



**MISSOURI  
HIGHWAYS and TRANSPORTATION  
COMMISSION**

**JEFFERSON CITY, MISSOURI**

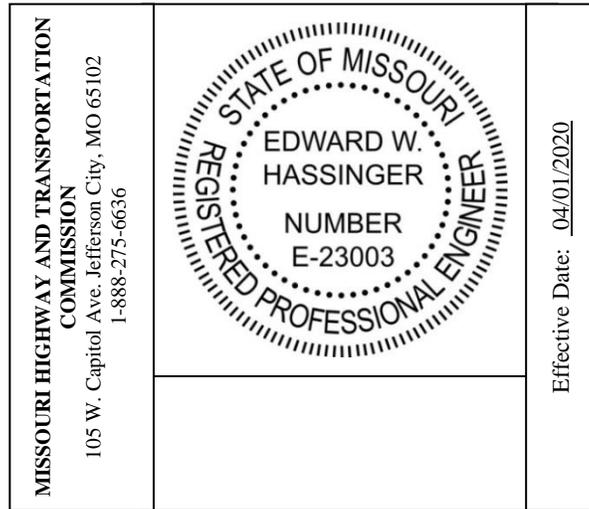
**GENERAL PROVISIONS AND  
SUPPLEMENTAL SPECIFICATIONS TO 2019  
MISSOURI STANDARD SPECIFICATIONS FOR  
HIGHWAY CONSTRUCTION**

**Effective April 1, 2020**

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**GENERAL PROVISIONS**

**SECTION 404 NATIONWIDE PERMIT GENERAL CONDITIONS**

**04/17**

**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 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. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

**3.0 Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practical. Activities that result in the physical destruction (e.g., through excavation, fill or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

**4.0 Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

**5.0 Suitable Material.** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.) Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

**6.0 Water Supply Intakes.** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

**7.0 Adverse Effects from Impoundments.** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

**8.0 Management of Water Flows.** To the maximum extent practicable, the pre-construction course, condition, capacity and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

**9.0 Fills Within 100-Year Floodplains.** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

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

**11.0 Soil Erosion and Sediment Controls.** Appropriate erosion and sediment controls must 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, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the US during periods of low-flow or no-flow.

**12.0 Removal of Temporary Fills.** Temporary fills must be completely removed in their entirety and the affected areas returned to the pre-construction elevations. The affected areas must be revegetated, as appropriate.

**13.0 Wild and Scenic Rivers.** No activity may 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.

**14.0 Tribal Rights.** No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.

**15.0 Endangered Species** No activity is authorized under any NWP which is likely to directly or indirectly 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 which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have "no effect" on listed species or critical habitat, or until ESA section 7 consultation has been completed.

**16.0 Migratory Birds and Bald and Golden Eagles.** The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

**17.0 Historic Properties.** In cases where the USACE District Engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

**18.0 Mitigation.** The project must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the U.S. to the maximum extent practicable at the project site (i.e., on site).

**19.0 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 Corps or by the state, Indian Tribe, or U.S. EPA in its Section 401 water quality certifications.

**20.0 Activities Affecting Structures or Works Built by the United States.** If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a USACE federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a preconstruction notification. See paragraph (b)(10) of general condition 32. An activity that requires Section 408 Permission is not authorized by NWP until the appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE project, and the USACE District Engineer issues a written NWP verification.

**21.0 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 US, and shall be followed to maintain compliance with the NWP authorization.

**21.1 Section 404 Nationwide Permit No. 3.**

**21.1.1** 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, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This NWP also authorizes the removal of previously authorized structures or fills. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project. This NWP also authorizes the removal of accumulated sediment and debris within, and in the immediate vicinity of, the structure or fill. This NWP also 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 is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the district engineer, provided the permittee can demonstrate funding, contract, or other similar delays.

**21.1.2** This NWP also authorizes the removal of accumulated sediments and debris outside the immediate vicinity of existing structures (e.g., bridges, culverts road crossings, water intake structures, etc.). The removal of sediment is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend farther than 200 feet in any direction from the structure. This 200 foot limit does not apply to maintenance dredging to remove accumulated sediments blocking or restricting outfall and intake structures or to maintenance dredging to remove accumulated sediments from canals associated with outfall and intake structures. All dredged or excavated materials must be deposited and retained in an area that has no waters of the United States unless otherwise specifically approved by the district engineer under separate authorization.

**21.1.3** This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the maintenance activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After conducting the maintenance activity, temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

**21.2 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.

**21.2.1 Utility lines.** This NWP authorizes discharges of dredged or fill material into waters of the United States and structures or work in navigable waters for crossings of those waters associated with the construction, maintenance, or repair of utility lines, including outfall and intake structures. There must be no change in pre-construction contours of waters of the United States. A "utility line" is 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 internet, radio and television communication. The term "utility line" does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area. Material resulting from trench excavation may be temporarily sidecast into waters of the U.S. for no more than three months, provided that the material is not placed in such a manner that it is dispersed by currents or other forces. The USACE District Engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the U.S. (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks shall be stabilized immediately upon completion of the utility line crossing of each waterbody.

**21.2.2 Utility line substations.** This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a power line or utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States.

**21.2.3 Foundations for Overhead Utility Line Towers, Poles, and Anchors.** This NWP authorizes 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) are used where feasible.

**21.2.4 Access Roads.** This NWP authorizes 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 activity, in combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2 acre of non-tidal waters of the U.S. Access roads shall be the minimum width necessary. Access roads must be constructed so that the length of the

road minimizes any adverse effects on waters of the US and must be as near as possible to preconstruction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above preconstruction contours and elevations in waters of the U.S. must be properly bridged or culverted to maintain surface flows. This NWP authorizes, to the extent that Department of the Army authorization is required, temporary structures, fills, and work necessary for the remediation of inadvertent returns of drilling fluids to waters of the United States through sub-soil fissures or fractures that might occur during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines. These remediation activities must be done as soon as practicable, to restore the affected waterbody. District engineers may add special conditions to this NWP to require a remediation plan for addressing inadvertent returns of drilling fluids to waters of the United States during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines. This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

**21.3 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.

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

**21.3.2** The bank stabilization activity is no more than 500 feet in length.

**21.3.3** The activity will not exceed an average of one cubic yard per running foot as measured along the length of the treated bank, below the plane of the ordinary high water mark or the high tide line, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in no more than minimal adverse environmental effects.

**21.3.4** 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.

**21.3.5** 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 waters of the U.S.

**21.3.6** 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).

**21.3.7** Native plants appropriate for current site conditions, including salinity, must be used for bioengineering or vegetative bank stabilization.

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

**21.4 Section 404 Nationwide Permit No. 14.** Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the U.S. If the activity meets the following criteria.

**21.4.1** The discharge does not cause the loss of greater than 1/2-acre of waters of the US.

**21.4.2** Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

**21.4.3** This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

**21.5 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 the construction of the bridge structure has been authorized by the U.S. Coast Guard under Section 9 of the Rivers and Harbors Act of 1899 or other applicable laws. Causeways and approach fills are not included in this NWP and will

require a separate Section 404 permit.

**21.6 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's implementing regulations for the National Environmental Policy Act (40 CFR Part 1500 et seq.), that the activity is categorically excluded from the requirement to prepare an environmental impact statement or environmental assessment analysis, because it is included within a category of actions which neither individually nor cumulatively have a significant effect on the human environment, and the USACE Office of the Chief of Engineers (ATTN: CECW-OR) has concurred with that agency's or department's determination that the activity is categorically excluded and approved the activity for authorization under NWP23.

**21.7 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. This NWP also authorizes temporary structures, work, and discharges, including cofferdams, necessary for construction activities not otherwise subject to the Corps or U.S. Coast Guard permit requirements. Appropriate measures shall be taken to maintain near normal downstream flows and to minimize flooding. Fill must consist 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 the USACE District Engineer determines that it will not cause more than minimal adverse effects. Following completion of construction, temporary fill must be entirely removed to areas an area that has no waters of the U.S., dredged material must be returned to its original location, and the affected areas must be restored to pre-construction elevations. Cofferdams shall not be used to dewater wetlands or other aquatic areas changing the use of these areas. The affected areas must also be revegetated, as appropriate. This permit does not authorize the use of cofferdams to dewater wetlands or other aquatic areas to change their use. 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**

**04/17**

**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** Temporary stream crossings will be designed so that no drops or dams are created that impede the passage of aquatic life.

**1.2** Stream channel modifications should be avoided as much as possible and, if needed, will be minimized. Where modifications are necessary for highway design safety or protection of state infrastructure, they will be designed using scientific guidelines, such as natural channel design.

**1.3** The following materials will not be specified or used for bank stabilization: earthen fill, gravel, fragmented asphalt, broken concrete with exposed rebar, large slabs of unbroken concrete, tires, vehicle bodies, liquid concrete including grouted riprap, or any material containing chemical pollutants.

**1.4** During construction, clearing of vegetation will be kept to the minimum necessary to accomplish the project.

**1.5** Petroleum products, hazardous chemicals, hazardous wastes, equipment, construction material and solid waste will not be stored after construction working hours below the ordinary high water mark.

**1.6** Equipment will not be operated in wetland or stream areas, except where permitted, expressed by the project plans or the engineer in writing. Petroleum products will not be stored in waters of the state.

**1.7** Riparian areas and stream banks will be restored to a stable condition as soon as possible after final contouring.

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

**1.9** Petroleum products spilled into any water or in areas where material could enter a water will be cleaned up immediately and disposed of properly. Any such spills of petroleum shall be reported as soon as possible, but no later than 24 hours after discovery to the MDNR, Environmental Emergency Response number at (573) 634-2436.

## **DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM REQUIREMENTS**

04/20

See Job Special Provisions.

### **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 contract 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  $550 \times \$20.00 = \$11,000.00$ .

**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 contractor 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 Committee 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 completed, 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.

## **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:

<b>Supplementary Cementitious Material (SCM)</b>	
<b>SCM</b>	<b>Maximum Percent of Total Cementitious Material</b>
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<sup>2</sup> 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<sup>2</sup> 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 subplot 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.

<b>Individual Measurements</b>	
<b>Control Parameter</b>	<b>Action Limit</b>
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:

<b>Test</b>	<b>Frequency</b>
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.

## **SAFETY PLAN**

04/16

**1.0 Description.** This contractor shall submit to the engineer a project Safety Plan (SP) for all work performed by the contractor and all subcontractors. The purpose of the SP is to encourage and enable all work to be performed in the safest possible manner and that all parties involved are aware of their individual responsibility for safety on the jobsite.

**1.1** The SP shall be completed by the contractor and provided to the engineer prior to the beginning of any construction activity or phase on the project.

**1.2** The contractor shall designate a person to serve as Project Safety Manager (PSM). The PSM shall be responsible for implementing and overseeing the SP. The PSM is not required to be present on the project at all times, but must be available to address safety issues and needs.

**1.3** The PSM shall make revisions to the SP as necessary. Any new project activities or phases shall be included in the SP prior to work beginning on that activity or phase.

**1.4** An example Safety Plan is available at: [www.modot.org/safetyplan](http://www.modot.org/safetyplan)

**2.0 Emergency Preparedness.** The SP shall outline and detail for all workers, the specific procedures and actions necessary to respond to a jobsite emergency and the measures taken to communicate these requirements to all workers.

**2.1** The SP shall include a list of local emergency contacts including phone numbers. A copy of the emergency contact list shall be accessible to workers.

**2.2** In the case where there is no cellular or land line phone service at the jobsite, the SP shall identify how to reach the nearest available phone service.

**3.0 Project Safety Analysis.** The SP should contain a basic Project Safety Analysis (PSA) that outlines the actions necessary to complete each activity or phase of the project. The SP shall include a general description of the primary activities or steps required to safely complete the project.

**3.1** Each activity should also include a general description of the work involved along with the known risks associated with the activity. In addition the PSA should outline the controls for those risks, including any Personal Protection Equipment (PPE) requirements for that activity or phase, and whether or not the activity or phase requires a specific safety meeting prior to beginning the activity or phase.

**3.2** Submittal of the PSA for all activities or phases is not required with the initial submittal of the SP; however, the PSA for each activity or phase shall be completed prior to the beginning of that activity or phase.

**4.0 Safety Meetings.** The SP shall include the types of safety meetings that will be required of and conducted by the contractor.

**5.0 Safety Training.** The SP shall identify the required safety training provided to the contractor's personnel. The contractor shall require that the appropriate safety training for the contractor's personnel is completed prior to the beginning of work on each activity or phase.

**5.1** The SP shall identify the recommended safety training needs and PPE for MoDOT employees who will be exposed to the work activities. MoDOT will provide safety training and PPE to MoDOT employees based on MoDOT safety policies.

**6.0 Payment.** There will be no direct payment for compliance with this Safety Plan provision.

## **SAFETY EDGE<sup>SM</sup>**

04/16; 04/18

**1.0 Description.** An approved longitudinal shoulder wedge system shall be used to create a beveled edge at the edge of pavement for a roadway without a paved shoulder, or at the edge of shoulder for pavement with a paved shoulder up to and including 4 feet in width.

**2.0 Construction Requirements.** The Safety Edge shall be constructed as shown in Standard Plan 401.00. The construction tolerance of the 30 degree Safety Edge<sup>SM</sup> shall be plus or minus 5 degrees.

**2.1** The shoulder wedge system shall maintain contact between the device and road shoulder surface and allow automatic transition to cross roads, driveways and obstructions. The device must be removable or be able to be lifted when not in use.

**2.2** All shoulder wedge systems to be used for the purpose of creating a Safety Edge<sup>SM</sup> must be approved by the engineer. The device must be designed to constrain the material, increase the consolidation of the extruded profile, and provide a smooth wedged surface. The use of a conventional single plate strike-off is not permitted.

**3.0 Basis of Payment.** There will be no direct payment for compliance with the requirements of this provision.

## **E-CONSTRUCTION**

**01/17; 1/19**

**1.0 Description.** E-Construction is a paperless construction administration delivery process that includes electronic submission of construction documents, approval of documents with digital signatures, and communication between stakeholders by mobile devices. E-Construction saves both time and money for all stakeholders involved, simplifies document storage, and eliminates waste of paper and other resources. This provision does not apply to the execution of the contract which is defined elsewhere in this contract.

### **2.0 Document Submittals.**

**2.1** The contractor shall submit all required documents to MoDOT electronically, except as described in Section 2.2 of this provision. Documents to be submitted electronically include, but are not limited to, Change Orders, Request to Subcontract Work (C-220), Project Payrolls, Progress Schedules, Value Engineering proposals, Safety Plans, Quality Plans, Pre-Construction conference submittals, etc. All documents shall be submitted in standard pdf format, except when otherwise directed by the engineer.

**2.2** The Affidavit for Compliance with the Prevailing Wage Law and the Contractor's Affidavit Regarding Settlement of Claims (Form C-242) require a notarization and therefore must be submitted on paper.

**2.3** The engineer will submit project documents to the contractor via email or through other secure file sharing sites.

**2.4** Documents that require multiple signatures, such as change orders, shall include all required signatures on the original electronic document, without scanning.

**2.5** Project Payrolls from subcontractors shall be electronically signed by the subcontractor. Payrolls shall be submitted as separate files per contractor per pay period.

### **3.0 Digital and Electronic Signatures.**

**3.1** All documents that require signature shall be signed with an electronic signature, except that change orders shall be signed with a registered digital signature in accordance with Section 3.2. Acceptable electronic signatures include any of the following options:

1. A digital signature, either registered or non-registered. A registered digital signature is defined in Section 3.2. Registration is only required for digital signatures on change orders.
2. An electronically written signature by the signee, such as with a stylus pen.
3. Simply typing the name of the author of a document in the signature field is acceptable if the document is also uploaded by the contractor to MoDOT's external Microsoft SharePoint®. This option is authenticated by the user's login credentials which are provided by MoDOT.

**3.2 Digital Signature on Change Orders.** All change orders shall be executed by the contractor with a registered Digital Signature. The contractor shall submit a letter to the engineer listing all personnel who are authorized to sign change orders on the contractor's behalf. All contractor personnel who are authorized to sign change orders shall create a Digital Signature and shall register their signature with MoDOT by submitting their Digital Signature Certificate (Public Key fdf file) to the Division of Construction prior to signing any change orders. The Public Key file will be used to validate the signee's signature on change orders. To assist contractors with setting up a digital signature, a Quick Reference Guide (QRG) is available in MoDOT's Engineering Policy Guide at <http://epg.modot.org> (click on QRGs in the left hand column and choose "Digital Signature for Adobe Reader").

**4.0 Communication.** The contractor shall be able to communicate and exchange information with MoDOT staff by email and mobile phone.

**5.0 Basis of Payment.** No payment will be made for compliance with this provision.

### **ELECTRONIC INFORMATION FOR BIDDER'S AUTOMATION**

**07/17**

**1.0 Description.** If electronic information for bidder's automation is provided in the Electronic Deliverables, it is for information only. This information, used for project design and quantity estimation purposes, is provided for the bidder's use in automation of bid estimating, project staking, automated machine guidance and other construction methods.

**2.0 Information Provided.** Electronic information may be provided consisting of survey and design information including but not limited to 3-dimensional design models, cross-section models, alignment data, and plan view geometry. This information does not constitute part of the bid documents or contract documents.

**3.0 Disclaimers.** The electronic information shall not be considered a representation of actual conditions to be encountered during construction. Furnishing this information does not relieve a bidder or contractor from the responsibility of making an investigation of conditions to be encountered including, but not limited to site visits, and basing the bid on information obtained from these investigations, and the professional interpretations and judgment of the bidder or contractor. The bidder or contractor shall assume the risk of error if the information is used for any purposes for which the information was not intended. The Commission makes no representation as to the accuracy or reliability of the information, since the information may not be representative of the sealed contract documents. Any assumption the bidder or contractor may make from this electronic information is at the bidder or contractor's risk; none are intended by the Missouri Highways and Transportation Commission. The bidder or contractor assumes the sole risk of liability or loss if the bidder or contractor does rely on this electronic information to its detriment, delay or loss.

**4.0 Basis of Payment.** No payment will be made for compliance with this provision.

### **"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.

**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 2019 MISSOURI STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION**

**SECTION 109 –MEASUREMENT AND PAYMENT**

*Delete Sec 109.16 Fixed Cost Items. and substitute the following:*

**04/20**

**109.16 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	203.20.00	Class C Excavation ≤ 500 cy	cy	\$75.00
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
505.10.14	505-00.04	Supplementary Wearing Surface Material (Low Slump Concrete)	cy	\$800.00
505.20.14	505-00.04	Supplementary Wearing Surface Material (Latex Modified Concrete)	cy	\$700.00
505.30.14	505-00.04	Supplementary Wearing Surface Material (Silica Fume Concrete)	cy	\$800.00
505.40.14	505-00.04	Supplementary Wearing Surface Material (Latex Modified Very Early Strength Concrete)	cy	\$900.00
505.50.14	505-00.04	Supplementary Wearing Surface Material (CSA Cement Very Early Strength Concrete)	cy	\$700.00
505.60.14	505-00.04	Supplementary Wearing Surface Material (Steel Fiber Reinforced Concrete)	cy	\$500.00
505.70.14	505-00.04	Supplementary Wearing Surface Material (Polyester Polymer Concrete)	cy	\$900.00
611.30.5.1	611-30.10	Furnishing Type 1 Rock Blanket	cy	\$24.00
611.30.5.1	611-30.20	Furnishing Type 2 Rock Blanket	cy	\$25.00
701.7.7	701-15.00	Concrete Coring	lf	\$100.00
618.3	618-10.20	Additional Mobilization for Seeding	Each	\$600.00
703.5.1	703-20.02	Class B Concrete (Misc) (Concrete Fill > 2 cy)	cy	\$500.00
703.5.1	703-20.02	Class B Concrete (Misc) (Concrete Fill ≤ 2 cy)	cy	\$750.00
706.4	706-10.00	Reinforcing Steel	lb	\$2.00

Delete Sec 109.16 Fixed Cost Items. and substitute the following:

01/20

109.16 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	203-20.00	Class C Excavation ≤ 500 cy	cy	\$75.00
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
618.3	618-10.20	Additional Mobilization for Seeding	Each	\$600.00
703.5.1	<b>Concrete Fill &gt; 2 cy</b>			
	703-20.02	Class B Concrete (Misc)	cy	\$500.00
703.5.1	<b>Concrete Fill &lt; 2 cy</b>			
	703-20.02	Class B Concrete (Misc)	cy	\$750.00

704.6	706-10.00	Reinforcing Steel	lb	\$2.00
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**SECTION 202 – REMOVAL OF ROADWAYS AND BUILDINGS**

*Delete Sec 202.2.1 Containment and Disposal of Material and substitute the following:* **04/20**

**202.2.1 Disposal of Material.** All improvements not designated to remain shall be removed or disposed of by the contractor as required. The work may involve the generation of excess material, which may be solid waste under the definitions of the MDNR Solid Waste Management Program. The contractor shall dispose of solid waste in accordance with the Missouri Solid Waste Management Law and implementing regulations, 10 CSR 80.

