OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION
SPECIAL PROVISIONS FOR
PROJECT NO. 43-22-06 (RE-BID)

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SPECIAL PROVISIONS FOR
PROJECT NO. 43-22-06 (RE-BID)

SP 1 GENERAL - INCLUDING MODIFICATIONS TO OHIO TURNPIKE GENERAL CONDITIONS

SP 101 PLANS AND DESCRIPTION OF THE WORK

The Work included in this Project, together with other pertinent information is shown and described in the Plans, which consist of a title sheet and other drawings, as tabulated on the index of sheets, covering details of the Work.

The title sheet for Project(s) No. 43-22-06 (RE-BID) bears the general title as follows:

OHIO TURNPIKE AND INFRASTRUCTURE COMMISSION
THE JAMES W. SHOCKNESSY OHIO TURNPIKE

PROJECT NO. 43-22-06 (RE-BID)
BRIDGE REPAIR AND REHABILITATION
OHIO TURNPIKE OVER CUYAHOGA RIVER M.P. 176.9
SUMMIT COUNTY, OHIO

The title sheet bears the approval of the Chief Engineer.

The Work to be performed consists of the following:

Chipping and patching of concrete surfaces, deck joint repair, performing concrete weatherproofing, maintenance of traffic and all other items incidental to the completion of the Work.

Details of this Work and other incidental Work are shown on the Plans and/or described in the Specifications and these Special Provisions.

Pre-bid Questions should be submitted in accordance with Sections 1.3.3 and 1.3.4 of Article 1 of the Instruction to Bidders.

No verbal Questions will be considered.

SP 102 SPECIFICATIONS

All Work under this Project is to be constructed under the applicable sections of the Construction and Material Specifications (“CMS”) of the State of Ohio Department of Transportation (“ODOT”), dated January 1, 2019 and Supplemental Specifications unless an earlier edition is specified on an Ohio Turnpike Standard drawing, excepting Section 100 thereof - General Provisions, and in accordance with the General Conditions of the Commission, these Special Provisions, the payment items listed on the Bid Form, and the terms and conditions of the Contract Documents. If there is reference to Section 100 of the ODOT CMS in other sections of the CMS, the appropriate provision of Section 100 shall apply and be operative, unless there is a specific statement to the contrary in the General Conditions, Special Provisions, and terms and conditions of the Contract Documents of the Commission. Whenever the word "Director" appears in the ODOT CMS, it shall be construed to mean the "Commission" or the "Chief Engineer" of the Commission, as set forth in the definitions of the Standard Conditions.

SP 103 **CONSTRUCTION PHASING AND TIME OF COMPLETION**
(12/06/2017)

The Work shall be performed and completed in its entirely in strict accordance with the Plans, Specifications, Special Provisions and other Contract Documents as follows:

A. Notice to Proceed (NTP): The Commission will issue the Contractor the Notice to Proceed (NTP) by the Chief Engineer after the Contract is fully executed. Upon receipt of the NTP, the Contractor shall begin performance of preliminary investigations and survey layout work, as approved by the Chief Engineer, and preparation of the Construction Schedule, Shop Drawings and submittals for this Project. The Commission anticipates issuing the Contractor the Notice to Proceed (NTP) by the Chief Engineer on or about **March 1, 2023.**

B. Baseline Construction Schedule: The Baseline Construction Schedule for this Project shall be submitted and acceptable prior to the Contractor performing the Work in accordance with General Condition Articles 4.2 and 4.3 and SP 120A or SP 120B to the extent made applicable through incorporation in the Contract Documents. Liquidated damages for failure to submit an acceptable Construction Schedule shall commence on the day the Contractor begins to perform the Work described in General Conditions Article 4.2.4.2. Mobilization on the site shall signify the beginning of the Work.

C. Construction Access: The Commission anticipates providing the Contractor access to the Turnpike on or about **April 4, 2023** at which time the Contractor may begin the Work for this Project.

D. Substantial Completion: The Work shall be substantially complete **by October 1, 2023**. Substantially completed shall mean all Work, as described in the Contract Documents, excluding bearing replacement, has been completed including that all Local Roads and the Turnpike roadway (all traffic lanes and shoulders) are open to traffic, as well as all traffic control and safety devices in place and approved by the Chief Engineer. Liquidated damages for failure to substantially complete the Work described in Part D herein shall commence **on October 2, 2023.** Liquidated damages will beassessed per day for failure to meet Substantial Completion Dates.

