a voltage fault occurs. When the conflict monitor actuates flashing operation, the controller shall freeze or stop timing in the condition causing the actuation until manually reset. A single lamp failure in any signal head shall not cause the monitor to actuate.

(e) For double controller cabinets, two sets of switches shall be provided, one set for each controller installed in each compartment. Each controller cabinet shall be furnished with the following switches:

(1) Power Interrupt Switch - A switch located inside the main cabinet shall interrupt electrical power to the controller during maintenance on the controller. Operation of this switch shall not affect the flash operation. This switch shall not be accessible via the police panel.

(2) Flash Switch - A switch mounted in the police panel shall place the signal on flash. Operation of this switch shall not affect the electrical power supply to the controller. When the signals are returned to normal operation the external start shall be activated causing the controller to revert to the programmed initialization phase(s).

(3) Stop Time Switch - A three-position switch mounted inside the main cabinet shall provide the following functions:

(i) Stop Time - Causes the controller to stop time.

(ii) Normal - Allows the controller to cycle all phases, but during conflict monitor flash causes the controller to stop time.

(iii) Run - Allows the controller to cycle all phases and during any flashing operation allows the controller to continue cycling all phases without displaying them on the signal heads.

(f) During all direction flash condition, controller operation shall permit the cycling of all signal phases without an external load being connected to the field terminals.

(g) Solid state controllers shall have electronic filters to prevent interference caused by the opening and closing of circuits in electro-mechanical auxiliary equipment.

(h) The controller shall be of modular design constructed for individual removal and replacement in the controller by multiple prong jacks or outlets without modifying wiring. Hand operable positive locking devices shall be used to hold the modules securely in the controller.

(i) The functional operating circuits and associated components shall be grouped in plug-in printed circuit assemblies. Similar assemblies shall be interchangeable between controllers manufactured by the same company.

(j) The controller shall contain the necessary phase sequence, interval sequence timing, power supply and monitoring equipment required to supervise the operation for the phasing shown on the plans, including any future controller expansion. If future phases are specified, the controller shall be completely configured to accept the future phases.

(k) Controllers that are interconnected shall have a coordinated/free operation switch to allow the controller to operate in coordination with the system or run free.

(l) High energy transient surge protection shall be provided on all solid state controllers to minimize damage to the controller and auxiliary equipment. This device shall be located on the incoming 120 volts, 60 hertz power service between the controller and signal circuit breaker and the power inputs to the controller and auxiliary equipment. The surge protector will plug-in to a hardwired base. Two LEDs that indicate the status of the surge protector shall be incorporated on the surge protector. One LED will indicate the surge protector is still operable and the other will indicate it has failed. The surge protector and base shall be capable of operating in the temperature range of -40°C to +85°C. The arrestor shall meet the latest NEMA specifications for surge protection.

(m) Every all direction flash operation called from a source external to the controller shall occur through the flash transfer relay.

(n) Any multi-conductor cable shall be contained in an expandable braided sleeve.

(o) Switches or relays that completely interrupt power to the signal heads other than the protective circuit breaker shall not be installed in the cabinet.

(p) All controllers shall be capable of downloading all programming data to a printer via a front panel RS-232 connection. The controller shall be capable of printing directly to a printer or via an external computer. If an external computer is required, the required software shall be provided with the controller.

(q) All controllers shall be provided with internal pre-emption functions and circuitry.