*Add new specification 202.3.1.3:* **04/20**

**202.3.1.3** All abrasives used in blasting activities, and the material removed in the blasting process, shall be removed from the project and disposed of by the contractor in accordance with all applicable federal and state laws.

**SECTION 216 – REMOVALS FOR BRIDGE STRUCTURES**

*Delete Sec 216.20 SCARIFICATION OF BRIDGE DECKS and substitute the following:* **04/20**

**SECTION 216.20 SCARIFICATION OF BRIDGE DECK.**

*Delete Sec 216.20.3 Method of Measurement thru 216.20.4 Basis of Payment and substitute the following:* **04/20**

**216.20.3 Method of Measurement.** Final measurement of scarification of bridge deck will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, scarification of bridge deck will be measured to the nearest square yard based on measurement longitudinally from end of slab to end of slab and transversely from roadway face of curb to roadway face of curb. The revision or correction will be computed and added to or deducted from the contract quantity.

**216.20.4 Basis of Payment.** Scarification of bridge deck will be paid for at the contract unit price.

*Delete Sec 216.30.1 Description and substitute the following:* **04/20**

**216.30.1 Description.** This work shall consist of the complete removal and disposal of the unbonded seal coat, bonded seal coat, polymer wearing surface, asphalt wearing surface and concrete wearing surface from the bridge deck as shown on the plans or as directed by the engineer.

*Add new specification 216.30.2.1.1:* **04/20**

**216.30.2.1.1** When a concrete or asphalt wearing surface is to be installed, prior to the removal of the wearing surface, the contractor shall determine an average depth of the existing wearing surface with sufficient examination at multiple locations to permit an accurate determination of any required supplementary wearing surface material for the new wearing surface.

*Delete Sec 216.30.2.2 and substitute the following:* **04/20**

**216.30.2.2** When a concrete wearing surface is to be installed, the removal of the wearing surface plus the amount of deck as shown on the plans or to the adjusted depth described in Sec 216.30.2.2.1 shall produce a very rough texture that is acceptable to the engineer as a bondable surface for the new concrete wearing surface or as a starting profile for total surface hydro demolition. The removal process shall not produce a polished or slick surface.

*Add new specification 216.30.2.2.1:* **04/20**

**216.30.2.2.1** Prior to removal of the wearing surface, the contractor shall verify the depth of the top mat of reinforcing steel within the deck. The cold milling depth shall be reduced to avoid damage to the reinforcing steel. Any reinforcing steel damaged by the milling operation shall be repaired or replaced at the contractor's expense.

*Delete Sec 216.30.3 Method of Measurement thru 216.40 and substitute the following:* **04/20**

**216.30.3 Method of Measurement.**

**216.30.3.1** Final measurement of the removal of seal coat or wearing surface will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, removal of bonded seal coat, polymer wearing surface, asphalt wearing surface and concrete wearing surface will be measured to the nearest square foot based on measurement longitudinally from end of slab to end of slab and transversely from roadway face of curb to roadway face of curb. The revision or correction will be computed and added to or deducted from the contract quantity. No measurement will be made for removal of unbonded seal coat.

**216.30.4 Basis of Payment.**

**216.30.4.1** The accepted quantities of the removal of seal coat or wearing surface will be paid for at the contract unit price, except that all costs incurred by the contractor while removing the unbonded seal coat will be considered completely covered in the contract unit price for other items.

**SECTION 216.40 REMOVAL AND STORAGE OF EXISTING BRIDGE RAIL.**

*Delete Sec 216.40.3 Method of Measurement thru 216.50 and substitute the following:* **04/20**

**216.40.3 Method of Measurement.** Final measurement of the removal and storage of existing bridge rail will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, removal and storage of existing bridge rail will be measured to the nearest linear foot from end of rail to end of rail. The revision or correction will be computed and added to or deducted from the contract quantity.

**216.40.4 Basis of Payment.** Removal and storage of existing bridge rail will be paid for at the contract unit price.

**SECTION 216.50 REMOVAL OF EXISTING BRIDGE DECK**

*Delete Sec 216.50.3 Method of Measurement thru 216.60 and substitute the following:* **04/20**

**216.50.3 Method of Measurement.** Final measurement of removal of existing bridge deck will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, removal of existing bridge deck will be measured to the nearest square foot based on measurement longitudinally from end of slab to end of slab and transversely from out to out of the bridge deck. The revision or correction will be computed and added to or deducted from the contract quantity.

**216.50.4 Basis of Payment.** Removal of existing bridge deck will be paid for at the contract unit price.

**SECTION 216.60 PARTIAL REMOVAL OF EXISTING BRIDGE DECK.**

*Delete Sec 216.60.3 Method of Measurement thru 216.60.4 Basis of Payment and substitute the following:* **04/20**

**216.60.3 Method of Measurement.** Final measurement of the partial removal of existing bridge deck will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, partial removal of existing bridge deck will be measured to the nearest square foot based on measurement longitudinally from end of slab to end of slab and transversely from outside edge of the existing slab to the line shown on bridge plans. The revision or correction will be computed and added to or deducted from the contract quantity.

**216.60.4 Basis of Payment.** Partial removal of existing bridge deck will be paid for at the contract unit price.

*Delete Sec 216.90 REMOVAL OF EXISTING EXPANSION JOINTS AND ADJACENT CONCRETE and substitute the following:* **04/20**

**SECTION 216.90 REMOVAL OF EXISTING EXPANSION JOINT AND ADJACENT CONCRETE.**

*Delete Sec 216.90.4 Method of Measurement thru 216.90.5 Basis of Payment and substitute the following:* **04/20**

**216.90.4 Method of Measurement.** Final measurement of the removal of existing expansion joint and adjacent concrete will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, removal of existing expansion joint and adjacent concrete will be measured to the nearest linear foot based on measurement from roadway face of curb to roadway face of curb along centerline of the existing joint. The revision or correction will be computed and added to or deducted from the contract quantity. Portions of the joint extending past the roadway face of curbs will not be measured for payment.

**216.90.5 Basis of Payment.** Removal of existing expansion joint and adjacent concrete will be paid for at the contract unit price for each of the items included in the contract.

*Add new specifications 216.110 thru 216.110.6.3:*

*04/20*

## **SECTION 216.110 TOTAL SURFACE HYDRO DEMOLITION.**

**216.110.1 Description.** This work shall consist of removal of all existing deck repairs followed by the selective removal of all unsound original concrete over the entire top surface of the bridge deck, and establishment of a highly rough and bondable surface, with a single pass of hydro demolition equipment. Existing deck repairs are defined as any sound or unsound repairs previously made to the original deck. Unsound original concrete is defined as existing bridge deck concrete that is deteriorated, spalled or as determined by the engineer to be unacceptable.

**216.110.2 Material.** Water used in the hydro demolition shall be in accordance with Sec 1070.

### **216.110.3 Removal and Repair Prior to Hydro Demolition.**

#### **216.110.3.1 Removal of Existing Deck Repair.**

**216.110.3.1.1** Following scarification of the deck or removal of an existing wearing surface and prior to hydro demolition, the entire deck surface shall be thoroughly cleaned by high pressure water blasting with sufficient pressure to remove all debris. After cleaning, all existing deck repairs will be measured by the engineer and marked for removal over the full deck.

**216.110.3.1.2** For bridges without special repair zones, prior to hydro demolition, the contractor shall remove all sound and unsound existing deck repairs using conventional hand/mechanical equipment in accordance with Sec 704.4.

**216.110.3.1.3** For bridges with special repair zones, following the completion of deck repair in all special repair zones and prior to hydro demolition, the contractor shall remove all sound and unsound existing deck repairs outside special repair zones using conventional hand/mechanical equipment in accordance with Sec 704.4.

**216.110.3.1.4** Removal shall not include any unsound original bridge deck concrete.

**216.110.3.1.5** Following removal of existing deck repairs, all debris shall be removed from the deck prior to hydro demolition, at no additional cost.

#### **216.110.3.2 Zoned Conventional Deck Repair.**

**216.110.3.2.1** Prior to hydro demolition, the deck shall be repaired inside special repair zones as called for in the contract plans in accordance with Sec 704.

**216.110.3.2.2** Hydro demolition shall not move forward until the repairs in all special repair zones are complete and properly cured.

### **216.110.4 Construction Requirements.**

#### **216.110.4.1 Environmental Compliance.**

**216.110.4.1.1** Prior to the start of any hydro demolition, the contractor shall submit to the engineer for review an Environmental Compliance Plan (ECP) that ensures compliance with all federal, state, and local environmental laws and regulations. The ECP shall include specific details of the contractor's plan for containment, filtering, and disposal of water, slurry, and other debris, including all best management practices (BMPs) that the contractor plans to utilize to prevent environmental pollution and protect the waters of the state.

**216.110.4.1.1.1** The ECP plan shall contain a pH control plan. Chronic toxicity limits of pH range from 2 to 12.5 standard pH units. For consideration of release of hydro-demolition waste water within the right of way or off right of way with an approved waste disposal agreement, pH limits shall be adjusted to be between 6.5 and 9.0. The contractor shall be responsible for determining pH levels of the hydro-demolition wastewater and any adjustments necessary to comply with this requirement. Slurry water outside these limits shall be transported and disposed of in an approved water treatment facility. Any requirements necessary for compliance with water treatment facility regulations for disposal will be the responsibility of the contractor.

**216.110.4.1.2** All drains, joints, and other locations where discharge water could exit the deck shall be blocked in order to direct runoff to a central collection and filtering location, as designed by the contractor. When runoff is allowed to be dispersed adjacent to the bridge, BMPs shall be utilized to contain and filter the slurry to prevent the discharge of slurry or other contaminants.

**216.110.4.1.3** No direct payment will be made for compliance with this ECP, including, but not limited to, containment of the water and slurry, installing, maintaining, and removing the BMPs, filtering, and disposal of all waste materials.

**216.110.4.2 Equipment.**

**216.110.4.2.1 General.** The hydro demolition process shall consist of a water supply system, a high pressure water pumping system, and a demolition type unit. The demolition unit shall be robotic, computerized, and self-propelled, utilizing a high pressure water jet stream that is capable of removing concrete to the desired depths specified with a single pass of the unit, including the selective removal of all unsound original concrete. It shall also be capable of cleaning rust and concrete particles from all exposed reinforcing steel. The resulting concrete surface profile shall be one that is highly rough and bondable.

**216.110.4.2.1.1** The hydro demolition equipment shall provide shielding to ensure containment of all dislodged concrete within the removal area in order to protect the traveling public and work crew from flying debris on, adjacent to, and below the work site.

**216.110.4.2.1.2** Vacuum equipment shall be utilized for clean-up of hydro demolition debris. This equipment shall be equipped with fugitive dust control devices and shall be capable of removing wet debris and standing water in the same pass.

**216.110.4.2.2 Calibration.** The hydro demolition equipment shall be calibrated on a representative sample of sound deck concrete, as directed by the engineer. The calibration will demonstrate the ability to cut to the desired depth or depths, as indicated on the plans, in a single pass. The minimum allowable water pressure shall be 13,000 psi and the maximum water pressure shall not exceed 20,000 psi. The calibration shall accomplish the desired surface roughness, profile, and cutting depth as indicated on the contract plans. The equipment shall then be moved to an area of deteriorated deck, as directed by the engineer, in order to demonstrate the ability to remove all unsound original material. The equipment shall selectively remove all unsound original concrete, avoid the removal of unnecessary sound concrete, and provide a highly rough and bondable surface.

**216.110.4.2.2.1** If the equipment does not demonstrate the ability to produce the desired result, as determined by the engineer, the equipment shall be removed from the project and the contractor shall provide other equipment for calibration. No additional contract time or compensation will be allowed for the mobilization of replacement equipment to the work site.

**216.110.4.2.2.2** After the contractor has calibrated the equipment settings to the satisfaction of the engineer so that the equipment does selectively remove all unsound original concrete and provide a highly rough and bondable surface, without removing additional sound concrete, the calibration will be approved by the engineer and the contractor shall record the equipment settings as follows:

Water Pressure Gauge	
Water Pressure Gauge Inside Special Repair Zones <sup>a</sup>	
Machine Staging Control (Step)	
Machine Staging Control (Step) Inside Special Repair Zones <sup>a</sup>	
Nozzle Size	
Nozzle Type	
Nozzle Travel Speed	
Water Usage Rate	

<sup>a</sup> Only applicable inside special repair zones on existing cast-in-place concrete box girder, solid slab and voided slab bridges. Not applicable for prestressed concrete or steel beam and girder bridges.

**216.110.4.2.2.3** Calibration shall be required on each bridge and when different equipment is brought to the site for use.

**216.110.4.3 Operation.**

**216.110.4.3.1** After calibration of the equipment, the contractor shall perform total surface hydro demolition over the entire surface of the bridge deck.

**216.110.4.3.1.1** For bridges without special repair zones, the settings shall be maintained throughout the operation, unless the desired results are not being attained, in which case re-calibration shall be performed. The engineer will periodically verify the calibration settings to ensure the desired results are being attained.

**216.110.4.3.1.2** For bridges with special repair zones, two separate settings shall be maintained throughout the operation. One set of settings shall be maintained throughout the operation outside special repair zones unless the desired results are not being attained, in which case re-calibration shall be performed. Another set of settings shall be maintained throughout the operation inside special repair zones unless the desired results are not being attained, in which case re-calibration shall be performed. The engineer will periodically verify the calibration settings to ensure the desired results are being attained.

**216.110.4.3.2** The operator shall minimize the overlap of the individual hydro demolition passes to limit the amount of sound concrete removal.

**216.110.4.3.3** When the hydro demolition process is taking place above an area of concern, the contractor shall take measures to protect that area from hydro blasting through the deck, falling debris, water runoff, or any other action that the engineer considers a risk to public safety or a risk of property damage. An area of concern shall include vehicular traffic, boat traffic, pedestrian traffic, parking areas, private property, railroad property or any other area of concern as determined by the engineer.

**216.110.4.3.4** Only those vehicles directly required to perform the hydro demolition work and clean-up, or corresponding wearing surface construction equipment, shall be allowed on the bridge deck. Contamination of the deck by construction equipment or any other source shall be prevented.

**216.110.4.3.5** The contractor shall clean up the slurry and rubble from the hydro demolition operation as soon as possible following the hydro demolition process. This clean-up shall be completed prior to the drying of the slurry on the deck and reinforcing steel. The contractor shall utilize a vacuum collection type system capable of removing wet debris and water in a single operation. Following the cleaning, the surface shall be free of all debris, loose material, slurry, or cement paste.

#### **216.110.4.4 Incidental Conventional Concrete Removals After Hydro Demolition.**

**216.110.4.4.1** After the deck has been cleaned and dried, and is free of frost, the engineer will visually inspect and perform a sounding test of the entire deck and identify any unsound original deck material that remains.

**216.110.4.4.2** The contractor shall remove all identified unsound original deck material, as well as any areas on the deck that were inaccessible to the hydro demolition equipment. This removal work shall be included in the cost of the hydro demolition.

**216.110.4.4.3** All removals after hydro demolition shall be done with pneumatic hammers no heavier than the nominal 35-pound class and operated no more than a 45 degree angle from the horizontal. Use of mechanical equipment for the purpose of chipping shall be kept to the absolute minimum to avoid creating micro-fractures on the surface of the deck.

**216.110.4.5 Reinforcing Steel Repair.** The contractor shall take steps necessary to prevent damage to existing reinforcing steel. All equipment shall be operated in a manner that does not damage the deck, reinforcing steel or superstructure components. Any damage caused by the contractor's equipment or negligence shall be repaired at the contractor's expense.

**216.110.4.5.1** Reinforcement repair shall be in accordance with Sec 704. Replacement of damaged reinforcing steel may include the removal of additional concrete to adequately anchor reinforcing steel to the appropriate lap splice length in accordance with Sec 706.

**216.110.4.5.2** Replacement of reinforcing steel will be made at the fixed unit price in Sec 109.16, except that no payment will be made for replacement of reinforcing steel cut or broken by the contractor.

#### **216.110.5 Method of Measurement.**

**216.110.5.1** Measurement for removal of existing deck repair will be made to the nearest square foot. For bridges without special repair zones, measurement will include all sound and unsound existing deck repairs. For bridges with special repair zones, measurement will only include all sound and unsound existing deck repairs outside special repair zones.

**216.110.5.2** Measurement for total surface hydro demolition will be per square yard of the bridge deck as specified on the plans or shown in the contract. No final measurement will be made for hydro demolition except for authorized changes during construction or where appreciable errors are found in the contract quantity.

**216.110.5.3** Measurement of reinforcing steel replaced due to excess section loss will be made to the nearest 10 pounds.

#### **216.110.6 Basis of Payment.**

**216.110.6.1** Payment for removal of existing deck repair will be made at the contract unit price.

**216.110.6.2** Payment for total surface hydro demolition will be paid for at the contact unit price. Payment includes all work associated with the hydro demolition process including, but not limited to, ECP, equipment calibration, hand chipping curb areas, removal of remaining unsound original concrete, clean-up of debris and slurry, forming for full depth monolithic repairs, and preparation of the deck for concrete wearing surface.

**216.110.6.3 Reinforcing Steel Repair.** 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 109.16. No payment will be made for replacement of reinforcing steel cut or broken by the contractor.

**SECTION 503 – BRIDGE APPROACH SLAB**

*Delete Sec 503.3 Construction Requirements and substitute the following:* **04/20**

**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 3,200 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 shall require sealing with a concrete sealer. Asphalt bridge approach slabs shall be constructed in accordance with the specifications for the mix type specified.

**SECTION 505 – BRIDGE DECK CONCRETE WEARING SURFACE**

*Delete Sec 505.10.1 Description and substitute the following:* **04/20**

**505.10.1 Description.** This work shall consist of constructing a low slump, concrete wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer.

*Delete Sec 505.10.2.2 and substitute the following:* **04/20**

**505.10.2.2** Gradation D may be used when the plan thickness of the bridge deck wearing surface is 3 inches or greater.

*Delete Sec 505.10.3.1 and substitute the following:* **04/20**

**505.10.3.1** The contractor shall submit a mix design to Construction and Materials meeting the following properties:

Property	Requirement
Air Content, percent, min.	5.0
Slump, inches	0.5 (±0.5)
Fine Aggregate, % of total aggregate by absolute volume	50
Cement Content, lb/cy	818 to 827

*Delete Sec 505.10.4.4 and substitute the following:* **04/20**

**505.10.4.4** Compressive strength will be determined from at least two 6 by 12-inch cylinders or from at least three 4 by 8-inch cylinders prepared in accordance with AASHTO T 23 and tested in accordance with AASHTO T 22. One set consisting of two cylinders will be made for 28-day compressive strength from each day's production. Cylinders made for determining when to permit traffic will be made at a frequency determined by the engineer, and will be cured in the near vicinity and in the same manner as the bridge deck.

*Delete Sec 505.10.6.2 thru 505.10.6.4 and replace with new specifications 505.10.6.2 thru 505.10.6.5:* **04/20**

**505.10.6.2** On existing concrete decks with existing wearing surfaces, the wearing surface shall be removed in accordance with Sec 216. On existing concrete decks without existing wearing surfaces, the surface shall be scarified in accordance with Sec 216.