E. Final Completion: All bearing replacements and punch list items for this Project shall be completed in strict accordance with the Plans, Specifications, Special Provisions, and other Contract Documents **by December 31, 2023**. Liquidated damages for failure to meet the Final Completion Date shall commence **on January 1, 2024**. Liquidated damages will be assessed per day for failure to meet Final Completion Dates

It shall be noted that in order to meet the above referenced dates, the Contractor may be required to Work additional shifts and/or extended hours as well as periodic holidays and weekends. These additional forces shall be included in their Bid and there shall be no additional cost to the Commission.

SP 104 **ACCESS TO TURNPIKE AND RESTRICTIONS**
(11/01/2021)

The Contractor will be provided access and use of Turnpike roadways during the progress of the Work under this Project as follows:

A. Toll-free access for the Contractor's equipment and vehicles may be granted. A limited number of construction transponders will be issued for the Contractor's motor vehicles. A detailed request outlining the quantity and need for toll-free transponders must be submitted to and approved by the Chief Engineer.

B. It shall be the Contractor's responsibility to manage the issuance and use of all construction transponders for performing the Work under the Project. The Contractor shall be liable for any misuse of said transponders whether it is by the Contractor's forces or those of a subcontractor. Use of these transponders for personal travel or other travel not associated with this Project is strictly forbidden. The Contractor shall be advised that any personal or company transponders issued for use other than on this Project, must be removed from Project vehicles or properly stored in protective mylar bags provided. It is the responsibility of the Contractor to advise all subcontractors of the same requirements. The Commission will not be responsible for providing credit to accounts that are billed due to improper storage of personal or company transponders. Upon the completion of the Project, ALL transponders shall be returned to the Commission. Should the Contractor return less than the number issued to them, the Commission shall withhold the sum of one hundred ($100.00) dollars per transponder not returned from any monies due the Contractor.

C. The toll-free access, if granted, will be limited to a specified range of gates on each side of the Project limits. The Contractor will be charged a toll for all Turnpike travel outside the limits authorized by the toll-free access. Any method of operation involving such travel will be subject to such requirements and restrictions as the Commission may impose to facilitate proper collection of tolls and avoid undue inconvenience or hazard to the traveling public.

D. If the Contractor elects to have its vehicles or equipment use any Interchange other than those authorized, such use will be subject to such restrictions as the Commission may determine to be necessary to avoid undue inconvenience or hazard to the traveling public.

E. Upon request from the Contractor and approval of the Chief Engineer, toll-free access will be provided for the Contractor's administrative and supervisory personnel and/or special equipment or material deliveries, exclusive of asphalt and concrete that may require Turnpike travel outside the toll-free zone.

F. Private automobiles of workmen will not be permitted on the Ohio Turnpike roadways and may not be parked in the construction area. All parking must be at an approved staging area.

G. Access for all material delivery and/or construction equipment shall be achieved through public Toll Plaza ramps only. No access drives, maintenance building facilities, service plazas or back-gate entrance locations will be permitted for use

without prior written approval of the Chief Engineer. See Section I below for proposed fence cuts or alternate access locations. Limited access will be granted at the following locations for the delivery of the noted items only, for which no access credit or plans are required.

Access Location(s): None Delivery Item(s): None

H. During all phases of construction, the following will apply:

1. During periods of high Turnpike traffic volume, crossing of the active lanes, shoulder closures and/or lane closures will not be permitted unless authorized by the Chief Engineer. The following times are known to have high Turnpike traffic volume:

<u>2023 Construction</u>

New Year's Day Holiday: Sundown Friday, December 30, 2022 through Sunrise Monday, January 2, 2023

Easter: Noon on Friday, April 7, 2023 through Sunrise Tuesday, April 11, 2023

Memorial Day Holiday: Noon on Friday, May 26, 2023 through Sunrise Tuesday, May 30, 2023

Independence Day Holiday: Noon on Monday, July 3, 2023 through Sunrise Wednesday, July 5, 2023

Labor Day Holiday: Noon on Friday, September 1, 2023 through Sunrise Tuesday, September 5, 2023

Thanksgiving Day Holiday: Sunset Tuesday, November 21, 2023 through Sunrise Monday, November 27, 2023

Christmas Day Holiday: Noon Friday, December 22, 2023 through Sunrise Tuesday, December 26, 2023

Summer Weekends: Noon on Friday through Sunrise on Monday for the period beginning Friday, June 2, 2023 through Sunrise Monday, August 28, 2023

Non-Summer Weekends: Fridays and Sundays 12:00 PM (noon) through 10:00 PM

2. Unforeseen circumstances may occur making it necessary to restrict lane closures, Work zones, and ingress/egress traffic, as deemed necessary by the Chief Engineer.

3. All lane closures shall be approved by the Chief Engineer. Written requests for lane closures shall be provided to the Chief Engineer at least forty-eight (48) hours in advance.

4. Traffic backups can be expected and should be anticipated by the Contractor. During all phases of construction, the Chief Engineer may restrict or suspend the Contractor's activities as per Article 13.1 - Suspension of the Work, of the

General Conditions and/or require both Turnpike roadways to be open to traffic if the weather or traffic conditions should so indicate. Delays caused by these restrictions or suspensions are not the responsibility of the Commission.

5. Shoulder drop-offs from the edge of the traveled lane shall be limited to three (3) inches maximum and all guardrail and terminal assemblies shall be reinstalled leaving no obstruction unprotected.

6. **Permitted Lane Closures:** In addition to the restrictions noted above, Lane Closures are only permitted at the times shown in APPENDIX B – PERMITTED LANE CLOSURES. Implementation of the lane closure (i.e. set-up operations) may not occur prior to the permitted lane closure time and lane closures must be removed (i.e. tear down operations) prior to the prohibited lane closure time.

   Approval of any Lane Closure is conditional that the zone must be removed anytime traffic backups extend one half (1/2) mile beyond the first transitional arrow board. If this occurs, the Contractor is to make the work area safe and remove the lane closure as directed by the Chief Engineer, thereby making at least two (2) lanes available to traffic. At no time may the closed lane which is adjacent to traffic be used for the storage or parking of any equipment and/or vehicles, except as specified on Ohio Turnpike Standard Drawing TCR-1.

   Written requests for any closures and or restrictions shall be provided to the Chief Engineer in a timely manner in order to meet the required time frames set forth in the SP 614 Notification Time Table. Approval, if granted, may be restricted at the Chief Engineer's discretion. Approval is conditional that the zone must be removed anytime traffic backups extend one half (1/2) mile beyond the first transitional arrow board. If this occurs, the Contractor is to make the work area safe and remove the lane closure as directed by the Chief Engineer.

7. In the event that any of the above mentioned requirements relative to lane closure(s) are not complied with and/or not authorized by the Chief Engineer, the Commission may impose upon the Contractor a Liquidated Damage in the amount of $10,000 per hour for each hour or portion of an hour not in compliance.

8. The Contractor may elect to perform culvert lining construction below the mainline in any construction phase, subject to the requirements of this Specification. Prior to performance of this Work, the Contractor shall submit an access plan to the Chief Engineer for approval. The Contractor's access plan shall include, but is not limited to, the following; the intended method of accessing the site, the extent of the material laydown and equipment area, and methods of maintaining proper drainage in the Work area. Existing guardrail lengths and locations shall be shown on the Contractor's access plan.

I. Temporary Access Deduct Alternate proposals (all proposed Entrances or Exits to the Turnpike at locations other than public Toll Plaza ramps) may be submitted by the Contractor, if the Commission includes this item on the Bid Form. The Contractor shall enter a lump sum credit in the space provided in the Proposal, setting forth the amount of credit, which will apply in case its proposal for

Temporary Access is granted (See Bid form). In addition, The Contractor shall furnish the following information in the sealed envelope containing its signed original Bid Guaranty/Performance Bond, Power of Attorney, Bidder's Affidavit and completed Financial Statement submitted within twenty-four (24) hours of the Bid Opening in accordance with Articles 2.7.2, 2.7.4 and 6.1.1 of the Instructions to Bidders.

1. The exact location of such proposed entrances or exits.

2. A detailed plan of all construction necessary to provide such access, including any drainage and guardrail work necessary and such Work that will be performed to restore the area to its original condition or repair of any damage after construction.

If the Temporary Access is approved, the Work of constructing the temporary access and restoration of the area as proposed by the bidder, or repair of any damage resulting to an existing facility that may be used, shall be the Contractor's responsibility and shall be performed as directed by the Chief Engineer. The Contractor is solely responsible for obtaining any permits or permissions required for the use of properties not within the Turnpike Right-of-Way. The unit prices bid shall not reflect any costs which apply to such temporary construction, restoration, or repair Work, and such Work shall not be separately measured or paid for, but shall be performed without cost to the Commission.