**505.10.6.3** For non-hydro demolition projects, the textured or scarified deck shall be sand or shot blasted followed by an air blast. The sand or shot blast shall remove all dirt, oil and other foreign material, as well as any unsound concrete or laitance from the surface and edges against which new concrete is to be placed. The compressor shall be equipped to prevent oil in the air supply. That portion of the curb and previously placed wearing surfaces against which new concrete is to be placed shall be sand or shot blasted. Any loose or foreign material detected on the concrete surface prior to placement of the wearing surface shall be removed by sand, shot or air blasting. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. The concrete surface may require retexturing where penetration of foreign material is evident. No contamination of the retextured or scarified concrete surface will be permitted.

**505.10.6.4** For hydro demolition projects, total surface hydro demolition shall be performed in accordance with Sec 216 and the following additional surface preparation.

**505.10.6.4.1** All areas of the deck, where further removal of concrete was performed with pneumatic hammering after the hydro demolition, shall be thoroughly sand or shot blasted to remove any loose material and micro-cracking. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3.

**505.10.6.4.2** After completion of sand or shot blasting and associated clean-up of debris, the entire deck surface shall be thoroughly cleaned by a minimum 7000 psi pressure water blasting to remove all debris and slurry residue within 24 hours prior to wearing surface placement begins. Water blasting shall continue until the run-off water from cleaning flows clear.

**505.10.6.4.3** After cleaning, the deck surface shall be thoroughly saturated to the point that the surface does not dry out, and any excess water removed with compressed air. Clean polyethylene sheeting shall then be used to cover the deck completely until such time as the wearing surface is placed. Just prior to placement of the wearing surface, the deck shall be brought to a saturated surface dry (SSD) condition and maintained in a SSD condition throughout the pour, with no ponding of water.

**505.10.6.4.4** Any standing water on the deck or in the depressed areas of monolithic deck repair shall be removed prior to placement of wearing surface material.

**505.10.6.5** To assure that the thickness of the concrete wearing surface above the prepared surface will be as specified on the plans, the clearance shall be checked in the following manner before concrete is placed. A filler block having a thickness 1/8 inch less than the wearing surface thickness shall be attached to the bottom of the screed. With screed guides in place, the screed shall be passed over the area to be concreted. Where the intended clearance does not allow use of this method, a stringline or other means shall be used, subject to approval from the engineer. All existing concrete shall be removed that does not have sufficient clearance.

**Delete Sec 505.10.7.1 and substitute the following:**

**04/20**

**505.10.7.1** The finishing machine shall be designed for striking off and finishing low slump concrete. The machine shall be mechanically powered to operate forward and reverse in a smooth manner, under positive control of the operator. The basic machine shall be of a width to finish a basic 12-foot width of wearing surface and shall be adjustable for wider placements. The finishing machine shall be designed to allow the screeds to be extended with bolted units to match the extension of the basic unit. The drive wheels shall be of the type that may be replaced with solid rubber wheels to permit travel upon previously completed lanes of wearing surface when striking off the abutting lanes.

**Delete Sec 505.10.7.2.1 and substitute the following:**

**04/20**

**505.10.7.2.1** Screeds shall be held positive to the machine with rollers and, unless otherwise approved by the engineer, shall be equipped with screed guides such as to control the profile grade of the finished wearing surface. The screed stroke shall be synchronized to speeds not exceeding 50 strokes per minute, with infinite variable control from the console. The screeds shall be capable of vertical lift when the machine is reversed for travel, and controlled for downward direction to the finishing position to permit feathering of the screeds to any previously finished surface.

**Delete Sec 505.10.7.4 and substitute the following:**

**04/20**

**505.10.7.4** Heavy duty support rails shall be used to support the finishing machine. Support rails shall be adjustable and the rail shall not deflect more than 1/32 inch between adjustable supports. Support rails shall be placed outside the area and parallel to axis of the area to be concreted. Support rails shall extend a sufficient distance beyond the end of the deck to allow the finishing machine to be completely removed from the deck surface such that hand finishing may proceed without interruption. The support rails shall be set to produce the final profile grade of the surface of the wearing surface. A hold-down device shot into the concrete will not be permitted unless the concrete is to be subsequently resurfaced. The proposed method of anchoring the support rails shall be submitted to the engineer for approval.

**Delete Sec 505.10.8.1 and substitute the following:**

**04/20**

**505.10.8.1** A lateral support for the concrete such as 2 by 4-inch lumber attached to the deck will be required at least 6 inches beyond the line where the saw cut for the longitudinal joint is to be made.

**Delete Sec 505.10.8.4 and substitute the following:**

**04/20**

**505.10.8.4** Transverse joints in the wearing surface will be permitted if approved by the engineer. These joints shall be located a minimum of 10 feet from the centerline of bent.

*Delete Sec 505.10.8.6 thru 505.10.8.7 and substitute the following:*

*04/20*

**505.10.8.6** The areas of half-sole and full depth repair shall have individual concrete placed in accordance with Sec 704. These individual placements shall remain rough and shall be completed before the wearing surface course is started. Areas of half-sole, full depth repair and all other patched areas shall be surface dried, sand or shot blasted and cleaned prior to the placement of low slump concrete wearing surface.

**505.10.8.7** Prior to placement of low slump concrete, the cleaned surface shall be thoroughly wetted for a minimum of three hours, then covered with polyethylene sheeting until the time of concrete placement. The surface shall be damp at the time the wearing surface is placed. Any standing water in depressions, holes or areas of concrete removal shall be blown out with compressed air. No free water or puddles of standing water shall exist at the time of placement.

*Delete Sec 505.10.8.9 thru 505.10.8.10 and substitute the following:*

*04/20*

**505.10.8.9** Placement of the concrete shall be a continuous operation throughout the pour. Only the minimum amount of concrete necessary for proper placement shall be placed in front of the screeds. If the concrete paver is stopped for any reason, all plastic concrete in front of the paver shall be covered with wet burlap. Concrete shall be placed and finished at a minimum of 2.5 cubic yards per hour for a 12-foot wide pour, except when the contractor elects to pour a wider section, the rate of pour shall be increased proportionately. When concrete is being mixed and placed at the specified minimum rate under normal operations, the finishing machine shall be designed such that the elapsed time between depositing the concrete on the deck and final screeding shall not exceed 10 minutes.

**505.10.8.10** If concrete is added to the wearing surface behind the finishing machine, the area shall be mechanically consolidated again by the finishing machine.

*Delete Sec 505.10.9 thru 505.20.1 and replace with new specifications for 505.10.9 thru 505.20.1:*

*04/20*

**505.10.9 Supplementary Wearing Surface Material.** This work shall consist of providing and placing additional wearing surface material in excess of the material required for the wearing surface at plan thickness.

**505.10.9.1** Supplementary wearing surface material will be required when conditions require the actual wearing surface thickness to exceed plan thickness, including but not limited to:

- (a) Thickness of existing wearing surface removed exceeds plan thickness.
- (b) Correcting profile grade and cross section deficiencies of the existing deck.
- (c) Contractor's negligence in milling too deep during scarification or removal of existing wearing surface.
- (d) Contractor's negligence in cutting sound deck concrete too deep during hydro demolition including excessive overlap of hydro demolition passes.

**505.10.9.2** Supplementary wearing surface material will be required to fill the depressions of monolithic deck repair in the deck below the bottom of the planned deck wearing surface thickness. This material is placed monolithic during the deck wearing surface process.

**505.10.10 Limitations of Operations.**

**505.10.10.1** Vehicle traffic shall not be permitted on the low slump concrete surface for 72 hours and until 3,000 psi compressive strength is attained.

**505.10.10.2** No low slump concrete shall be placed at ambient temperatures below 45 F or above 85 F. Concrete placement may begin when the air temperature and deck temperature is 45 F and rising. Concrete shall not be exposed to freezing temperatures until a strength of 3,000 psi has been attained. Any concrete damaged by freezing shall be removed and replaced at the contractor's expense.

**505.10.10.3** When the weather forecast predicts temperatures of 85 F or higher, the contractor shall schedule placing and finishing low slump concrete during hours in which the ambient temperature will be lower than 85 F. The mixed concrete when placed shall have a maximum temperature of 90 F.

**505.10.10.4** Concrete shall not be placed adjacent to a parallel surface course that is less than 72 hours old. This restriction will not apply to a continuation of placement in a lane or strip beyond a joint in the same lane or strip.

**505.10.10.5** Preparation of the area may be started in a lane or strip adjacent to a newly placed surface the day following placement of the new surface. If this work is started before the end of the 72-hour curing period, the work shall be restricted as follows:

- (a) Sawing or other operations shall interfere with the curing process for the minimum practical time only, in the immediate work area only, and the curing shall be resumed promptly.
- (b) No power-driven tools heavier than 15 pounds shall be used.
- (c) Air compressors shall be operated on the deck only directly over the piers.
- (d) No loads other than construction equipment shall be permitted on any portion of the bridge floor that has undergone preparation prior to placement and curing of new concrete.

**505.10.11 Removal.** All material removed shall be disposed of by the contractor at the contractor's expense in a location meeting the approval of the engineer.

**505.10.12 Repair.**

**505.10.12.1** Unbonded areas will be marked by the engineer. The contractor shall saw cut and remove the affected area. All saw cuts shall be straight vertical lines and form square corners at all changes in direction. After removal of the concrete, the surface of the area to be repaired and vertical saw cuts shall be cleaned of all loose or foreign material by sand or shot blasting and then air blasting. The surface shall be comparable to the original concrete surface prior to the original wearing surface being placed.

**505.10.12.2** The concrete used for repair shall meet the same requirements as the original mixture. The concrete shall be vibrated with a surface or pan-type vibrator to obtain compaction. Spud type vibrators shall not penetrate to contact with the original concrete. Surface finish and curing shall be in accordance with the specifications for the mixture used.

**505.10.13 Method of Measurement.**

**505.10.13.1** Final measurement of the wearing surface at plan thickness will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, the area of wearing surface will be measured to the nearest square yard based on measurement longitudinally from end to end of bridge deck and transversely between roadway face of curbs, excluding the area of any expansion devices. The revision or correction will be computed and added to or deducted from the contract quantity.

**505.10.13.2** Measurement of supplementary wearing surface material will be made to the nearest cubic yard by deducting the theoretical volume of material necessary to construct the wearing surface at plan thickness from the total volume of deck wearing surface material placed on the deck surface. Deductions will be made for:

- (a) Material wasted.
- (b) Material used to correct contractor's negligence in milling too deep during scarification or removal of existing wearing surface.
- (c) Material used to fill contractor's negligence in cutting sound deck concrete too deep during hydro demolition including excessive overlap of hydro demolition passes.

**505.10.14 Basis of Payment.**

**505.10.14.1** The accepted quantities of the wearing surface at plan thickness, complete in place, will be paid for at the contract unit price.

**505.10.14.2** The accepted quantities of supplementary wearing surface material, complete in place, will be paid for at the fixed contract unit price specified in Sec 109.16.

**SECTION 505.20 LATEX MODIFIED CONCRETE.**

**505.20.1 Description.** This work shall consist of constructing a latex modified concrete wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer.

*Delete Sec 505.20.3.1 Concrete Mixture and substitute the following:*

**04/20**

**505.20.3.1** The contractor shall submit a mix design to Construction and Materials meeting the following requirements:

<b>Property</b>	<b>Requirement</b>
Air Content, percent	0.0 to 6.5
Slump, inches, max.	9.0
Fine Aggregate, % of total aggregate by absolute volume	50 to 55
Cement Content, lb/cy, min.	658
Latex Emulsion Admixture, gal/cy, min.	24.5
Net Water <sup>a</sup> -Cement Ratio, lb water/lb cement, max.	0.40

<sup>a</sup> Net water shall be considered the quantity of mixing water added, plus the non-solid portion of the latex emulsion.

*Delete Sec 505.20.6 Surface Preparation and substitute the following:*

**04/20**

**505.20.6 Surface Preparation.** Surface preparation shall be in accordance with Sec 505.10.6, except as specified herein.

*Delete Sec 505.20.6.2 and substitute the following:*

**04/20**

**505.20.6.2** On both existing and new decks for non-hydro demolition projects, within 24 hours prior to placing latex modified concrete, the entire surface shall be thoroughly cleaned by sand or shot blasting followed by an air blast. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3.

*Delete Sec 505.20.7.1 and substitute the following:*

**04/20**

**505.20.7.1** The finishing machine shall be self-propelled and shall be capable of forward and reverse movement under positive control, with a provision for raising all screeds to clear the screeded surface for traveling in reverse. A self-propelled finishing machine with one or more rollers, augers and 1500 to 2500 vpm vibratory pans shall be used. A drag float may be necessary. Any modifications will be subject to approval from the engineer.

*Delete Sec 505.20.8 thru 505.30.2 and replace with new specifications for 505.20.8 thru 505.30.2:*

**04/20**

**505.20.8 Placing and Finishing Concrete.** Placing and finishing shall be in accordance with Sec 505.10.8, except as specified herein.

**505.20.8.1** Prior to placement of latex modified concrete, the cleaned surface shall be thoroughly wetted for a minimum of three hours, then covered with polyethylene sheeting until time of concrete placement. The surface shall be damp at the time the wearing surface is placed. Any standing water in depressions, holes or areas of concrete removal shall be blown out with compressed air. No free water or puddles of standing water shall exist at the time of placement.

**505.20.8.2** Hand vibrators shall be used in areas of monolithic deck repair in the deck below the bottom of the planned deck wearing surface thickness where concrete is being placed around reinforcement, deeper areas within the pour, and along curb lines and construction joints. Deep areas shall be filled in advance during the wearing surface pour so the material stiffens enough that it will not roll back under the paving screed.

**505.20.8.3** Expansion joints and dams shall be formed in the concrete wearing surface. Formation of the joint by sawing through the wearing surface will not be permitted.

**505.20.8.4** Texturing shall occur immediately after finishing and before the plastic film forms on the surface. Texturing shall be performed in a manner to prevent pulling the concrete away from an existing vertical face. Care shall be taken not to texture too deep and not to tear the surface.

**505.20.8.5** Screed rails and headers shall be separated from the newly placed material by passing a pointing trowel along the inside face. Metal expansion dams shall not be separated from the wearing surface. The trowel cut shall be made for the entire depth and length of rails or headers after the mixture has stiffened sufficiently and shall prevent the concrete from flowing back into the cut.

**505.20.8.6** During placement of the wearing surface, all joints with adjacent concrete shall be sealed with a mortar paste of equal parts cement and fine aggregate, using latex emulsion in lieu of mixing water.

**505.20.8.7** The wet cure shall be applied promptly after the concrete has been placed on the deck without deforming the finished surface.

**505.20.8.8** The surface shall receive a wet cure for at least 48 hours.

**505.20.8.9** After placement and cure of the latex modified concrete, the finished deck will be tested to detect unbonded areas.

**505.20.8.10** No surface sealing shall be applied to the latex modified concrete wearing surface.

**505.20.9 Supplementary Wearing Surface Material.** Supplementary wearing surface material shall be in accordance with Sec 505.10.9.

**505.20.10 Limitations of Operations.**

**505.20.10.1** No latex modified concrete shall be placed when the ambient or deck surface temperature is above 85 F. Deck temperature shall be determined in accordance with MoDOT Test Method TM 20.

**505.20.10.2** No latex modified concrete shall be placed at ambient or deck surface temperatures below 45 F. Latex modified concrete shall be protected to maintain a minimum specified curing temperature of 45 F. Any concrete damaged by freezing or that is exposed to a temperature of less than 45 during the first 8 hours after placement shall be removed and replaced at the contractor's expense.

**505.20.10.3** The temperature of the latex modified concrete at time of placement shall be between 45 F and 90 F. If either the aggregate or water is heated, the maximum temperature for each shall be 100 F at the time of addition to the mix. Any method of heating during the mixing of concrete may be used provided the heating apparatus will heat the mass uniformly and avoid hot spots that will burn the material. Cement or aggregate containing lumps or crusts of hardened material or frost shall not be used.

**505.20.10.4** No vehicular traffic shall be permitted on the latex modified concrete surface until the concrete is at least 72 hours old and has attained a minimum compressive strength of 3,000 psi.

**505.20.10.5** Concrete shall not be placed adjacent to a parallel surface course that is less than 96 hours old; however, this restriction will not apply to a continuation of placement in a lane or strip beyond a joint in the same lane or strip.

**505.20.10.6** Preparation of the area, except scarifying, may be started in a lane or strip adjacent to a newly placed surface the day following the surface placement. If this work is started before the end of the 48-hour wet curing period, the work will be restricted such that any interference with the curing process is held to the minimum practical time.

**505.20.10.7** Longitudinal construction joints shall be placed between designated traffic lanes. The location of the longitudinal joints will be subject to the approval from the engineer.

**505.20.10.8** Transverse joints in the wearing surface may be permitted if approved by the engineer. These joints shall be located a minimum of 10 feet from the centerline of bent.

**505.20.10.9** A header shall be installed in case of delay in the placement operations exceeding one-half hour in duration. During minor delays of one-half hour or less, the end of the placement shall be protected from drying with several layers of wet burlap.

**505.20.10.10** Adequate precautions shall be taken to protect freshly placed concrete from rain. All placing operations shall cease when rain begins. The engineer may order removal of any material damaged by rainfall and such material shall be replaced in accordance with these specifications at the contractor's expense.

**505.20.11 Removal.** Removal shall be in accordance with Sec 505.10.11.

**505.20.12 Repair.** Repair shall be in accordance with Sec 505.10.12.

**505.20.13 Method of Measurement.** Measurement will be in accordance with Sec 505.10.13.

**505.20.14 Basis of Payment.** Payment will be in accordance with Sec 505.10.14.

**SECTION 505.30 SILICA FUME CONCRETE.**

**505.30.1 Description.** This work shall consist of constructing a silica fume concrete wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer.

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

Item	Section
Type I Cement	1019
Air Entraining Admixture	1054
Retarding Admixture	1054
Water-Reducing Admixture	1054
Burlap	1055
Polyethylene Sheeting	1058
Water	1070

*Delete Sec 505.30.3.1 and substitute the following:*

04/20

**505.30.3.1** The contractor shall submit a mix design to Construction and Materials with the following properties:

Property	Requirement
Air Content, percent, min.	5.0
Slump, inches	3.0 to 7.5
Cement Content, lb/cy, min	640
Water/Cement Ratio, lb water/lb cement, max.	0.37
Silica Fume, % replacement of cement	6.0 to 8.0
Fine Aggregate, % of total aggregate by absolute volume	50 to 55
High Range Water Reducer	As required

*Delete Sec 505.30.5.6 and substitute the following:*

04/20

**505.30.5.6** Prior to placement of concrete, the contractor may be required to prepare trial batches of concrete for tests. Trial batches shall comply with and be paid for in accordance with Sec 501.

*Delete Sec 505.30.7 thru 505.40.2 and replace with new specifications for 505.30.7 thru 505.40.2:*

04/20

**505.30.7 Finishing Equipment.** The finishing machine shall be designed for striking off and finishing silica fume concrete wearing surface. The finishing machine, screeds, traveling strike off and support rails shall be in accordance with Sec 505.10.7.

**505.30.8 Placing and Finishing Concrete.** Placing and finishing shall be in accordance with Sec 505.10.8, except as specified herein.

**505.30.8.1** The cleaned areas to receive the wearing surface shall be thoroughly and continuously wetted with water at least three hours before placement of the wearing surface is started, then covered with polyethylene sheeting until the time of placement. Any accumulations of water shall be dispersed or removed prior to applying the wearing surface.

**505.30.8.2** Hand vibrators shall be used in areas of monolithic deck repair in the deck below the bottom of the planned deck wearing surface thickness where concrete is being placed around reinforcement, deeper areas within the pour, and along curb lines and construction joints. Deep areas shall be filled in advance during the wearing surface pour so the material stiffens enough that it will not roll back under the paving screed.

**505.30.8.3** Since silica fume concrete produces very little bleed water, the engineer may require one or both of the following procedures to maintain a surface film until the burlap is placed.

**505.30.8.3.1** A commercially available evaporative retarder may be used judiciously with a misting device during the finishing process until the wet burlap is applied only to prevent the surface of the concrete from drying out. The evaporative retarder shall not be used to increase surface workability.

**505.30.8.3.2** Fogging may be done to increase humidity in the area of placement. Any fogging shall be done with nozzles specifically designed for fogging, with a maximum rate of one gallon per minute per nozzle.