If such temporary access is located within a Project construction zone, the bidder will not be permitted to use the temporary access during times that traffic is being maintained on the right lane of the adjacent roadway. Granting of this temporary access will not waive the Contractor's responsibility to haul only legal weights on the Turnpike roadways.

In the event that the construction of such temporary access is not approved, the Project shall proceed as if no request or bid had been made for the construction thereof.

SP 105 DISPOSAL OF EXCESS MATERIALS

Except as otherwise specifically provided in these Special Provisions, materials in excess of the requirements of the Work under this Project shall be disposed of by the Contractor **off** the Turnpike right-of-way. It shall be the Contractor's responsibility to select and maintain disposal areas and enter into appropriate waste disposal agreements to dispose of excess materials. All costs associated with disposing of excess materials shall be incidental to the Project. The Contractor shall supply a copy of the waste disposal agreement to the Commission at least forty-eight (48) hours prior to any disposal. The Commission will in no way be responsible for disposal areas.

SP 106 HOURS OF WORK

The Commission will consider extended hours of Work for construction operations for the duration of this Project. However, when overtime, multiple shift or nighttime Work is contemplated, the Contractor shall give the Chief Engineer a minimum of forty-eight (48) hours in advance notice of its overtime, multiple shift or nighttime Work schedule so that inspection may also be scheduled. If other nighttime operations are contemplated, the Contractor shall give the Chief Engineer a minimum forty-eight (48) hours advance notice

and the Contractor shall furnish the Chief Engineer its proposed construction operations and proposed scheme for lighting the Work area. Nighttime Work shall not begin without written approval of the lighting plan.

A proposed night work plan shall be submitted for review and approval by the Chief Engineer. The submittal shall clearly describe the type of Work to be done, the duration of the Work, location of the intended Work, and the Contractor's proposed lighting plan. Temporary lighting of the Work site for operations conducted during nighttime periods shall be positioned so the lights do not cause glare to the drivers on the highway. If glare is detected, the light placement and shielding shall be adjusted to the satisfaction of the Chief Engineer before Work proceeds.

SP 107 TIME OF THE ESSENCE - LIQUIDATED DAMAGES

Time is of the essence under the Project. The operation of the Turnpike roadway is of prime importance to the Commission and the traveling public. Completion of the Work at the scheduled time and, if possible, prior to the scheduled completion date, is vitally important.

Article 3 of the Contract Form provides for the assessment of liquidated damages on the Contractor's failure to complete the Work within the time set forth in these Special Provisions, or as modified by the Chief Engineer. For each calendar day that any Work required shall remain uncompleted beyond the specified time of completion, Liquidated Damages shall be deducted from the funds due the Contractor, in accordance with the provisions of Article 3 of the Contract Form.

SP 108 CONCRETE PLANT CERTIFICATION

The Contractor must submit either a current Certificate of Conformance issued by the National Ready Mixed Concrete Association or maintain a certification from a Sealer of Weights and Measures, or a scale servicing company attesting to the accuracy of the weighing and metering devices, within a twelve (12) month period before use of the plant for the supply of concrete to this Project. Failure to comply with this requirement will result in rejection of all concrete supplied from the non-complying producer unless the certification is otherwise waived by the Chief Engineer.

SP 109 HAULING OVER LOCAL ROADS

A. General

All deliveries, waste removal loads, and heavy traffic in general shall use the Ohio Turnpike mainline as the only ingress/egress route. Local roads shall only be used for and in connection with the Project as routes for cars and small trucks. Any deviation from this requirement must have prior approval from the Chief Engineer and all applicable local authorities. The Contractor shall determine the existence of and comply with any local laws and/or ordinances governing locally maintained roads including, but not limited to, bonds for road damage and weight/load size restrictions.

B. Surveys

The Contractor shall conduct a video and written pre-construction local roads conditions survey. This survey shall be conducted by the Contractor, the Chief Engineer and the local governing body responsible for the roads. Copies of the

survey shall be approved and maintained by both the local government and the Chief Engineer.

A post-construction survey shall similarly be conducted, approved and distributed.

C. Repair Responsibility

The Contractor and local governing body shall determine the damage to roads and appurtenant structures due to extra construction traffic from this Project.

The Contractor shall either repair, have repaired, or pay agreed repair costs as determined with the local governing body.

The Commission shall be held harmless for any damage to local roads and appurtenant structures due to construction of this Project.

The Commission will withhold final payment of monies due the Contractor until all such local road repairs are satisfactorily completed and/or negotiated costs paid and a copy of the signed release from the local governing body is provided to the Commission.