**505.30.8.4** The surface shall receive a wet cure for at least 7 days. Time when the ambient temperature is below 45 F will not be counted as cure time. Cure shall be continued until 3000 psi compressive strength has been attained.

**505.30.8.5** The finished deck will be examined for cracking. If cracking is found, the engineer will determine whether cracking is detrimental, whether remedial surface repairs are needed or whether the wearing surface in the cracked area should be removed and replaced. All remedial surface repairs, removal or replacement shall be done by the contractor at the contractor's expense.

**505.30.8.6** After placement and cure of the silica fume concrete, the finished deck will be tested to detect unbonded areas.

**505.30.8.7** No surface sealing shall be applied to the silica fume concrete wearing surface.

**505.30.9 Supplementary Wearing Surface Material.** Supplementary wearing surface material shall be in accordance with Sec 505.10.9.

**505.30.10 Limitations of Operations.** Operations shall be limited in accordance with Sec 505.10.10, except as specified herein.

**505.30.10.1** Vehicular traffic shall not be permitted on the silica fume concrete surface for seven days, and in no case until 3000 psi compressive strength is attained.

**505.30.10.2** Silica fume concrete shall not be placed when the air temperature or deck temperature is below 45 F or above 85 F. Concrete placement may begin when the air temperature and deck temperature are 45 F and rising. Concrete shall not be exposed to freezing temperatures until a strength of 3000 psi has been attained. Any concrete damaged by freezing shall be removed and replaced at the contractor's expense.

**505.30.10.3** When the weather forecast predicts temperatures of 85 F or higher, the contractor shall schedule placing and finishing silica fume concrete during hours in which the ambient temperature will be lower than 85 F. The mixed concrete shall not have a temperature higher than 85 F when placed.

**505.30.10.4** Since silica fume concrete may not exhibit bleed water, the probability of plastic shrinkage cracking is increased. At surface evaporation rates above 0.1 pound per square foot per hour, plastic shrinkage cracking is probable and the contractor shall take precautions such as erecting windbreaks, lowering the mix temperature or delaying operations until ambient temperatures are lower. Fogging the concrete surface will only be permitted as provided for in this specification. Surface evaporation rates may be predicted from mix temperature, air temperature, relative humidity and wind velocity, using Figure 1 of the 1986 revised edition of ACI 308-81, *Standard Practice for Curing Concrete*.

**505.30.11 Removal.** Removal shall be in accordance with Sec 505.10.11.

**505.30.12 Repair.** Repair shall be in accordance with Sec 505.10.12.

**505.30.13 Method of Measurement.** Measurement will be in accordance with Sec 505.10.13.

**505.30.14 Basis of Payment.** Payment will be in accordance with Sec 505.10.14.

#### **SECTION 505.40 LATEX MODIFIED VERY EARLY STRENGTH CONCRETE.**

**505.40.1 Description.** This work shall consist of constructing a latex modified very early strength concrete wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer.

**505.40.2 Material.** All material shall be in accordance with Sec 505.10.2, Division 1000, Materials Details and specifically as follows:

<b>Item</b>	<b>Section</b>
Latex Emulsion Admixture	1054
Polyethylene Sheeting	1058
Water	1070

*Delete Sec 505.40.2.2 and substitute the following:*

**04/20**

**505.40.2.2** Coarse aggregate shall be an approved crushed limestone, crushed quartzite, flint chat from the Joplin area, or porphyry in accordance with Sec 1005, Gradation E or Gradation F, except the percentage of deleterious substances shall not exceed the following values, and the sum of percentages of all deleterious substances shall not exceed one percent.

<b>Item</b>	<b>Percent by Weight</b>
Deleterious Rock	1.0
Shale and Pyrite	0.2
Chert in Limestone	0.5
Other Foreign Material	0.1

*Delete Sec 505.40.2.4 and substitute the following:*

**04/20**

**505.40.2.4** With approval of the engineer, other gradations of coarse or fine aggregate may be used, however all quality requirements, including a maximum of 2 percent passing the No. 200 for fine and coarse aggregate, shall apply and the maximum aggregate size shall not exceed that of Sec 1005, Grade E aggregate.

*Delete Sec 505.40.3.1 thru 505.40.3.3 and substitute the following:*

**04/20**

**505.40.3.1** The concrete mixture shall meet the following requirements:

<b>Property</b>	<b>Requirement</b>
Air Content, percent	0.0 to 6.5
Slump, inches, max.	9.0
Fine Aggregate, % of total aggregate by weight	50 to 55
Cement Content, lb/cy, min.	658
Latex Emulsion Admixture, gal/cy, min.	24.5
Net Water <sup>a</sup> -Cement Ratio, lb water/lb cement, max.	0.42

<sup>a</sup> Net water shall be considered the quantity of mixing water added plus the non-solid portion of the latex emulsion.

**505.40.3.2** Chloride permeability shall not be greater than 1000 coulombs when tested in accordance with AASHTO T 277. Tests shall be performed on specimens at 28 days. This test shall be performed on each mixture submitted for approval. The tests are to be performed by a qualified commercial laboratory.

**505.40.3.3** The mixture shall be designed to develop a minimum 28-day compressive strength of 4500 psi.

*Delete Sec 505.40.4 thru 505.40.9 and replace with new specifications for 505.40.3.8 thru 505.40.9:*

**04/20**

**505.40.3.8 Mix Design.** The contractor shall submit the mix design to Construction and Materials for approval. The mix design shall be within the limits specified in this specification. The mix design shall also include actual test results for the following information:

- (a) Air.
- (b) Slump.
- (c) Compressive strengths at 4 hours, 8 hours, 12 hours, 24 hours, 7 days and 28 days. Compressive strengths determined using 6 by 12-inch cylinders.
- (d) Results of chloride permeability testing.

**505.40.3.8.1** If other aggregate gradations than standard specifications are utilized, the contractor shall designate the intended target gradation and allowable gradation range for each fraction. The target gradations and allowable gradation ranges will be used for inspection and quality control of the aggregates.

**505.40.3.8.2** Any change in mix design or proportions shall be approved by the engineer.

**505.40.4 Testing.** Testing will be done in accordance with Sec 505.10.4, except that the slump test will be conducted 4 to 5 minutes after discharge from the mixer. During the waiting period, concrete shall be deposited on the deck and shall not be disturbed.

**505.40.5 Mixing.**

**505.40.5.1** The concrete shall be volumetrically mixed at the bridge site by a continuous mixer in accordance with Sec 501. In addition to other requirements, the mixer shall provide positive control of the latex emulsion into the mixing chamber, and the latex emulsion shall calibrate to within  $\pm 2$  percent of that required. The mixer shall be capable of continuously circulating the latex emulsion and have a flow-through screen between the storage tank and the discharge.

**505.40.5.2** The concrete discharged from the mixer shall be uniform in composition and consistency. Mixing capability shall be such that initial and final finishing operations can proceed at a steady pace. Final finishing shall be completed before the formation of a plastic surface film on the surface.

**505.40.5.3** The moisture content of aggregates at the time of proportioning shall be such that water will not drain or drip from a sample. Coarse and fine aggregate shall be furnished and handled to avoid variations in the moisture content affecting the uniform consistency of the concrete.

**505.40.5.4** Each drum of latex admixture shall be mechanically agitated or hand rolled until thoroughly mixed prior to being introduced into the mixer storage compartment. Latex admixture that is stored in the mixer storage compartment overnight or during delays in mixing of four hours or more shall be agitated by at least two complete cycles in a continuous circulating pump or by mechanical means in the storage compartment. The flow through screen shall be cleaned immediately prior to beginning proportioning and as often as necessary thereafter. Latex admixtures of different brands shall not be combined together in any manner.

**505.40.5.5** The water/cement ratio shall be within 0.02 of that specified in the approved mix design. If adjustments for water content beyond that are necessary, a previously tested and approved mixture shall be used.

**505.40.5.6** Prior to placement of concrete, the contractor shall be required to prepare trial batches of concrete for testing. Trial batches shall comply with the limits specified in this specification.

**505.40.6 Surface Preparation.** Surface preparation shall be in accordance with Sec 505.10.6, except as specified herein.

**505.40.6.1** Prior to scarifying or chipping on concrete adjacent to latex modified very early strength concrete, 24 hours of curing shall elapse. If practical, or unless otherwise shown on the plans, all scarifying by mechanical units shall be completed prior to placing any latex modified very early strength concrete. Areas from which unsound concrete and patches have been removed shall be kept free of slurry produced by wet sawing or wet scarifying by planning the work such that this slurry will drain away from the completed areas of preparation.

**505.40.6.2** On both existing and new decks for non-hydro demolition projects, within 24 hours before placement of the wearing surface begins, the entire surface shall be thoroughly cleaned by water blasting followed by an air blast in accordance with Sec 505.10.6.4.2.

**505.40.6.3** Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3.

**505.40.7 Finishing Equipment.**

**505.40.7.1** The finishing machine shall be in accordance with Sec 505.20.7.

**505.40.7.2** Support rails shall be in accordance with Sec 505.10.7.

**505.40.8 Placing and Finishing Concrete.** Placing and finishing shall be in accordance with Sec 505.10.8, except as specified herein.

**505.40.8.1** Prior to placement of latex modified very early strength concrete, the cleaned surface shall be thoroughly wetted for a minimum of one hour, then covered with polyethylene sheeting until time of concrete placement. The surface shall be damp at the time the wearing surface is placed. Any standing water in depressions, holes or areas of concrete removal shall be blown out with compressed air. No free water or puddles of standing water shall exist at the time of placement.

**505.40.8.2** Hand vibrators shall be used in areas of monolithic deck repair in the deck below the bottom of the planned deck wearing surface thickness where concrete is being placed around reinforcement, deeper areas within the pour, and along curb lines and construction joints. Deep areas shall be filled in advance during the wearing surface pour so the material stiffens enough that it will not roll back under the paving screed.

**505.40.8.3** Expansion joints and dams shall be formed in the concrete wearing surface. Formation of the joint by sawing through the wearing surface will not be allowed.

**505.40.8.4** Water shall not be added to the surface of the concrete during finishing. A commercially available evaporation retardant may be used judiciously with a misting device during the finishing process until the wet burlap is applied only to prevent the surface of the concrete from drying out. The evaporation retardant shall not be used to increase surface workability.

**505.40.8.5** Texturing shall occur immediately after finishing and before the plastic film forms on the surface. Texturing shall be performed in a manner to prevent pulling the concrete away from an existing vertical face. Care shall be taken not to texture too deep and not to tear the surface.

**505.40.8.6** Screed rails and headers shall be separated from the newly placed material by passing a pointing trowel along their inside face. Metal expansion dams shall not be separated from the new wearing surface. The trowel cut shall be made for the entire depth and length of rails or headers after the mixture has stiffened sufficiently and shall prevent the concrete from flowing back into the cut.

**505.40.8.7** During placement of the wearing surface, all joints with adjacent concrete shall be sealed with a mortar paste of equal parts cement and fine aggregate, using latex emulsion in lieu of mixing water.

**505.40.8.8** The wearing surface concrete shall be moist cured from the time placed until opened to traffic.

**505.40.8.9** The wet cure shall be applied promptly after the concrete has been placed on the deck without deforming the finished surface.

**505.40.8.10** Within one hour of covering with wet burlap, a layer of white polyethylene sheeting shall be placed on the wet burlap. The surface shall receive a wet cure until the latex modified very early strength concrete has attained a compressive strength of at least 3000 psi.

**505.40.8.11** The thickness of the wearing surface shall not exceed 3 inches, unless otherwise approved by the engineer.

**505.40.8.12** The finished deck will be examined for cracking. If cracking is found, the engineer will determine whether cracking is detrimental, whether remedial surface repairs are needed or whether the wearing surface in the cracked area should be removed and replaced. All remedial surface repairs, removal or replacement shall be done by the contractor at the contractor's expense.

**505.40.8.13** After placement and curing of the latex modified very early strength concrete, the finished deck will be tested to detect unbonded areas.

**505.40.8.14** No surface sealing shall be applied to the latex modified very early strength concrete wearing surface.

**505.40.9 Supplementary Wearing Surface Material.** Supplementary wearing surface material shall be in accordance with Sec 505.10.9.

*Delete Sec 505.40.10.3 and substitute the following:* **04/20**

**505.40.10.3** A fogging system shall be in-place prior to concrete placement. The fogging system shall consist of pressurized equipment that distributes water at minimum rate of 0.10 gallon per hour per square foot. The fogging system shall apply the fog uniformly over the entire surface of the bridge deck. The fogging system shall produce atomized water that has a droplet with a maximum diameter of 0.003 inch and which keeps the finished deck surface saturated without producing standing water. The contractor shall submit a letter certifying that their fogging system is in accordance with this specification.

*Delete Sec 505.40.10.7 and substitute the following:* **04/20**

**505.40.10.7** No vehicle traffic shall be permitted on the latex modified very early strength concrete surface until the latex modified very early strength concrete has attained a minimum compressive strength of 3200 psi. Compressive strength will be determined by tests conducted in accordance with MoDOT test methods.

*Delete Sec 505.40.10.11 and substitute the following:* **04/20**

**505.40.10.11** Transverse joints in the wearing surface may be permitted if approval by the engineer. Transverse joints shall be located a minimum of 10 feet from the centerline of bent.

*Delete Sec 505.40.11 thru 505.40.14 and substitute the following:* **04/20**

**505.40.11 Removal.** Removal shall be in accordance with Sec 505.10.11.

**505.40.12 Repair.** Repair shall be in accordance with Sec 505.10.12.

**505.40.13 Method of Measurement.** Measurement will be in accordance with Sec 505.10.13.

**505.40.14 Basis of Payment.** Payment will be in accordance with Sec 505.10.14.

*Add new specifications 505.50 thru 505.70.14:* **04/20**

**SECTION 505.50 CSA CEMENT VERY EARLY STRENGTH CONCRETE.**

**505.50.1 Description.** This work shall consist of constructing a calcium sulfoaluminate dicalcium silicate (CSA) cement very early strength concrete wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer.

**505.50.2 Material.** All material shall be in accordance with [Division 1000](#), Materials Details and specifically as follows:

Item	Section
Water Reducing Admixture	<a href="#">1054</a>
Burlap	<a href="#">1055</a>
Polyethylene Sheeting	<a href="#">1058</a>
Water	<a href="#">1070</a>

**505.50.2.1** CSA cement shall be a Type VRH (very rapid hardening) in accordance with ASTM C 1600. Mixing other hydraulic cements with CSA cement will not be permitted.

**505.50.2.2** Coarse aggregate shall be an approved crushed limestone, crushed quartzite, flint chat from the Joplin area, or porphyry in accordance with Sec 1005, Gradation E, except the percentage of deleterious substances shall not exceed the following values, and the sum of percentages of all the deleterious substances shall not exceed one percent.

Item	Percent by Weight
Deleterious Rock	1.0
Shale and Pyrite	0.2
Chert in Limestone	0.5
Other Foreign Material	0.1

**505.50.2.3** Fine aggregate shall be in accordance with Sec 1005 and shall be Class A sand in accordance with [Sec 501](#).

**505.50.2.4** With approval of the engineer, other gradations of coarse or fine aggregate may be used, however all quality requirements, including a maximum of 2 percent passing the No. 200 for fine and coarse aggregate, shall apply and the maximum aggregate size shall not exceed that of [Sec 1005](#), Grade E aggregate.

**505.50.2.5** Pozzoloanic material or Portland pozzolan cements shall not be used.

**505.50.2.6** Type S admixtures in accordance with ASTM C 494 may be used, if approved by the engineer.

**505.50.3 Concrete Mixture.**

**505.50.3.1** The concrete mixture shall meet the following requirements:

Property	Requirement
Air Content, percent	0.0 to 6.5
Water-Cement Ratio, lb water/lb cement	0.42 to 0.45
Slump (at discharge), inches	7.0 to 9.0
Slump (after discharge) <sup>a</sup> , inches	3.0 to 6.0
Fine Aggregate, % of total aggregate by weight	50 to 55
Cement Content, lb/cy, min.	575

<sup>a</sup> Conduct test 7 to 10 minutes after discharge.

**505.50.3.2** Chloride permeability shall not be greater than 1000 coulombs when tested in accordance with AASHTO T 277. Tests shall be performed on specimens at 28 days. This test shall be performed on each mixture submitted for approval. Tests shall be performed by a qualified commercial laboratory.

**505.50.3.3** The mixture shall be designed to develop a minimum 3-hour compressive strength of 3000 psi and a minimum 28-day compressive strength of 4500 psi.

**505.50.3.4** Air-entraining admixtures shall not be added.

**505.50.3.5** A set control (citric acid) in accordance with the cement manufacturer's recommendations may be used.

**505.50.3.6** Admixtures containing calcium chloride shall not be used.

**505.50.3.7 Mix Design.** The contractor shall submit the mix design to Construction and Materials for approval. The mix design shall be within the limits specified in this specification. The mix design shall also include actual results for the following information:

(a) Air.

(b) Slump.

(c) Compressive strengths at 3 hours, 6 hours, 12 hours, 24 hours, 7 days and 28 days. Compressive strengths shall be determined using three 4 by 8-inch cylinders or two 6 by 12-inch cylinders.

(d) Results of chloride permeability testing.

**505.50.3.7.1** If other aggregate gradations than standard specifications are utilized, the contractor shall designate the intended target gradation and allowable gradation range for each fraction. The target gradations and allowable gradation ranges will be used for inspection and quality control of the aggregates.

**505.50.3.7.2** Any change in mix design or proportions shall be approved by the engineer.

**505.50.4 Testing.** Testing will be done in accordance with Sec 505.10.4, except that the slump test will also be conducted 7 to 10 minutes after discharge from mixer. During the waiting period, concrete shall be deposited on the deck to allow for continued operations. Required adjustments to water shall be made upon notice of results of slump test.

#### **505.50.5 Mixing.**

**505.50.5.1** The concrete shall be volumetrically mixed at the bridge site by a continuous mixer in accordance with Sec 501.

**505.50.5.2** The concrete discharge from the mixer shall be uniform in composition and consistency. Mixing capability shall be such that initial and final finishing operations can proceed at a steady pace. Final finishing shall be completed before the formation of a plastic surface film on the surface.

**505.50.5.3** The moisture content of aggregates at the time of proportioning shall be such that water will not drain or drip from a sample. Coarse and fine aggregate shall be furnished and handled to avoid variations in the moisture content affecting consistency of the concrete.

**505.50.5.4** Adjustments to the water-cement ratio shall be in accordance with Sec 505.50.3.1. If adjustments for water content beyond that are necessary, a previously tested and approved mixture shall be used.

**505.50.5.5** Prior to placement of concrete, the contractor shall be required to prepare trial batches of concrete for testing. Trial batches shall comply with the limits specified in this specification.

**505.50.6 Surface Preparation.** Surface preparation shall be in accordance with Sec 505.10.6, except as specified herein.

**505.50.6.1** Scarifying or chipping shall not be started until 6 hours of curing of adjacent parallel courses of the new wearing surface. Saw cutting of or adjacent to parallel courses of the new wearing surface shall not be started until 3 hours of curing of new wearing surface. If practical, or unless otherwise shown on the plans, all scarifying by mechanical units shall be completed prior to placing any wearing surface. Areas from which unsound concrete and patches have been removed shall be kept free of slurry produced by wet sawing or wet scarifying by planning the work such that slurry will drain away from the completed areas of preparation.

**505.50.6.2** On both existing and new decks for non-hydro demolition projects, within 24 hours before placement of the wearing surface begins, the entire surface shall be thoroughly cleaned by water blasting followed by an air blast in accordance with Sec 505.10.6.4.2.

#### **505.50.7 Equipment.**

**505.50.7.1** The finishing machine shall be in accordance with Sec 505.20.7 except the allowance for the use of truss or roller type screeds for narrow and short placements are subject to the approval of the engineer.

**505.50.7.2** Support rails shall be in accordance with Sec 505.10.7.

**505.50.8 Placing and Finishing Concrete.** Placing and finishing shall be in accordance with Sec 505.10.8, except as specified herein.

**505.50.8.1** Prior to placement of wearing surface, the cleaned surface shall be thoroughly wetted for a minimum of one hour, then covered with polyethylene sheeting until time of placement. All surfaces that will be covered with the wearing surface shall be damp at time of placement. Any standing water in depressions, holes or areas of concrete removal shall be blown out with compressed air or other type blowers sufficient for removal or removed with the use of vacuums. No free water or puddles of standing water shall exist at time of placement.