No extra payment for this item will be made to the Contractor. All Work required under this Special Provision shall be considered incidental to the Project and shall be completed at no cost to the Commission.

SP 110 PROJECT SAFETY

(02-16-18)

A. General

It is the intention of this program that safety not be sacrificed for production but should be an integral part of the planning process. The Commission promotes a ZERO Accident Culture and expects contractors to adopt this same culture.

The Contractor is charged with the responsibility for supervising Project safety and providing a workplace free of recognized hazard for all employees. The Contractor is responsible for enforcing its safety program and shall describe its enforcement procedures that are to be used, to ensure the program is followed.

The Contractor is solely responsible for the safety and health of its employees and for the protection of property and the general public. The Contractor shall comply with and ensure that all subcontractors comply with all Commission, OSHA, Federal, State, County and Local safety and health laws, regulations and Specifications, and enforce all applicable jobsite safety and health regulations and requirements through daily inspections and other measures deemed appropriate to ensure compliance by employees and subcontractor employees.

The jobsite will be subject to safety inspection by OSHA, the Commission, and the Chief Engineer, but this provision does not in any way affect the responsibility of the Contractor to be solely responsible for safety. Upon written notice of any safety violation, the Contractor will provide a written response within twenty-four (24) hours stating corrective actions and date of such corrections within twenty-four (24) hours.

Upon failure to immediately correct any safety violation after written notice of the violation from the Commission, the Chief Engineer, any insurance carrier or other authorized representative, the Chief Engineer has the right to stop the Work affected by the violation until the condition is corrected to the satisfaction of the Chief Engineer. No extension of time or additional compensation will be granted as a result of any stop order so issued. The Chief Engineer also reserves the right to withhold the processing of Contractor pay estimates until unresolved safety issues are corrected to the satisfaction of the Chief Engineer.

The Contractor will ensure that personal protective equipment is readily available, issued, properly fitted, maintained and worn. Hard hats and Hi-Viz shirts or retro-reflective traffic safety vests will be worn by all jobsite personnel. The vests shall meet the latest requirements of ANSI/ISEA, Class 3, or as approved by the Commission. Proper clothing will be worn by all jobsite personnel to include: shirts covering shoulders, long pants, and Work type shoes or boots (shorts, muscle shirts, cut-a-way shirts, and sport type shoes are not permitted).

The Contractor will assure that proper material and equipment storage and housekeeping are maintained daily. Access is not to be obstructed, which would prevent the assistance of emergency personnel and equipment.

The Contractor will establish means to inform subcontractors, vendors and visitors of site rules and regulations.

B. Safety Program

Fourteen (14) days prior to the commencement of the Work, the Contractor shall submit two (2) copies of the Contractor's written safety program, including night operations, and the past three (3) years of the Contractor's OSHA Log of Work-Related Injuries and Illnesses (Form 300) for review by the Chief Engineer. Upon receipt of the Chief Engineer's comments, any revisions required must be submitted within seven (7) days. At a minimum, this written safety program is to address the following:

1. Compliance with all applicable OSHA, Federal, State, County and Local laws, rules, regulations and Commission's Specifications.

2. Designation of the Contractor's Safety Representative. (Submit resume for review).

3. Safety training requirements; all employees are encouraged to have completed the **Safety Training Passport Program** and other OSHA training. (Record keeping required, copy of the training record shall be readily available upon request).

4. New employee safety orientation (record keeping required, copy maintained on site).

5. Weekly tool box safety meetings (record keeping required, copy maintained on site).

6. Hazard Communication (Right to Know Training Program, inclusive of safety data sheet ("SDS") storage procedures).

7. Procedure to enforce safety policy, to include disciplinary measures where appropriate.

8. Procedure to enforce safety policy on Subcontractors.

9. Housekeeping.

10. Safety inspections of equipment, i.e., cranes, dozers, trucks (rock) hoes and loaders; daily, weekly inspection log required: To include inspection of equipment prior to being allowed on jobsite (record keeping required, maintain logs on site during the duration of the Project).

11. Incorporation of safety topics, i.e., safety concerns into Project progress meetings.

12. Use of personal protective equipment.

13. Program for jobsite medical service, to include emergency phone numbers.

14. Accident record keeping procedures (copies of all recordable accidents will be provided to the Chief Engineer within twenty-four (24) hours of occurrence). This should be revised or an exception added to consider a fatal accident. Fatal accidents must be reported to OSHA within **8** hours.