**505.50.8.2** Hand vibrators shall be used in areas of monolithic deck repair in the deck below the bottom of the planned deck wearing surface thickness where concrete is being placed around reinforcement, deeper areas within the pour, and along curb lines and construction joints. Deep areas shall be filled in advance during the wearing surface pour so the material stiffens enough that it will not roll back under the paving screed.

**505.50.8.3** Expansion joints and dams shall be formed in the wearing surface. Formation of the joint by sawing through the wearing surface will not be allowed.

**505.50.8.4** Water shall not be added to the surface of the wearing surface during finishing. A commercially available evaporation retardant may be used judiciously with a misting device during the finishing process until the wet burlap is applied only to prevent the surface of the concrete from drying out. The evaporation retardant shall not be used to increase the surface workability.

**505.50.8.5** Texturing shall occur immediately after finishing and before the plastic film forms on the surface. Texturing shall be performed in a manner to prevent pulling the concrete away from an existing vertical surface. Care shall be taken not to texture too deep and not to tear the surface.

**505.50.8.6** Screed rails and headers shall be separated from the newly placed material by passing a pointing trowel along their inside face. Metal expansion dams shall not be separated from the new wearing surface. The trowel cut shall be made for the entire depth and length of the rails or headers after the mixture has stiffened sufficiently and shall prevent the concrete from flowing back into the cut.

**505.50.8.7** During placement of the wearing surface, all joints with adjacent concrete shall be sealed with a mortar paste of equal parts cement and fine aggregate, using the CSA cement and water.

**505.50.8.8** The wearing surface shall be wet cured from the time of placement a minimum of 3 hours and until a compressive strength of 3200 psi is achieved.

**505.50.8.9** Wet burlap shall be applied promptly after the wearing surface has been placed on the deck without deforming the finish surface.

**505.50.8.10** Within one hour of covering with burlap, a layer of white polyethylene sheeting shall be placed on the wet burlap. The wearing surface material shall be wet at all times during curing process and may require additional wetting by contractor.

**505.50.8.11** The thickness of the wearing surface shall not exceed 3 inches, unless otherwise approved by the engineer.

**505.50.8.12** The finished deck will be examined for cracking. If cracking is found, the engineer will determine whether cracking is detrimental, whether remedial surface repairs are needed or whether the wearing surface in the cracked areas should be removed and replaced. All remedial surface repairs, removal or replacement shall be done by the contractor at the contractor's expense.

**505.50.8.13** After placement and curing of the wearing surface, the finished deck shall be tested to detect unbonded areas.

**505.50.8.14** No surface sealing shall be applied to the wearing surface.

**505.50.9 Supplementary Wearing Surface Material.** Supplementary wearing surface material shall be in accordance with Sec 505.10.9.

**505.50.10 Limitations of Operations.**

**505.50.10.1** No wearing surface shall be placed when ambient or deck surface temperature is above 85 F. Deck temperature shall be determined in accordance with MoDOT Test Method T20.

**505.50.10.2** Since CSA cement very early strength concrete will not exhibit bleed water, the probability of plastic shrinkage surface cracking is increased. At surface evaporation rates above 0.1 pounds per square foot per hour plastic shrinkage is probable and the contractor shall take precautions such as erecting windbreaks, lowering the mix temperature, fogging or delaying operations until ambient temperatures and/or wind conditions are more favorable. Fogging the plastic concrete surface will only be allowed, as provided in this specification. Surface evaporation rates can be predicted from mix temperature, ambient temperature, relative humidity and wind velocity using Figure 1 of ACI 308-81 (revised 1986) "Standard Practice for Curing Concrete".

**505.50.10.3** A fogging system shall be in-place prior to concrete placement. The fogging system shall consist of pressurized equipment that distributes water at a minimum rate of 0.10 gallons per hours per square foot. The fogging system shall apply the fog uniformly over the entire surface of the bridge deck. The fogging system shall produce atomized water that is a droplet with a maximum diameter of 0.003 inch and which keeps the finish deck surface saturated without producing standing water. The fogging system shall be started progressively along the length of the deck, during or immediately after floating. The contractor shall submit a letter certifying their fogging system is in accordance with this specification.

**505.50.10.4** No wearing surface shall be placed at ambient or deck temperatures below 45 F. Concrete shall be protected to maintain a minimum specified curing temperature of 45 F. The contractor shall provide a method, meeting the approval of the engineer, of monitoring the concrete that demonstrates the concrete has been maintained above the minimum curing temperature and has been protected from freezing. Any concrete damaged by freezing or which is exposed to a temperature of less than 45 F during the first 8 hours after placement shall be removed at the contractor's expense.

**505.50.10.5** The temperature of the concrete at time of placement shall be between 45 F and 90 F. If either the aggregate or water is heated, the maximum temperature for each shall be 100 F at time of addition to the mix. Any method of heating during the mixing of concrete may be used provided the heating apparatus will heat the mass uniformly and avoid hot spots which will burn the material. Cement or aggregate containing lumps or crusts of hardened material or frost shall not be used.

**505.50.10.6** No vehicle traffic shall be permitted on the wearing surface until the concrete has attained a minimum compressive strength of 3200 psi. Compressive strength will be determined by tests conducted in accordance with MoDOT test methods.

**505.50.10.7** Concrete shall not be placed adjacent to a parallel course which is less than 24 hours old; however, this restriction will not apply to a continuation of placement in the lane or strip beyond a joint in the same lane or strip.

**505.50.10.8** Preparation of an area, except scarifying, may be started in the lane or strip adjacent to newly placed surface after 3 hours of wet curing. If this work is started before the end of the curing period, the work will be restricted such that any interference with the curing process is held to the minimum practical time only.

**505.50.10.9** Longitudinal construction joints shall be placed between designated traffic lanes. The location of the longitudinal joints shall be subject to the approval of the engineer.

**505.50.10.10** Transverse joints in the wearing surface may be permitted if approved by the engineer. Transverse joints shall be located a minimum of 10 feet from the centerline of bent.

**505.50.10.11** A header shall be installed in case of delay in the placement operations exceeding one-half hour in duration. During minor delays of one-half hour or less, the end of the placement shall be protected from drying with several layers of wet burlap.

**505.50.10.12** Adequate precautions shall be taken to protect the placement from rain. All placing operations shall stop when rain begins. The engineer may order removal of any material damaged by rainfall and such material shall be replaced in accordance with this specification at the contractor's expense.

**505.50.11 Removal.** Removal shall be in accordance with Sec 505.10.11.

**505.50.12 Repair.** Repair shall be in accordance with Sec 505.10.12.

**505.50.13 Method of Measurement.** Measurement will be in accordance with Sec 505.10.13.

**505.50.14 Basis of Payment.** The basis of payment will be in accordance with Sec 505.10.14.

## **SECTION 505.60 STEEL FIBER REINFORCED CONCRETE.**

**505.60.1 Description.** This work shall consist of constructing a steel fiber reinforced concrete wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer.

**505.60.2 Material.**

**505.60.2.1** Concrete shall be Class B-1 or B-2 as specified on the plans and in accordance with Sec 501.

**505.60.2.2** Aggregate shall be in accordance with Sec 505.10.2.

**505.60.2.3** Steel fibers shall be made from stainless steel and nominally be 2 inches long and meet the physical property requirements prescribed in ASTM A820. One-inch Helix fibers are also allowed. Steel fibers shall have a quantity of at least 2000 fibers per pound and a fiber aspect ratio of 40 to 60. The steel fibers shall not have any hooks or 90-degree bends. The steel fibers shall be free from rust, oil and other deleterious materials. Steel fibers shall be transported, stored and applied to the concrete mixture in accordance with the manufacturer's recommendations.

**505.60.2.3.1** The contractor shall provide initial on-site technical assistance from the supplier of the steel fiber reinforcement. Further technical assistance shall be available at the request of the engineer.

**505.60.3 Concrete Mixture.** The contractor shall prepare and submit the mix design and mixing procedures to Construction and Materials for approval. The contractor shall not begin ordering materials until the mix design and mixing procedures are approved.

**505.60.3.1** The contractor shall designate in the mix design letter what target the slump will be in the field.

**505.60.3.2** The steel fiber dosage rate shall be 80 pounds per cubic yard of concrete.

**505.60.3.3** Any change in mix design or proportions shall be approved by the engineer.

**505.60.4 Testing.** Testing shall be in accordance with Sec 505.10.4.

**505.60.5 Mixing.** Mixing shall be in accordance with Sec 501.

**505.60.6 Surface Preparation.** Surface preparation shall be in accordance with Sec 505.10.6.

**505.60.7 Finishing Equipment.** The finishing machine shall be designed for striking off and finishing steel fiber reinforced concrete wearing surface. The finishing machine, screeds, traveling strike off and support rails shall be in accordance with Sec 505.10.7.

**505.60.8 Placing and Finishing Concrete.** Placing and finishing shall be in accordance with Sec 505.10.8, except as specified herein.

**505.60.8.1** Pumping shall generally be in accordance with Sec 703. Unless otherwise approved by the engineer, the following practices shall be observed:

- (a) Avoid rapid reduction in line size from the pump to the lines.
- (b) Operating pressure inside the line should be kept as low as functionally possible.
- (c) Use 5-inch (minimum) diameter clean, steel lines.

**505.60.8.2 Placement Plan.** At least six weeks prior to the first placement of the steel fiber reinforced concrete wearing surface on the project, a pre-placement conference shall be held with the contractor, the steel fiber supplier, the engineer and other parties involved with the steel fiber reinforced concrete wearing surface on the project. The contractor shall present the plan for furnishing, placing, sampling and testing of the steel fiber reinforced concrete wearing surface in accordance with the requirements of this specification.

**505.60.8.2.1** As part of the pre-placement conference a trial placement of steel fiber reinforced concrete wearing surface shall be made. The trial placement shall use the same delivery and placing equipment as shall be used in the actual work and shall use the mix design as approved by the engineer. For pumped concrete, simulate as closely as possible the distance and height that the concrete is to be pumped. As a minimum, the trial placement shall be a 10-foot by 10-foot by 4-inch thick slab.

**505.60.8.2.2** Placement of steel fiber reinforced concrete wearing surface for the project shall not be allowed until the engineer approves the contractor’s plan, including the results of the trial placements. Mixing, pumping, placing and finishing techniques should ensure uniform fiber distribution throughout the mixture without fiber balling or segregation. After approval, the placement plan shall not be changed unless approved in writing by the engineer.

**505.60.8.2.3** The trial slab shall become the property of the contractor after the placement plan has been approved by the engineer and shall be removed and disposed of in accordance with Sec 202.

**505.60.8.2.4** The curing and sealing of the concrete wearing surface on existing bridge decks shall be in accordance with Sec 703.3.6.

**505.60.8.2.5** The curing of the concrete wearing surface on the bottom slab of existing box culverts shall be in accordance with Sec 703.3.6. Concrete sealer will not be required.

**505.60.9 Supplementary Wearing Surface Material.** Supplementary wearing surface material shall be in accordance with Sec 505.10.9.

**505.60.10 Limitations of Operations.** Operations shall be limited in accordance with Sec 505.10.10.

**505.60.11 Removal.** Removal shall be in accordance with Sec 505.10.11.

**505.60.12 Repair.** Repair shall be in accordance with Sec 505.10.12.

**505.60.13 Measurement of Payment.** Measurement will be in accordance with Sec 505.10.13.

**505.60.14 Basis of Payment.** The basis of payment will be in accordance with Sec 505.10.14.

**SECTION 505.70 POLYESTER POLYMER CONCRETE.**

**505.70.1 Description.** This work shall consist of constructing a polyester polymer concrete wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer. Polyester polymer concrete wearing surface shall be composed of the following components – polyester resin binder, high molecular weight methacrylate (HMWM) resin and aggregate.

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

Item	Section
Polyester Polymer Wearing Surface	1039

**505.70.2.1 Delivery of Material.** All material shall be delivered in their original containers bearing the manufacturer’s label, specifying date of manufacturing, batch number, trade name, and quantity. Each shipment of polyester resin binder and HMWM resin shall be accompanied by a MSDS.

**505.70.2.2 Storage of Material.** The material shall be stored to prevent damage by the elements and to ensure the preservation of their quality and fitness for the work. The storage space shall be kept clean and dry, and shall contain a high-low thermometer. The temperatures of the storage space shall not fall below nor rise above that recommended by the manufacturer. Every precaution shall be taken to avoid contact with flame.

**505.70.2.3 Inspection.** Stored materials shall be inspected prior to their use, and shall meet the requirements of this specification at the time of use.

**505.70.2.4 Failure.** Any material which is rejected because of failure to meet the required tests or has been damaged so as to cause rejection shall be immediately replaced at no additional expense to the Commission.

**505.70.2.5 Required Amount.** Sufficient material to perform the entire polyester concrete application shall be in storage at the site prior to any field application, so there shall be no delay in procuring the material for each day’s application.

**505.70.2.6 Training.** The contractor shall arrange to have the material supplier furnish technical service related to application of material and health and safety training for personnel who are to handle the polyester polymer concrete and the HMWM resin prime coat.

**505.70.2.7 Technical Support.** The materials supplier shall have a representative onsite during placement of the polyester polymer concrete.

**505.70.3 Concrete Mixture.** The contractor shall prepare and submit the mix design and mixing procedures to Construction and Materials for approval. The contractor shall not begin ordering materials until the mix design and mixing procedures are approved.

**505.70.3.1** The contractor shall designate in the mix design letter what the target slump will be in the field.

**505.70.3.2** The mix design shall include a recommended initiator percentage for the expected application temperature.

**505.70.3.3** Any change in mix design or proportions shall be approved by the engineer.

**505.70.4 Testing.** Testing shall be in accordance with Sec 505.10.4, except as specified herein.

**505.70.4.1** Bond testing shall be performed for each placement on each day. Testing will be conducted at three locations 48 hours after placement. Testing will be performed in accordance to ACI 506R. A passing test is the failure of the concrete substrate or bond strength above 250 psi.

**505.70.5 Mixing.** Mixing shall be in accordance with Sec 501.

**505.70.6 Surface Preparation.** Surface preparation shall be in accordance with Sec 505.10.6, except as specified herein.

**505.70.6.1** With approval from the engineer, the contractor may use automatic shot blasting units in lieu of sand blasting. The automatic shot blasting units shall be self-propelled and include a vacuum to recover spent abrasive. The abrasive shall be steel shot. Magnetic rollers shall be used to remove any spent shot remaining on the deck after vacuuming. Cleaned surfaces shall not be exposed to vehicular or pedestrian traffic other than that required by the wearing surface operation.

**505.70.6.2** All steel surfaces that will be in contact with the wearing surface shall be cleaned in accordance with SSPC-SP10, Near-White Blast Cleaning, except that wet blasting methods shall not be allowed.

**505.70.7 Finishing Equipment.** The finishing machine shall be designed for striking off and finishing polyester polymer concrete wearing surface. The finishing machine, screeds, traveling strike off and support rails shall be in accordance with Sec 505.10.7.

**505.70.8 Placing and Finishing Concrete.** Placing and finishing shall be in accordance with Sec 505.10.8, except as specified herein.

**505.70.8.1 Prime Coat.** One coat of HMWM prime coat shall be applied to the prepared concrete and steel surfaces immediately before placing the polyester polymer concrete. The prime coat shall be uniformly applied to completely cover the surface to receive the wearing surface. The area receiving the prime coat shall be dry and had no exposure to any moisture within the past 24 hours. Prior to applying the prime coat, the surface shall be cleaned with compressed air to remove accumulated dust and any other loose material.

**505.70.8.1.1** The concrete bridge deck surface shall be between 50 F and 100 F when applying the prime coat.

**505.70.8.1.2** If the primed surface becomes contaminated, the contaminated area shall be cleaned by abrasive blasting and re-primed at no additional expense to the Commission.

**505.70.8.2 Polyester Polymer Concrete.** Polyester polymer concrete shall be placed immediately after the prime coat is applied to the bridge deck and within two hours of placing the prime coat.

**505.70.8.2.1** Polyester polymer concrete shall not be placed when the relative humidity is above 90 percent. If placed at night, care should be taken that the relative humidity does not rise rapidly with falling temperatures.

**505.70.8.2.2** The surface temperature of the area to receive polyester polymer concrete shall be the same as specified in Sec 505.70.8.1.1.

**505.70.8.2.3 Mixing.** The concrete shall be volumetrically mixed at the bridge site by a continuous mixer in accordance with Sec 501.

**505.70.8.2.3.1** The continuous mixer shall be equipped with a metering device that automatically measures and records the aggregate volumes and corresponding resin volumes. The volumes shall be recorded at no greater than five-minute intervals

along with the time and date of each recording. A printout of the recordings shall be furnished to the engineer at the end of each shift. Readout gages shall be visible to the engineer at all times.

**505.70.8.2.3.2** The concrete discharged from the mixer shall be uniform in composition and consistency. Mixing capability shall be such that initial and final finishing operations can proceed at a steady pace.

**505.70.8.2.3.3** The contractor shall prevent any cleaning chemicals from reaching the polyester polymer concrete mix during the mixing operation.

**505.70.8.2.3.4** Polyester polymer concrete shall be placed prior to gelling and within 15 minutes following the addition of initiator, whichever occurs first. Polyester polymer concrete that is not placed within this time shall be discarded.

**505.70.8.2.3.5** The polyester resin binder in the polyester polymer concrete shall be 12 percent  $\pm$  one percent by weight of the dry aggregate. The contractor shall determine the exact percentage as approved by the engineer.

**505.70.8.2.3.6** The amount of peroxide initiator used shall result in a polyester polymer concrete set time between 30 and 120 minutes during placement. The initial set time will be determined by using an initial-setting time Gillmore needle in accordance with ASTM C266. Accelerators or inhibitors may be required as recommended by the polyester resin supplier and as approved by the engineer.

**505.70.8.2.4** Finishing equipment shall be capable of consolidating the polyester polymer concrete and striking off the polyester polymer concrete to the final grade, thickness and cross-sections as shown in the contract documents.

**505.70.8.3 Surface Texturing.** The roadway surface, except within 12 inches of the inside face of the curb, shall be textured as soon as the condition of the polyester polymer concrete will permit. The roadway finishing shall otherwise be in accordance with Sec 502. Hand-operated devices producing a satisfactory texture will be permitted. At the contractor's option, a finned float with a single row of fins may be used. The grooves produced by the finned float shall be approximately 1/8 inch wide at 5/8 to 3/4-inch centers and shall be approximately 1/8 inch deep. This operation shall be performed at such a time and in such a manner that the desired texture will be achieved while minimizing displacement of the layer aggregate particles.

**505.70.9 Supplementary Wearing Surface Material.** Supplementary wearing surface material shall be in accordance with Sec 505.10.9.

**505.70.10 Limitations of Operations.** Operations shall be limited in accordance with Sec 505.10.10, except that traffic and construction equipment shall not be permitted on the polyester polymer concrete wearing surface for at least two hours and until the polyester polymer wearing surface has reached a minimum compressive strength of 3000 psi as verified by the rebound number determined in accordance with ASTM C805.

**505.70.11 Removal.** Removal shall be in accordance with Sec 505.10.11.

**505.70.12 Repair.** Repair shall be in accordance with Sec 505.10.12.

**505.70.13 Method of Measurement.** Measurement will be in accordance with Sec 505.10.13.

**505.70.14 Basis of Payment.** The basis of payment will be in accordance with Sec 505.10.14.

## **SECTION 613 – PAVEMENT REPAIR**

*Delete Sec 613.20.3.2 Cleaning and substitute the following:*

**04/20**

**613.20.3.2 Cleaning.** The exposed faces of the concrete shall be free of loose particles, oil, dust, traces of bituminous material and any other contaminants before repair material is placed. The procedure shall produce a clean, roughened surface, such as can be produced by sandblasting or, shotblasting. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. All remaining loose material shall be removed with air blasting equipment just prior to placement of material. The air from the air blasting equipment shall be free of contaminants.

*Delete Sec 613.30.2 Material and substitute the following:*

**04/20**

**613.30.2 Material.** The material used for Class B partial depth pavement repairs shall be either the bituminous surface mix specified in the contract for resurfacing the existing pavement or a PG64-22 surface mix in accordance with Sec 401. Tack material shall be in accordance with Sec 407.2.

*Delete Sec 613.30.3.2 Cleaning and substitute the following:*

*04/20*

**613.30.3.2 Cleaning.** The exposed faces of the concrete shall be free of loose particles, dust and any other contaminants before repair material is placed. The procedure shall produce a clean, roughened surface, such as can be produced by sandblasting, or shotblasting. Clean-up and disposal of blast material shall be in accordance with [Sec 202.3.1.3](#). All remaining loose material shall be removed with air blasting equipment just prior to placement of material. The air from the air blasting equipment shall be free of contaminants.

*Delete Sec 613.40.3.1 Preparation of Slots and substitute the following:*

*04/20*

**613.40.3.1 Preparation of Slots.** Two saw cuts shall be made in the pavement to outline the longitudinal sides of each dowel bar slot. The slots shall be sawed to a depth and length that allows the center of the dowel to be placed at mid-depth in the pavement slab. The slots shall be 2 ½ inches wide. The contractor shall provide a method, approved by the engineer, that will align the slots parallel to centerline of the roadway with a maximum variation of ¼ inch from a true parallel line. Slots in a wheel path shall be created by using saws with gang-mounted diamond blades, capable of simultaneously making six saw cuts for three dowel bar slots at the desired slot spacing. Equipment shall not cause damage to the existing pavement. All saw slurry shall be removed from the slot and pavement. No water residue or paste shall be allowed to flow onto lanes open to traffic or into closed drainage systems. If pneumatic hammers or other equipment used during concrete removal operations cause damage to pavement that is to remain, the concrete removal operations shall be discontinued and shall not resume until the contractor has taken corrective measures. The pneumatic hammer will not be permitted to break through the concrete, and if this occurs, a full depth pavement repair shall be conducted at the contractor's expense. The bottom of slots shall be flat. The edges of the slots shall be cleaned by sandblasting to produce a rough surface. Blasting operations shall not damage the surrounding pavement. Clean-up and disposal of blast material shall be in accordance with [Sec 202.3.1.3](#). The newly exposed concrete surface shall be free of spalls, burrs, lath and all contaminants detrimental to achieving an adequate bond. The maximum amount of spalling allowed on the edges of the slots will be ¾ inch. The point of curvature at the bottom of either end of the slot shall be ½ inch beyond the dowel bars end.

## **SECTION 616 – TEMPORARY TRAFFIC CONTROL**

*Delete Sec 616.5.1.1 Red or Red and Blue Warning Lights and substitute the following:*

*04/20*

**616.5.1.1 Red or Red and Blue Warning Lights.** The contractor may elect to use red or red and blue warning lights in accordance with Missouri law 307.175 RSMo. and the following requirements:

- (1) Use of red or red and blue lights shall be limited to use on a total of two vehicles per work zone and/or project.
- (2) Use of red or red and blue warning lights shall be limited to areas in advance of tapers or lane shifts and at the active work location.
- (3) Lights shall be SAE Class 2 or SAE Class 1 with dimming capabilities to minimize glare experienced by travelers.

The awarded contract will serve as a permit by the Commission, granting the prime contractor and approved sub-contractors to utilize red or red and blue lights as required by Missouri law.

## **SECTION 618 - MOBILIZATION**

*Add new specifications 618.3 thru 618.4:*

*01/20*

**618.3 Additional Mobilization for Seeding.** Additional mobilization to perform temporary or permanent seeding, beyond the initial occurrence, may be necessary as specified in [Sec 806.50.2](#) and as required per terms of the SWPPP. Mobilization of all equipment, workers and materials necessary to perform seeding and mulching shall be considered included in this work.

**618.3.1 Method of Measurement.** When payment for Additional Mobilization is provided in the contract, measurement of the number of occurrences authorized by the engineer to mobilize equipment onto the project to perform temporary or permanent seeding will be made per each occurrence, except for the initial occurrence and as specified herein. No measurement will be made for mobilization necessary to perform repair work to previously seeded areas or for mobilization necessary due to removal of equipment prior to completion of seeding all areas available for seeding, as determined by the engineer.

**618.3.2** When payment for Additional Mobilization is not provided in the contract, all mobilization occurrences necessary to comply with the SWPPP shall be considered included in payment for other items.

**618.4 Basis of Payment.** Payment for Additional Mobilization for Seeding will be paid per each occurrence at the fixed unit price specified in Sec 109. Payment for the initial occurrence to mobilize for seeding, and any additional mobilization costs in excess of the fixed price, shall be considered completely covered under other items.

**SECTION 623 – CONCRETE BONDING COMPOUND, EPOXY MORTAR AND EPOXY POLYMER CONCRETE OVERLAY**

*Delete Sec 623 title and substitute the following:* **04/20**

**SECTION 623**

**POLYMER PRODUCTS**

*Delete Sec 623.10.2 Material and substitute the following:* **04/20**

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

Item	Section
Type II Epoxy	1039

*Delete Sec 623.20.2 Material and substitute the following:* **04/20**

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

Item	Section
Type III Epoxy	1039
Sand for Epoxy Mortar	1039

*Delete Sec 623.30 thru 623.30.2 and substitute the following:* **04/20**

**SECTION 623.30 EPOXY POLYMER WEARING SURFACE.**

**623.30.1 Description.** This work shall consist of constructing an epoxy polymer wearing surface on a prepared surface in accordance with this specification, as shown on the plans or as directed by the engineer. Epoxy polymer wearing surface shall be composed of the following components - prime coat and two courses of epoxy polymer and aggregate.

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

Item	Section
Epoxy Polymer Wearing Surface	1039

*Delete Sec 623.30.3.1 and substitute the following:* **04/20**

**623.30.3.1 Manufacturer Representation.** The wearing surface manufacturer's representative shall witness the entire testing phase of each field test. The manufacturer's representative shall verify that all operations are performed by acceptable practices.

*Delete Sec 623.30.3.3 Field Test thru 623.30.3.3.1 and substitute the following:* **04/20**

**623.30.3.3 Field Test.** Prior to the start of the wearing surface operation, a test area of the complete wearing surface system shall be placed on the bridge deck in a contractor proposed location that is approved by the engineer. When multiple bridges are included in a project, a test area will be required on each bridge. The contractor may utilize one-half of the bridge deck or an area equal to one day's placement operation, whichever is smaller, as a field test. The degree of cleaning used on the test area shall be the minimum used on the remainder of the structure. The surface for the test wearing surface shall be prepared in accordance with the test method prescribed in ACI 503R - Appendix A of the ACI Manual of Concrete Practice to establish an approved cleaning practice. The approved cleaning practice shall remove all potentially detrimental material which may interfere with the bonding or curing of the wearing surface. Concrete shall be sound, with mortar soundly bonded to the coarse aggregate, with clean and open pores to be considered adequate for bond. All areas of asphalt and pavement markings shall be removed. Preparation of the surface shall produce a surface relief equal to International Concrete Repair Institute (ICRI) surface preparation level 6 or 7 or ASTM E 965 pavement macrotexture depth of 0.04 to 0.08 inch.

**623.30.3.3.1** Visible moisture on the prepared deck at the time of placing the wearing surface will not be permitted. Moisture in the deck shall be checked by taping a plastic sheet to the deck for a minimum of 2 hours in accordance with ASTM D4263.

*Delete Sec 623.30.3.3.4 thru 623.30.3.3.5 and substitute the following:* **04/20**

**623.30.3.3.4** Successful completion of the adhesion strength tests will be required before the full-scale wearing surface operation is to begin. All cleaning operations shall equal those used for the adhesion strength test areas, in both profile and cleanliness. If changes are made to the established cleaning practice, new adhesion strength testing shall be performed at the contractor's expense.

**623.30.3.3.5** Test patches shall be installed with the same material, equipment, personnel, timing, sequence of operations and curing period that will be used for the installation of the wearing surface.

*Delete Sec 623.30.3.4 Surface Preparation and substitute the following:* **04/20**

**623.30.3.4 Surface Preparation.** Before placement of the wearing surface, the entire deck surface shall be prepared by the cleaning practice established in the field adhesion strength tests in accordance with Sec 623.30.3.3 by shot blast method. Sand blasting will not be permitted. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3.

*Delete Sec 623.30.3.4.2 thru 623.30.3.4.4 and substitute the following:* **04/20**

**623.30.3.4.2** No traffic of any kind shall be permitted on any portion of the deck which has been shot blasted or on the wearing surface without approval from the engineer. The time between surface preparation and application of the first course shall not exceed 24 hours.

**623.30.3.4.3** All patching and cleaning operations shall be inspected and approved prior to placing the wearing surface.

**623.30.3.4.4** If the deck or intermediate course is contaminated by foreign material or water after initial cleaning, the contamination and any detrimentally affected wearing surface material shall be removed. Both courses shall be applied prior to opening the area to traffic.

*Delete Sec 623.30.3.6 Epoxy Mixture thru 623.30.3.7.2 and substitute the following:* **04/20**

**623.30.3.6 Mixing.** Mixing of epoxy polymer components shall be in accordance with the manufacturer's recommendations, except that the use of a volumetric mixer will be required. When mineral fillers are specified, the mineral fillers shall be inert and non-settling or readily dispersible. Material showing a permanent increase in viscosity or the settling of pigments that cannot be readily dispersed with a paddle shall be replaced at the contractor's expense. At least 95 percent of the filler shall pass the No. 200 sieve.

**623.30.3.7 Application.** Application of epoxy polymer shall be performed by the manufacturer or by a factory trained or licensed applicator with written approval from the manufacturer of the epoxy system.

**623.30.3.7.1** The handling and mixing of epoxy polymer shall be in accordance with the manufacturer's written recommendations. The epoxy polymer shall not be placed when weather or surface conditions are such that the material cannot be properly handled, placed and cured within the specified requirements of traffic control, or when rain is forecasted within 24 hours of application.

**623.30.3.7.2** The wearing surface shall consist of a two-course application of epoxy polymer and aggregate. A prime coat shall be used if recommended by the manufacturer. Each of the two courses shall consist of a layer of epoxy polymer covered with a layer of aggregate in sufficient quantity to completely cover the epoxy polymer. The thickness of each course shall be approximately equal. The total thickness of the wearing surface shall be no less than 1/4 inch.

*Delete Sec 623.30.3.7.4 and substitute the following:* **04/20**

**623.30.3.7.4** Dry aggregate shall be applied in such a manner as to cover the epoxy polymer completely within 5 minutes of application. The dry aggregate shall be placed in a manner such that the level of the epoxy polymer is not disturbed.

*Delete Sec 623.30.3.7.6 and substitute the following:* **04/20**

**623.30.3.7.6** The thickness of the wearing surface shall be verified to be at least 1/4inch, measured from the deck surface to the top of the epoxy polymer. The contractor shall provide a minimum 1/2-inch diameter hole at a rate of at least one hole per 100 feet of traffic lane. Hole placement shall be at locations designated by the engineer. Thin areas shall be recoated and reverified at the contractor's expense.

*Delete Sec 623.30.3.7.8 thru 623.30.5 Basis of Payment and substitute the following:* **04/20**

**623.30.3.7.8** All adhesion strength test areas, thickness test holes or any debonded areas shall be repaired by filling with wearing

surface material before final acceptance.

**623.30.3.7.9** The first epoxy polymer course shall be cured at least one hour, or until brooming or vacuuming can be performed without tearing or otherwise damaging the surface. No traffic or equipment shall be permitted on the first course during the curing period.

**623.30.3.7.10** After the curing period, all loose aggregate shall be removed by brooming or vacuuming and the next epoxy polymer course applied as specified in the contract documents.

**623.30.3.7.11** The epoxy polymer mixture shall not be permitted to run into drains.

**623.30.3.7.12** Unless otherwise specified, the epoxy polymer courses shall be applied over the expansion joints and joint seals of the bridge deck. The expansion joints and joint seals shall be provided with a bond breaker. Prior to opening to traffic, the wearing surface shall be removed over each joint by removal of the bond breaker in accordance with the epoxy polymer manufacturer's recommendations.

**623.30.3.7.13** Prior to opening a section to public or construction traffic, the wearing surface shall be allowed to cure in accordance with the manufacturer's recommendations. First course applications shall not be opened to traffic.

**623.30.3.7.14** Damaged or debonded areas of an epoxy polymer course shall be removed and repaired prior to acceptance. Repair shall consist of saw-cutting in rectangular sections to the top of the concrete deck surface and replacing the various courses in accordance with this specification at the contractor's expense.

**623.30.4 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, the area of epoxy polymer wearing surface will be measured to the nearest square yard based on measurement longitudinally from end to end of bridge deck and transversely between roadway face of curbs, excluding the area of any expansion devices. The revision or correction will be computed and added to or deducted from the contract quantity.

**623.30.5 Basis of Payment.** The accepted quantity of epoxy polymer wearing surface will be paid for at the contract unit price. Payment will be considered full compensation for all labor, equipment and material necessary to complete the described work.

*Delete Sec 623.40.4.2 Surface Preparation and substitute the following:* **04/20**

**623.40.4.2 Surface Preparation.** Portland cement concrete shall be allowed to cure and dry for a minimum of seven dry days prior to installing the polymer concrete. Days with cold, wet or inclement weather which may be a detriment to curing of the Portland cement concrete will not count in this seven day minimum curing and drying time. The concrete surface shall be dry when placing the polymer concrete. The substrate shall be structurally sound and sand or shot blasted to be free of all foreign matter, grease, dirt and laitance for all areas that will be in contact with the polymer concrete. Steel surfaces shall be cleaned in accordance with SSPC-SP 10 surface preparation requirements. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. After sand or shot blasting is completed, the joint shall be cleaned of debris by using oil and water free compressed air at a minimum of 90 psi or by vacuuming. These areas shall then be primed in accordance with the manufacturer's recommendations.

*Add new specifications 623.50 thru 623.50.6:* **04/20**

**SECTION 623.50 METHYL METHACRYLATE POLYMER SLURRY WEARING SURFACE.**

**623.50.1 Description.** This work shall consist of constructing a methyl methacrylate (MMA) polymer slurry wearing surface on a prepared surface in accordance with this specification as shown on the plans or as directed by the engineer. MMA polymer slurry wearing surface shall be composed of the following components – MMA primer; MMA polymer slurry; broadcast aggregate; and MMA top coat.

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

Item	Section
MMA Polymer Slurry Wearing Surface	1039

**623.50.2.1 Mixing and Application.** Mixing and application shall be done in accordance with the manufacturer's recommendations.

**623.50.2.2 Delivery of Material.** All material shall be delivered in their original containers bearing the manufacturer's label, specifying date of manufacturing, batch number, trade name, and quantity. Each shipment shall be accompanied by a MSDS.

**623.50.2.3 Storage of Material.** The material shall be stored to prevent damage by the elements and to ensure the preservation of their quality and fitness for the work. The containers shall be stored in a manner that will not allow leakage or spillage from one material to contact the containers or material of the other. The storage space shall keep the material clean and dry and shall contain a high-low thermometer. The temperatures of the storage space shall not fall below nor rise above that recommended by the manufacturer. Every precaution shall be taken to avoid contact with flame.

**623.50.2.3.1** Stored material shall be inspected prior to their use and shall meet the requirements of this specification at the time of use.

**623.50.2.3.2** Sufficient material to perform the entire MMA polymer slurry wearing surface application shall be in storage at the site prior to any field application, so that there shall be no delay in procuring the material for each day's application.

**623.50.2.4 Training.** The contractor shall arrange to have the material supplier furnish technical service related to application of material and health and safety training for personnel who are to handle the material.

**623.50.2.5 Technical Support.** The material supplier shall have a representative onsite during the surface preparation and placement of the wearing surface. The material representative shall provide onsite consultation as Quality Control of the installation of the product, but the engineer will have final decision-making authority in all matters.

### **623.50.3 Preconstruction Requirements.**

**623.50.3.1 Experience.** The contractor shall have experience placing similar thin polymer wearing surfaces on at least three structures prior to doing work on this project. Written proof of this experience along with project contacts shall be provided to the engineer in writing for approval prior to the preconstruction meeting. Prior to installation of the wearing surface, the contractor shall also provide certification by the material supplier that the contractor is a trained and qualified installer of the selected wearing surface.

**623.50.3.2 Mix and Application Procedure.** The contractor shall prepare and submit all applicable mixing and application procedures to the engineer for approval prior to the preconstruction meeting. The contractor shall not begin ordering materials for application of the wearing surface until the mixing and application procedures are approved. All equipment and materials used in the mixing and application procedure shall be in accordance with the manufacturer's requirements.

### **623.50.4 Construction.**

**623.50.4.1 Trial Area.** The contractor shall demonstrate their proficiency by preparing and placing the wearing surface on a 10-foot by 10-foot area (or approved equivalent area) prior to the placement of the production wearing surface. The engineer shall select the location of the trial area. Final wearing surface production shall not proceed without the approval of the engineer.

#### **623.50.4.2 Deck Preparation.**

**623.50.4.2.1 Procedure.** The contractor shall submit in writing to the engineer for approval the deck preparation procedure. The contractor's procedure shall include, but not be limited to; equipment used for surface preparation and deck cleaning, shot size, rate of speed to achieve required profile and method of surface profile testing for Quality Control.

**623.50.4.2.2 Existing Wearing Surface.** On existing concrete decks with an existing wearing surface, the wearing surface shall be removed and the exposed concrete surface shall be prepared in accordance with Sec 623.50.4.2.4.

**623.50.4.2.3 Unsound Deck.** Any areas of unsound deck encountered shall be completely removed to sound, natural concrete. Polymer concrete or other patching material, approved by the engineer, may be used to repair the deck. Surfaces of concrete patches shall be prepared in the same manner as the rest of the deck. Any new concrete or concrete patches shall cure a minimum of 28 days prior to application of overlay system. All deck repairs shall be in accordance with Sec 704.

**623.50.4.2.4 Surface Preparation.** The concrete surface shall be prepared in accordance with Sec 623.30.3.4 by shot blast method, except as specified herein.

**623.50.4.2.4.1** The contractor shall remove pavement marking and other surface contaminants. Upon approval by the engineer, scarifiers or hand grinders may be used to aid in the removal of pavement marking and other surface contaminants but shot blast will still be required for final acceptable surface preparation.

**623.50.4.2.4.2** The contractor shall remove residual bituminous based crack sealer and any debris from the entire deck including: within cracks, pop-outs or other deck irregularities, tining grooves, deck grooves, gutter lines or any other areas that have trapped material. Removal shall be to the satisfaction of the engineer. The contractor shall be responsible to make note of the deck conditions prior to bidding.

**623.50.4.2.5 Reflective Cracks.** Reflective cracks in the deck shall be prepared if specified on the plans. The deck shall be blasted to clean out cracks and be dry prior to priming. Before starting priming operations, all cracks shall be blown out with dry high-pressure air.

**623.50.4.2.5.1** Reflective cracks or any open cracks greater than 0.06 inch shall be treated to keep the primer material from leaking through the joints of the deck panels below.

**623.50.4.2.5.2** All panel deck joints below open deck cracks greater than 0.06 inch shall be identified, mapped and sealed from below at the panel joints with a material resistant to effects of the deck primer to prevent leakage of the deck primer through the bridge deck.

**623.50.4.2.5.3** After sealing of the required deck panel joints from below, deck cracks above greater than 0.06 inch shall be prefilled with deck primer.

**623.50.4.2.5.4** After cracks greater than 0.06 inch are prefilled, a flood primer application shall be done to the concrete surface to fill all other smaller and fine cracks.

### **623.50.4.3 Application of Wearing Surface.**

**623.50.4.3.1 General.** The primer, slurry or top coat shall not be permitted to run into drains. Unless otherwise specified, the wearing surface shall not be applied over the expansion joints and joint seals of the bridge deck. Prior to opening a section to public or construction traffic, the wearing surface shall be allowed to cure in accordance with the manufacturer's recommendations. Surfaces with primer only shall not be opened to traffic. During primer, slurry and top coat applications; the contractor shall provide neat clean lines for staging, joints, obstacles or any break in production.

**623.50.4.3.1.1** The wearing surface shall not be placed when the relative humidity is above 90 percent. If placed at night, care should be taken that the relative humidity does not rise rapidly with falling temperatures.

**623.50.4.3.2 Prime Coat.** One coat of the MMA primer coat shall be applied to the prepared concrete surfaces immediately before placing the MMA polymer slurry in accordance with the manufacturers recommended procedures. The prime coat shall be uniformly applied to completely cover the surface to receive the MMA polymer slurry. The area receiving the prime coat shall be dry and had no exposure to any moisture within the past 24 hours. Prior to applying the prime coat, the surface shall be cleaned with compressed air to remove accumulated dust and any other loose material. Do not allow traffic on the prepared surface prior to wearing surface placement.

**623.50.4.3.2.1** The concrete bridge deck surface shall be between 45 F and 90 F when applying the prime coat.

**623.50.4.3.2.2** If the primed surface becomes contaminated, the contaminated area shall be cleaned by abrasive blasting and re-primed at no additional expense to the Commission.

**623.50.4.3.3 MMA Polymer Slurry.** The MMA polymer slurry shall be placed on the prime coat according to the manufacturer's recommendations, but no later than two hours after placing the prime coat.

**623.50.4.3.3.1** The surface temperature of the area to receive the MMA polymer slurry shall be the same as specified in Sec 623.50.4.3.2.1 or as approved by the manufacturer's representative.

**623.50.4.3.3.2** The contractor shall prevent any cleaning chemicals from reaching the MMA polymer slurry components during the mixing operation.

**623.50.4.3.3.3** The MMA polymer slurry shall be placed at a minimum thickness of 1/4 inch and a maximum of 3/8 inch.

**623.50.4.3.4 Broadcast Aggregate.** Dry aggregate shall be applied in such a manner as to cover the MMA polymer slurry completely within 5 minutes of application prior to the gelling of the MMA polymer slurry. The dry aggregate shall be placed in a manner such that the level of the MMA polymer slurry is not disturbed.

**623.50.4.3.4.1** After the MMA polymer slurry curing period, all loose aggregate shall be removed by brooming or vacuuming. Any loose aggregate reclaimed for reuse as broadcast aggregate shall be approved by the engineer. At a minimum the reclaimed

aggregate shall be screened and verified to be clean, uncontaminated and dry. All reclaimed aggregate must be in conformance with the requirements in Sec 623.50.2.

**623.50.4.3.5 Top Coat.** The surface should be dry and the top coat should not be allowed to puddle. Top coat shall be placed no later than two hours after the slurry has cured. During the course of work, the contractor shall ensure the top coat is applied to all wearing surface areas prior to any forecasted rain events.

**623.50.4.4 Testing.** Bond testing shall be performed for each bridge placement per stage on each day. Testing will be conducted at three locations 24 hours after placement. Testing will be performed in accordance to ASTM C 1583. A passing test is the failure of the concrete substrate or bond strength above 250 psi. Do not perform tests if the deck temperature is above 90 F.

**623.50.4.4.1** All adhesion strength test areas, thickness test holes or any debonded areas shall be repaired by filling with wearing surface material before final acceptance.

**623.50.4.4.2** Any material which is rejected because of failure to meet the required tests or has been damaged so as to cause rejection shall be immediately replaced at the contractor's expense.

**623.50.4.4.3** Damaged or debonded areas of the wearing surface shall be removed and repaired prior to acceptance. Repair shall consist of saw-cutting in rectangular sections to the top of the concrete deck surface and repairing using the same procedure called for in the specification. All repairs shall be at the contractor's expense.

**623.50.5 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, the area of MMA polymer slurry wearing surface will be measured to the nearest square yard based on measurement longitudinally from end to end of bridge deck and transversely between roadway face of curbs, excluding the area of any expansion devices. The revision or correction will be computed and added to or deducted from the contract quantity.

**623.50.6 Basis of Payment.** The accepted quantity of MMA polymer slurry wearing surface will be paid for at the contract unit price. Payment will be considered full compensation for all labor, equipment and material necessary to complete the described work.

## **SECTION 703 – CONCRETE MASONRY CONSTRUCTION**

*Delete Sec 703.3.3.10.2 and substitute the following:*

*04/20*

**703.3.3.10.2** The slab area to be in contact with the closure pour shall be sand or shot blasted to remove all foreign matter and shall be cleaned to remove all dirt and loose material. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. After the slab area has been cleaned and any damaged epoxy coating on the reinforcing bars repaired, an epoxy-bonding compound shall be applied to the slab area to be in contact with the closure pour. The concrete bonding compound and application shall be in accordance with Sec 623.

*Delete Sec 703.3.8 Surface Sealing for Concrete and substitute the following:*

*04/20*

**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, top and roadway faces of sidewalks, curbs, parapets, medians and barriers. 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 wearing surface shall not be sealed. The surface of all other concrete wearing surfaces shall be sealed.

*Delete Sec 703.3.8.5.2 and substitute the following:*

*04/20*

**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 wearing surfaces 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.

## **SECTION 704 – CONCRETE MASONRY REPAIR**

*Delete Sec 704.2 Material and substitute the following:*

*04/20*

**704.2 Material.** All material shall be in accordance with Division 1000, Material Details, and specifically as follows. The qualified special mortar shall be from the qualified rapid set concrete patching material listing available from Construction and Materials or MoDOT’s website.

Item	Section
Concrete	501
Concrete Bonding Compound and Epoxy Mortar	623
Gradation E Coarse Aggregate	1005
Type III Cement	1019
Type III Epoxy or Epoxy Material for the Polymer Wearing Surface	1039
Concrete Crack Filler	1053
Water	1070

*Delete Sec 704.3.1 Repairing Concrete Deck (Half-Soling) and substitute the following:* **04/20**

**704.3.1 Half-Sole Repair.** This work shall consist of partial removal and replacement of bridge deck concrete in the required areas. Repair areas shall consist of deck imperfections exposing the upper layer of the top mat of reinforcing steel a 1/4 inch. Slight deck imperfections less than 1/2 inch will not be repaired for bridge decks to be covered with an asphalt or concrete wearing surface. Slight deck imperfections less than 1/4 inch will not be repaired for bridge decks to be covered with a seal coat, polymer type wearing surface or no wearing surface.

*Delete Sec 704.3.4 Modified Deck Repair and substitute the following:* **04/20**

**704.3.4 Modified Deck Repair.** This work shall consist of the removal of visibly loose or spalled bridge deck concrete and placement of Class B-1 concrete or qualified special mortar in the areas where the reinforcing steel is exposed. If reinforcing steel is not exposed, the asphalt wearing surface in accordance with Sec 403 shall be placed monolithically into the deck imperfections.

*Add new specifications 704.3.11 Monolithic Deck Repair thru 704.3.12 Shallow Deck Repair:* **04/20**

**704.3.11 Monolithic Deck Repair.** This work shall consist of providing and placing supplementary wearing surface material necessary to fill all depressions in the deck below the bottom of the planned deck wearing surface thickness. This material is placed monolithic during the deck wearing surface process.

**704.3.12 Shallow Deck Repair.** This work shall consist of removal of bridge deck concrete in required areas and placing polymer concrete per Sec 623.40. Repair areas shall consist of deck imperfections deeper than 1/4 inch to a depth where reinforcing steel is not exposed. Slight deck imperfections less than 1/4 inch will not be repaired.

*Delete Sec 704.4 Construction Requirements thru 704.4.4.4 Curing and substitute the following:* **04/20**

**704.4 Construction Requirements for Non-Hydro Demolition Projects.**

**704.4.1 Removal Requirements.**

**704.4.1.1 General.** The type of repair and areas to be repaired will be outlined by the engineer. Determination of deck repair areas will be by sounding, except when modified deck repair is specified. All loose, deteriorated and unsound concrete in the required repair areas shall be removed by conventional hand/mechanical or other approved equipment.

**704.4.1.2 Conventional Hand/Mechanical Equipment.** For bridge decks rated 6 or above, conventional hand/mechanical equipment consisting of jackhammers no heavier than the 35-pound class shall be used for concrete removal, except that for modified deck repair chip hammers no heavier than 15-pound class shall be used. For bridge decks rated 5 or below, the jackhammers shall not be heavier than the 65-pound class, except for modified deck repair. Chipping hammers from the 15-pound class shall be used to remove concrete from beneath any reinforcing bars, where required. The bits shall be sharp in order to reduce pounding. Jackhammers shall be operated to minimize damage to the sound concrete around the patch area. Other methods that would be less damaging to the concrete and reinforcement may be used with approval from the engineer.

**704.4.1.3 Concrete Removal.** A boundary perimeter with one-inch vertical sides shall be established outside the deteriorated area. The deteriorated concrete shall be removed as required to provide good sound concrete on which new concrete can be placed and satisfactorily bonded to the reinforcing bars. The areas of repair shall be made approximately rectangular with the sides generally perpendicular to the surface being repaired. These areas shall be carefully removed such that reinforcement is not disturbed or damaged. For full depth repair, a saw cut outside the deteriorated area shall also be made on the bottom of the bridge deck, except on voided slab, solid slab and box girder bridges without entry access. Other acceptable methods for saw cutting the bottom of the

deck may be used with approval from the engineer. No more than one-fourth of the column perimeter shall be removed at any one time, and no more than one-eighth of the column perimeter if the repair is completed under live load. Once the one-quarter or one-eighth limit has been reached, the column shall be repaired before any further column removal is done.

**704.4.1.4 Reinforcing Bar Exposed.** All exposed reinforcing bars shall be thoroughly cleaned by sand, shot or water blasting to the satisfaction of the engineer.

**704.4.1.4.1** The concrete within the boundary area for superstructure repair (unformed), substructure repair (formed) and substructure repair (unformed) shall be removed a minimum of one inch beyond the inside edge of any exposed reinforcing bars, including the main reinforcement.

**704.4.1.4.2** When the bond between existing concrete and a reinforcing bar has been destroyed, or more than half the diameter of a reinforcing bar is exposed during half-sole and modified deck repair, the concrete adjacent to the reinforcing bar shall be removed to a depth that will permit the concrete to bond to the entire periphery of the bar. A minimum of one-inch clearance shall be maintained.

**704.4.1.4.3** If a reinforcing bar is exposed during slab edge repair, the concrete adjacent to the bar shall be removed to a depth that will permit a qualified special mortar to bond to the entire periphery of the bar. A minimum of one-inch clearance shall be maintained.

**704.4.1.5 Reinforcement Repair.** Particular care shall be taken not to disturb or damage reinforcing bars. All exposed reinforcing bars shall be thoroughly cleaned by sand, shot or water 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.

**704.4.1.6 Material Disposal.** All material removed shall be disposed of in accordance with Sec 202.

#### **704.4.2 Preparation of the Repair Area.**

**704.4.2.1 Concrete Repair.** After removal of deteriorated concrete, the area to be repaired shall be sand, shot or water blasted to remove all foreign matter, dirt, free standing water and loose material and micro-cracking. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. The area to come in contact with new concrete shall be cleaned as stated above, saturated with water and painted with a concrete bonding compound or an epoxy mortar prior to placing new concrete. A concrete bonding compound shall be used for all structures with the following exception. An epoxy mortar shall be used on box girder, voided and solid slab structures and on structures where a cathodic protection system is to be installed.

**704.4.2.2 Epoxy Sealing.** The area to be sealed shall be cleaned by sand or shot blasting. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. Prior to sealing the concrete, all loose particles and foreign matter shall be removed using oil-free and water-free compressed air or a vacuum of at least 90 psi.

**704.4.2.3 Concrete Crack Filler.** The area to fill the cracks shall be cleaned by pressure washing with at least 2500 psi, 3 days minimum prior to the crack filler application and 2 days after any measurable precipitation.

#### **704.4.3 Placement of Repair Material.**

**704.4.3.1 Concrete Repair.** Concrete shall be placed before the concrete bonding compound or epoxy mortar has begun to set. Deck repair concrete shall be placed in the repair area to match the top of the original deck surface. For bridges to be covered with concrete wearing surface, deck repair concrete shall be placed in the repair area up to the bottom of the proposed concrete wearing surface. The finished repair area shall have a light broom texture for bonding of the deck seal, except bridges to be covered with concrete wearing surface shall have a rough surface for bonding of the concrete wearing surface. All joints shall be formed to match any existing joint pattern.

**704.4.3.1.1** Concrete for concrete deck repair shall be Class B-2 except as specified in Sec 704.3.4 and Sec 704.4.3.1.2 and that solid slab, voided slab and box girder structures shall be the same class as the existing deck concrete. The repair area shall not be opened to any traffic until the concrete has reached a compressive strength of 3200 psi. Type III cement may be used to accelerate the set. The coarse aggregate shall be Gradation E in accordance with Sec 1005. Accelerating additives containing chlorides will not be permitted.

**704.4.3.1.2** Concrete for repairing bridge decks with cathodic protection systems shall be Class B-1. The repair area shall not be opened to any traffic until the concrete has reached a compressive strength of 3200 psi. Type III cement may be used to accelerate the set. The coarse aggregate shall be Gradation E in accordance with Sec 1005. Accelerating additives containing chlorides will not be permitted. All half-sole repairs made on the deck shall be Class B-1 concrete that has a maximum chloride ion content of 5

pounds per cubic yard. All full depth repairs made on the deck shall be chloride-free Class B-1 concrete from the bottom of the deck to within one inch of the lowest rebar of the top layer of reinforcing steel. The remainder of the repair shall be Class B-1 concrete with a maximum chloride ion content of 5 pounds per cubic yard.

**704.4.3.1.3** The repaired areas shall be cured in accordance with Sec 703.

**Add new specifications 704.4.3.2 Epoxy Sealing thru 704.5.5.2:**

**04/20**

**704.4.3.2 Epoxy Sealing.** The area to be sealed shall be sealed with a qualified Type III epoxy or epoxy material for the polymer wearing surface. Sealing shall be completed before the application of any wearing surface. The cleaning, sealing and epoxy application shall proceed only as approved by the engineer, in accordance with the manufacturer's written recommendations. The epoxy application and rate of coverage shall be in accordance with manufacturer's recommendations, with a maximum coverage of 100 square feet per gallon.

**704.4.3.3 Concrete Crack Filler.** The area to fill the cracks shall be filled with a low viscosity polymer crack filler. The concrete crack filler application and rate of coverage shall be in accordance with the manufacturer's recommendations, with a maximum coverage of 100 square feet per gallon. The broadcasting of dry blasting sand shall be applied only as approved by the engineer, in accordance with the manufacturer's written recommendations with a maximum coverage of 1 to 2 pounds per square yard starting approximately 10 minutes after crack filling operation has started.

#### **704.5 Construction Requirements for Hydro Demolition Projects.**

##### **704.5.1 Zoned Conventional Deck Repair Prior to Hydro Demolition.**

**704.5.1.1** Prior to hydro demolition, the deck shall be repaired inside special repair zones as called for in the contract plans in accordance with Sec 704.4 except as follows:

(a) The removal and replacement of all sound and unsound existing deck repairs shall be considered as half-sole repair in accordance with Sec 704.4.

(b) Monolithic deck repair as specified in Sec 704.5.5 shall be used to replace shallow deteriorated concrete when only half the diameter or less of the top mat of reinforcing steel is exposed.

##### **704.5.2 Conventional Half-Sole Repair After Hydro Demolition.**

**704.5.2.1** For polyester polymer concrete or low slump concrete wearing surfaces, following removal of unsound original concrete by hydro demolition and hand chipping, any areas requiring half-sole deck repair will be identified by the engineer.

**704.5.2.2** All half-sole repair identified by the engineer shall be made prior to the deck wearing surface.

**704.5.2.3** Half-sole repair shall be in accordance with Sec 704.4 except that the removal is accomplished by hydro demolition and limited only to locations where the removal of concrete around the perimeter of the top transverse reinforcing steel is required.

**704.5.2.4** Concrete or qualified repair mortars used for half-sole repair shall be fully cured prior to placing the wearing surface.

##### **704.5.3 Conventional Full Depth Repair After Hydro Demolition.**

**704.5.3.1** Following removal of unsound original concrete by hydro demolition and hand chipping, any areas requiring a full depth repair will be identified by the engineer.

**704.5.3.2** For polyester polymer concrete or low slump concrete wearing surfaces on all bridge decks and all concrete wearing surfaces on voided slab bridges, all full depth repair shall be made prior to the deck wearing surface in accordance with Sec 704.4 except that the removal is accomplished by hydro demolition.

**704.5.3.3** For concrete wearing surfaces not covered by Sec 704.5.3.2, full depth repair for areas greater than 5 square feet (3 square feet in areas of prestressed panels) shall be made prior to the deck wearing surface in accordance with Sec 704.4 except that the removal is accomplished by hydro demolition and concrete may be placed in the repair area up to one inch below the top mat of reinforcement.

**704.5.3.4** If the engineer determines that for concrete wearing surfaces not covered by Sec 704.5.3.2, full depth repair for areas less than or equal to 5 square feet (3 square feet in areas of prestressed panels) can be made monolithic with the new deck wearing

surface. The contractor shall form the bottom of the repair prior to the wearing surface. No payment will be made for forming the bottom of full depth monolithic repairs, including form removal.

**704.5.3.5** Concrete or qualified repair mortars used for full depth repair shall be fully cured prior to placing the wearing surface.

**704.5.4 Void Tube Replacement Requiring Conventional Deck Repair After Hydro Demolition.**

**704.5.4.1** Following removal of unsound original concrete by hydro demolition and hand chipping, any void tubes requiring replacement will be identified by the engineer.

**704.5.4.2** Deck repair required for void tube replacement shall be in accordance with Sec 704, except that the removal is accomplished by hydro demolition.

**704.5.4.3** Concrete or qualified repair mortars used for deck repair with void tube replacement shall be fully cured prior to placing the wearing surface.

**704.5.5 Monolithic Deck Repair After Hydro Demolition.**

**704.5.5.1** Monolithic deck repair shall not be used with void tube replacement and with polyester polymer or low slump concrete when more than half the diameter of the top bar is exposed.

**704.5.5.2** For deck repair and concrete wearing surfaces not covered by Sec 704.5.5.1, shallow and deep areas, including approved full depth repair areas, shall be filled monolithically with the deck wearing surface.

*Delete Sec 704.5 Method of Measurement thru 704.6 Basis of Payment and substitute the following:* **04/20**

**704.6 Method of Measurement.** The extent of repair may vary from the estimated quantities, but the contract unit price shall prevail regardless of the variation. Final measurement will not be made for preparation of the existing deck. No duplication of measurement will be made for full depth repair, half-sole repair, deck repair with void tube replacement, monolithic deck repair, shallow deck repair, slab edge repair, superstructure repair (unformed) or modified deck repair. No duplication of measurement will be made for substructure repair, unformed and formed.

**704.6.1** Half-sole repair, deck repair with void tube replacement, shallow deck repair, full depth repair, modified deck repair, superstructure repair (unformed) and substructure repair (formed and unformed) will be measured to the nearest square foot.

**704.6.2** Slab edge repair will be measured to the nearest linear foot.

**704.6.3** No measurement will be made for epoxy sealing.

**704.6.4** Measurement of reinforcing steel replaced due to excess section loss will be made to the nearest 10 pounds.

**704.6.5** Filling concrete cracks will be measured to the nearest square foot.

**704.6.6** Supplementary wearing surface material required to fill monolithic deck repair will be measured in accordance with Sec 505.

**704.7 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, except for the following repairs.

**704.7.1** Supplementary wearing surface material required to fill monolithic deck repair will be paid for in accordance with Sec 505.

**704.7.2** No direct payment will be made for epoxy sealing.

**704.7.3** 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 109.16. No payment will be made for replacement of reinforcing steel cut or broken by the contractor.

**SECTION 717 – FLEXIBLE JOINT SYSTEMS**

*Delete Sec 717.10.3.2 Installation and substitute the following:* **04/20**

**717.10.3.2 Installation.** The preformed compression seal shall be installed in joints in one continuous piece without field splices. Factory splicing will be permitted for joints in excess of 53 feet. The area of steel armor to come in contact with preformed compression seal lubricant adhesive shall be sand blasted prior to installing the seal. Sand blasting will be considered acceptable when the steel surfaces have been cleaned to an SSPC-SP10 degree of cleanliness. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. The lubricant adhesive shall be applied in a continuous film to the sides of the seal and to the joint surfaces just prior to placing the seal in the joint. The seal shall be installed with an installation tool recommended by the manufacturer, in a manner that prevents the seal from being damaged and from being in tension. Twisting, curling and nicking the seal will be prohibited. Lubricant adhesive on top of the installed seal shall be removed before drying. Unless the installation tool is capable of installing the seal without elongation prior to placement, the seal shall be pre-cut to the exact length for the joint plus ends as shown in the contract documents. The pre-cut seal shall be installed and measured for stretch. The seal shall be removed and reinstalled if the seal stretch length exceeds five percent of the pre-cut length.

*Delete Sec 717.20.3.2 Installation and substitute the following:*

*04/20*

**717.20.3.2 Installation.** The area of steel armor to come in contact with strip seal lubricant adhesive shall be sand blasted prior to installing the seal. Sand blasting will be considered acceptable when the steel surfaces have been cleaned to an SSPC-SP10 degree of cleanliness. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. The strip seal shall be made watertight with a lubricant adhesive for bonding the neoprene gland to the steel extrusion as recommended by the manufacturer. The contractor shall obtain the services of a qualified technical representative, approved by the manufacturer of the expansion system and acceptable to the engineer, to assist during the installation. The installation shall not occur without the technical representative being present.

*Delete 717.30.3.2 Surface Preparation and substitute the following:*

*04/20*

**717.30.3.2 Surface Preparation.** The concrete or steel surface shall be prepared for priming and sealant placement. New Portland cement concrete shall be fully cured and allowed to dry a minimum of seven days. The joint shall be cleaned of all gravel, loose material and other contaminants before sand blasting. Areas that will be in contact with the sealant shall be sand blasted with a clean, hard aggregate that will leave little to no dust residue. Sand blasted concrete surfaces will be considered acceptable when areas that will be in contact with the sealant have a roughened surface with clean, exposed aggregate. The surface shall be free of foreign matter or plastic residue. Sand blasted steel surfaces will be considered acceptable when the steel surfaces have been cleaned to an SSPC-SP10 degree of cleanliness. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. After sand blasting is completed, the joint shall be cleaned of debris using oil-free and water-free compressed air or a vacuum, either being at least 90 psi.

*Delete 717.40.3.5 and substitute the following:*

*04/20*

**717.40.3.5** Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3.

*Delete 717.60.3.1 Surface Preparation and substitute the following:*

*04/20*

**717.60.3.1 Surface Preparation.** The concrete or steel surface shall be prepared for priming and seal placement. New Portland cement concrete shall be fully cured and allowed to dry a minimum of seven days. The joint shall be cleaned of all gravel, loose material and other contaminants before sand blasting. Areas that will be in contact with the sealant shall be sand blasted with a clean, hard aggregate that will leave little to no dust residue. Sand blasted concrete surfaces will be considered acceptable when areas that will be in contact with the sealant have a roughened surface with clean, exposed aggregate. The surface shall be free of foreign matter or plastic residue. Sand blasted steel surfaces will be considered acceptable when the steel surfaces have been cleaned to an SSPC-SP10 degree of cleanliness. Clean-up and disposal of blast material shall be in accordance with Sec 202.3.1.3. After sand blasting is completed, the joint shall be cleaned of debris using oil-free and water-free compressed air or a vacuum, either being at least 90 psi. Using a rag saturated in denatured alcohol, wipe clean both vertical faces of the expansion joint opening.

## **SECTION 724 – PIPE CULVERTS**

*Delete Sec 724.3.7 and substitute the following:*

*01/20*

**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 R 82-17	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 R 82-17	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 R 82-17	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

**SECTION 902 – TRAFFIC SIGNALS**

*Delete Sec 902.4.5 and substitute the following:*

*01/20*

**902.4.5** The Commission will include Form D-15 in the Electronic Deliverables listing the lighting and signal equipment to be installed. The contractor shall complete the list by writing in the name of the equipment manufacturer and catalog number of each item listed. A list of preapproved equipment and material is available on the MoDOT web site. For each category of the preapproved list, only those items listed under each category of the latest revision will be accepted for use. All other equipment and material to be installed that does not fall under a category on the preapproved list shall be in accordance with Sec 902.4. A completed list shall be submitted electronically to the engineer and shall be approved in writing before items are installed. Approval of the items on the list will not relieve the contractor of responsibility for satisfactory performance of the installation.

**SECTION 1019 – CEMENT**

*Delete 1019.2.1 Portland Cement and substitute the following:*

*04/20*

**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 430 m<sup>2</sup>/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.

**SECTION 1029 – FABRICATING PRESTRESSED CONCRETE MEMBERS FOR BRIDGES**

*Delete Sec 1029.6.2 (d) and substitute the following:*

*10/19*

**1029.6.2 Forms and Formwork.**

(d) 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 a surface temperature of 90 F or lower.

**SECTION 1039 – EPOXY RESIN MATERIAL**

*Delete Sec 1039 title and substitute the following:*

*04/20*

**SECTION 1039**

**POLYMER PRODUCTS**

*Delete Sec 1039.60 EPOXY POLYMER CONCRETE OVERLAY thru Sec 1039.60.2.1 and substitute the following: 04/20*

**SECTION 1039.60 EPOXY POLYMER WEARING SURFACE.**

**1039.60.1 Scope.** This specification covers epoxy polymer and aggregate to be used for an epoxy polymer wearing surface.

**1039.60.2 Epoxy Polymer.** The infrared spectrum for each component of the epoxy polymer shall essentially match that of the standard infrared spectrum for the particular component as specified in AASHTO T 237, Sections 4 and 5. The epoxide equivalent for Component A shall not exceed 270. The mixed epoxy polymer shall meet the following requirements:

<b>Property</b>	<b>Requirement</b>
Pot life (at 75 F), minutes	10 to 55
Tensile Strength (at 75 F, 7 days), psi, min.	1500
Tensile elongation (at 75 F), percent, min.	20
Water Absorption, percent, max.	0.8
Compressive Strength (at 4 hr), psi, min.	1000
Compressive Strength (at 48 hr, wet), psi, min.	4000
Ash Content, percent, max.	0.5
Rotational Viscosity (at 75 F, spindle 3, 60 rpm), poise	7 to 25
Volatile Content, percent, max.	3.0
Thermal Shear (shearing, shrinkage, expansion or scaling)	None

**1039.60.2.1 Classes.** Epoxy resin shall be formulated for use at specific temperatures as specified in ASTM C 881. The controlling temperature shall be that of the hardened concrete surface to which the polymer is applied. Where unusual curing rates are desired and upon the approval from the engineer, a class of epoxy resin may be used at a temperature other than that for which the epoxy resin is normally intended.

*Delete Sec 1039.60.3 Aggregate for Epoxy Polymer Concrete Overlay and substitute the following:*

*04/20*

**1039.60.3 Aggregate.** Aggregate shall be bauxite, crushed porphyry, aluminum oxide, flint chat or other similarly hard, durable, dry aggregates with less than 0.2 percent moisture. Aggregate shall be in accordance with the following gradation:

<b>Sieve Size</b>	<b>% Passing By Weight</b>
No. 4	100
No. 20	0-5
No. 200	0-1.0

*Delete Sec 1039.60.3.2 Aggregate Recommendation thru Sec 1039.60.7 Product History and substitute the following: 04/20*

**1039.60.3.2 Aggregate Recommendation.** For each contract, the epoxy polymer supplier shall supply a letter to the engineer specifically recommending the use of a designated aggregate and source, which has been previously approved by Construction and Materials.

**1039.60.4 Epoxy Polymer Performance.** The epoxy polymer shall not exhibit shearing, shrinkage, expansion or scaling.

**1039.60.5 Test Methods.** Tests will be performed in accordance with the following methods:

Test Methods	
Rotational Viscosity	ASTM D 2393 Model LVT Brookfield viscometer
Epoxy Equivalent	MoDOT Test Method TM 73
Volatile Content <sup>a</sup>	ASTM D 1259, Method B, for mixed system
Filler Content	MoDOT Test Method TM 73
Ash Content	ASTM D 482
Pot Life	AASHTO T 237
Tensile Strength	ASTM D 638
Compressive Strength	ASTM C 881
Water Absorption	ASTM D 570
Thermal Shear	MoDOT Test Method TM 72

<sup>a</sup> Sample cured 4 days at room temperature and weighed on a previously weighed metal foil.

**1039.60.6 Manufacturer and Brand Name Approval.** Prior to approval and use of this material, the manufacturer shall submit to Construction and Materials a certified test report showing specific test results in accordance with all requirements of this specification. The certified test report shall include the manufacturer's name, brand name of material, lot tested, date of manufacture, ratio of components by volume and system tested. In addition, the manufacturer shall submit to Construction and Materials a sample representing the system for laboratory testing accompanied by a technical data sheet, an MSDS and any special installation instructions relative to the system being submitted. Upon approval of the certified test report and satisfactory results of tests performed on the sample submitted, the brand name and manufacturer will be placed on a qualified list of epoxy resin material for epoxy polymer wearing surface. New certified test results and samples shall be submitted any time the manufacturing process or the material formulation is changed and may be required when random sampling and testing of material offered for use indicates non-conformity with any of the requirements herein specified.

**1039.60.7 Product History.** The epoxy polymer shall have a proven record of a minimum of two years on similar bridge decks within the United States. A list including the location, the name of the agency involved with the project, and a name and phone number of a contact person with that agency, shall be provided for each location used as evidence of satisfactory use.

*Add new specifications Sec 1039.80 thru 1039.90.4.2:*

*04/20*

#### **SECTION 1039.80 METHYL METHACRYLATE (MMA) POLYMER SLURRY WEARING SURFACE**

**1039.80.1 Scope.** This specification covers MMA primer, polymer slurry and top coat; and broadcast aggregate to be used for a MMA polymer slurry wearing surface.

**1039.80.2 Preapproved Product.** The following material has been preapproved for use under this specification: Transpo T-18 Thin Overlay and SterlingLloyd Bridgemaster.

**1039.80.3 MMA Primer.** The MMA primer shall be wax-free low odor and comply with the following requirements:

Property	Requirement	Test Method
Viscosity, cps	50 to 70	ASTM D2393
Density, lb/gal	8 to 9	ASTM D2849
Pot Life (at 70 F), minutes	10 to 30	ASTM C881
Flash Point, F, min.	43	ASTM D1310
Solids Content (w/catalyst), %, min.	100	ASTM D1644

**1039.80.4 MMA Polymer Slurry.** The MMA polymer slurry shall comply with the following requirements:

Property	Requirement	Test Method
Elongation at Break, percent, min.	50	ASTM D 638 (Type 1)
Tensile Strength (at 75 F), psi	500 to 900	ASTM D 638
Tensile Adhesion, psi, min.	250	ASTM C 1583
Water Absorption (at 24 hr), %, max.	0.8	ASTM D 570
Volatile Content, percent, max.	3.0	ASTM D 2369

**1039.80.5 Broadcast Aggregate.** Aggregate shall be in accordance with Sec 1039.60 unless otherwise specified. Unless otherwise specified, aggregate shall be light-colored (i.e. flint rock or similar).

**1039.80.5.1** All aggregates shall be furnished in appropriate packaging that is clearly labeled and protects the aggregate from any contaminants on the jobsite and from exposure to rain or other moisture.

**1039.80.6 MMA Top Coat.** The MMA top coat shall comply with the following requirements:

Property	Requirement	Test Method
Viscosity, cps	200 to 400	ASTM D 2393
Flash Point, F, min.	50	ASTM D 1310

**SECTION 1039.90 POLYESTER POLYMER WEARING SURFACE.**

**1039.90.1 Scope.** This specification covers MMA primer, polyester resin binder and aggregate to be used for a polyester polymer wearing surface.

**1039.90.2 Primer.** The prepared surface shall receive a wax-free low odor, high molecular weight methacrylate prime coat complying with the following requirements:

Property	Requirement	Test Method
Viscosity (Brookfield RVT w/UL adapter, 50 rpm at 77 F), Pa-s, max.	0.025	ASTM D 2196 <sup>a</sup>
Specific Gravity (at 75 F), min.	0.90	ASTM D 1475 <sup>a</sup>
Volatile Content, %, max.	30	ASTM D 2369 <sup>a</sup>
Flash Point, F, min.	180	ASTM D 3278 <sup>a</sup>
Vapor Pressure (at 77 F), mm Hg, max.	1.0	ASTM D 323 <sup>a</sup>
Tack Free Time (at 77 F), minutes, max.	400	ASTMC 679
PCC Saturated Surface-Dry Bond Strength (24 hrs at 70 F +/- 1°), psi, min.	500	California Test 551

<sup>a</sup>Tested prior to adding initiator

**1039.90.2.1 Mixing Requirements.** The prime coat initiator shall consist of a metal drier and peroxide. If supplied separately from the resin, at no time shall the metal drier be mixed directly with the peroxide.

**1039.90.2.2 Storage.** The containers shall be stored in a manner that will not allow leakage or spillage from one material to contact the containers or materials of the other.

**1039.90.3 Aggregates.** The aggregates shall comply with Sec 1005, except as specified herein.

**1039.90.3.1 Crushed Particles.** Aggregate retained on the No. 8 sieve shall have a maximum of 45 percent crushed particles as determined by AASHTO T 335.

**1039.90.3.2 Absorption.** The aggregate absorption shall not exceed one percent as determined by AASHTO T 85.

**1039.90.3.3 Moisture Content.** At the time of mixing with the resin, the moisture content of the aggregate, as determined by AASHTO T 255, shall not exceed one half of the aggregate absorption.

**1039.90.3.4 Temperature.** The aggregate temperature shall be between 45 F and 100 F at the time of mixing.

**1039.90.3.5 Combined Gradation.** Aggregate for polyester polymer concrete shall comply with the following requirements:

Sieve Size	1/2" Maximum % Passing by Weight	3/8" Maximum % Passing by Weight
1/2"	100	100
3/8"	83 – 100	100
No. 4	65 – 82	62 – 85
No. 8	45 – 64	45 – 67
No. 16	27 – 48	29 – 50
No. 30	12 – 30	16 – 36
No. 50	6 – 17	5 – 20

Sieve Size	1/2" Maximum % Passing by Weight	3/8" Maximum % Passing by Weight
No. 100	0 – 7	0 – 7
No. 200	0 - 3	0 – 3

**1039.90.3.6 Fine Aggregate.** The fine aggregate shall consist of natural sand.

**1039.90.3.7 Finishing Sand.** The sand for abrasive finish shall be commercial quality blast sand having at least 95 percent passing the No. 8 sieve and at least 95 percent retained on the No. 20 sieve when tested in accordance with AASHTO T 27. The absorption of the sand shall not exceed 1 percent when tested in accordance with AASHTO T 84.

**1039.90.4 Polyester Resin Binder.** The resin shall be an unsaturated isophthalic-styrene co-polymer conforming to the following requirements:

Property	Requirement	Test Method
Viscosity (RVT, No. 1 Spindle, 20 rpm at 77 F), Pa-s	0.075 to 0.200	ASTM D 2196 <sup>a</sup>
Specific Gravity (at 77 F)	1.05 to 1.10	ASTM D 1475 <sup>a</sup>
Elongation (Type I at 0.45 inch/minute, thickness = 1/4" +/- 0.04), %, min. (Sampling Condition)	35	ASTM D 638
	18h at 77 F & 50% RH + 5h at 158 F	ASTM D 618
Tensile Strength (Type I at 0.45 inch/minute, thickness = 1/4" +/- 0.04), psi, min. (Sampling Condition)	2500	ASTM D 638
	18h at 77 F & 50% RH + 5h at 158 F	ASTM D 618
Styrene Content (by weight), %	40 to 50	ASTM D 2369 <sup>a</sup>
Silane Coupler (by weight of polyester-styrene resin), %, min.	1.0	
PCC Saturated Surface-Dry Bond Strength (24 hrs at 70 F +/- 1 F), psi, min.	500	California Test 551

<sup>a</sup>Tested prior to adding initiator

**1039.90.4.1 Silane Coupler.** The silane coupler shall be an organosilane ester, gammamethacryloxypropyltrimethoxysilane.

**1039.90.4.2 Hardener.** The promoter/hardeners shall be compatible with suitable methyl ethyl ketone peroxide (MEKP) and cumene hydroperoxide (CHP) initiators. MEKP initiators shall be used when the surrounding concrete temperatures are above 60 F. A blend of initiators may be used as approved by the engineer when the surrounding concrete temperature is 50 – 60 F.

## **SECTION 1080 – STRUCTURAL STEEL FABRICATION**

*Delete Sec 1080.3.1.6 Certifications (g) and substitute the following:*

**04/20**

(g) Fabricators that apply steel painted coatings in the fabrication shop shall be certified to the AISC Applicators of Complex Coatings Endorsement (SPE), SSPC QP3 – Shop Painting Certification Program, or NIICAP AS-1 Shop Accreditation.

## **SECTION 1081 – COATING OF STRUCTURAL STEEL**

*Delete Sec 1081.10.3.2 Certification and substitute the following:*

**04/20**

**1081.10.3.2 Certification.** Contractors performing coating operations for new structural steel shall be certified prior to the start of coating operations under the following SSPC Certified Contractor QP program or NACE International Institute Contractor Accreditation Program (NIICAP) as follows:

- (a) For field application of intermediate and finish coats, the contractor shall be certified to the SSPC QP1 – Field Application or NIICAP AS-1 Field Application.
- (b) For shop application of any coats by the steel fabricator, the fabricator shall be certified in accordance with Sec 1080.3.1.6 (g).
- (c) For field application of gray epoxy mastic primers to new steel and contact surfaces between the new steel and existing steel, no SSPC QP certification or NIICAP accreditation will be required.

*Delete Sec 1081.10.4.2 Certification and substitute the following:*

*04/20*

**1081.10.4.2 Certification.** Contractors performing coating operations for field applied recoating shall be certified prior to the start of the coating operations under the appropriate category of the SSPC Certified Contractor QP program or NACE International Institute Contractor Accreditation Program (NIICAP) as follows:

- (a) For coating operations where there is no presence of lead, heavy metals, or other hazardous materials, the contractor shall be certified to the SSPC QP1 or NIICAP AS-1 – Field Application.
- (b) For coating operations where lead, heavy metals, or other hazardous materials are present, the contractor shall be certified to the SSPC QP2 or NIICAP AS-2 - Field Removal of Hazardous Coatings.

*Delete Sec 1081.10.5.2 Certification and substitute the following:*

*04/20*

**1081.10.5.2 Certification.** Contractors performing coating operations for field applied overcoating shall be certified prior to the start of the coating operations under the appropriate category of the SSPC Certified Contractor QP program or NACE International Institute Contractor Accreditation Program (NIICAP) as follows:

- (a) For coating operations where there is no presence of lead, heavy metals, or other hazardous materials, the contractor shall be certified to the SSPC QP1 or NIICAP AS-1 – Field Application.
- (b) For coating operations where lead, heavy metals, or other hazardous materials are present, the contractor shall be certified to the SSPC QP2 or NIICAP AS-2 - Field Removal of Hazardous Coatings.

## **SECTION 1092 – SIGNAL EQUIPMENT**

*Delete Sec 1092.4.7.6 Microwave Vehicle Detectors and substitute the following:*

*01/20*

**1092.4.7.6 Microwave Vehicle Detectors.** The product shall be designed for traffic management application and detect vehicles within user definable fields of detection. The number of lanes covered and number of detection outputs shall be sufficient to support the specific traffic signal design or application. The product shall have a minimum detection range of 120 feet for any vehicle type. The product shall be designed to place a constant call to the controller in the event of any failure. All product components shall meet or exceed NEMA environmental standards, including a continuous operating temperature range of -29° F to 165° F (-34° C to 74° C). The unit shall have FCC certification and shall be tested to the applicable FCC specifications. Sensor enclosures shall be weather and UV resistant. All user operated controls and adjustments shall be clearly marked and easily accessible. The product shall include all interface circuitry and cabinet modules necessary to interface with NEMA TS1, NEMA TS2 or Type 170 traffic signal control cabinets as appropriate to support the specific traffic signal design or application. All cabling installed shall be as specified by the detection system manufacturer. The product shall include mounting hardware designed for attachment to typical signal and lighting structures. Power supply equipment shall be specified by the detection system manufacturer and shall be provided with the unit. Any software required for configuration, operation or maintenance shall be included.