15. Provisions for required OSHA bulletin board notices. (Submit samples, i.e., OSHA, state posters).

16. Provisions for a safety awareness program.

17. Provision for evacuation/emergency plans.

18. Provision for training of Zone and Flagger personnel (submit training program). All Flaggers and Zone personnel shall wear Hi- Viz yellow/green safety vests and hard hats. The vests shall meet the latest requirements of ANSI/ISEA, Class 3. During night work operations, all Flagger personnel shall wear a Class 3 vest and Class E Leggings. Illumination shall be provided at the location where the flagger is stationed based on the National Cooperative Highway Research Program (Report 498).

19. Provide an updated copy of your company's Silica Protection Plan in order to comply with OSHA's new Crystalline Silica Rule.

20. Substance Abuse Program that includes as a minimum the following elements:

    (a) A written program that complies with Ohio Revised Code Sections 153.03 and 153.031.

    (b) The Contractor is required to be enrolled and in good standing in the Drug-Free Safety Program of the Ohio Bureau of Workers' Compensation ("Bureau") or a comparable program approved by the Bureau that requires an employer to do all of the following:

        (1) Develop, implement, and provide to all employees a written substance use policy that conveys full and fair disclosure of the employer's expectations that no employee be at

work with alcohol or drugs in the employee's system, and specifies the consequences for violating the policy.

(c) Drug and alcohol tests on employees are required as listed and must use the Federal testing model that the Bureau's Administrator has incorporated into the Bureau's Drug-Free Safety Program.

(1) Prior to an individual's employment or during an employee's probationary period, which shall not exceed 128 days after the probationary period begins;
(2) At random intervals, while an employee provides labor or onsite supervision of labor. A neutral selection procedure required by the United States Department of Transportation to determine which employees to test and when to test those employees. All employees must have a negative substance test result for the Ohio Turnpike Project prior to starting Work on the Project. Substance testing must be performed on the substance specified in the employer's company substance abuse program;
(3) After an accident at the site where labor is being performed pursuant to the Project;
(4) When the employer or a construction manager has reasonable suspicion that prior to an accident an employee may be in violation of the employer's written substance use policy;
(5) The Contractor shall submit a notarized letter each month that there is complete compliance with the substance abuse program.

(d) Require all employees to receive at least one (1) hour of training that increases awareness of and attempts to deter substance abuse and supplies information about employee assistance to deal with substance abuse problems, and require all supervisors to receive one (1) additional hour of training in skill building to teach a supervisor how to observe and document employee behavior and intervene when reasonable suspicion exists of substance use. This training must be received before Work begins on the Project.

(e) Contractors must ensure that all employees are subjected to testing for at least five (5) drugs; Amphetamines, Cannabinoids ("THC"), cocaine, opiates, and phencyclidine ("PCP"/angel dust); and alcohol.

(f) The laboratories used must be certified by the Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. No other laboratories are considered compliant. A breath/saliva preliminary test for alcohol shall be used with a confirmatory breath test conducted by a certified breath alcohol technician.

(g) Employees tested under this criterion who are found to have a blood alcohol level of 0.04 or greater will be immediately relieved from performing Work under this Project.

(h) The Contractor shall require all subcontractors to be enrolled and be in good standing in the Ohio Bureau of Workers' Compensation's Drug-Free Safety Program or comparable program.

(i) Each subcontractor shall require all lower-tier subcontractors be enrolled in and be in good standing in the Ohio Bureau of Workers' Compensation's Drug-Free Safety Program or a comparable program.

(j) Failure of a Contractor to require a subcontractor to be enrolled and be in good standing in the Ohio Bureau of Workers' Compensation's Drug-Free Safety Program or a comparable program prior to the time the subcontractor provides labor at the Project site will result in the Contractor being found in breach of the Contract and that breach shall be used in the responsibility analysis of that Contractor or subcontractor who was not enrolled in a program for future contracts with the Commission for five (5) years after date of the breach.

(k) Failure of a subcontractor to require a lower-tier subcontractor to be enrolled and in good standing in the Ohio Bureau of Workers' Compensation's Drug-Free Safety Program or a comparable program prior to the time the lower-tier subcontractor provides labor at the Project site will result in the subcontractor being found in breach of the Contract and that breach shall be used in the responsibility analysis of that subcontractor or the lower-tier subcontractor who was not enrolled in a program for future contracts with the Commission for five (5) years after date of the breach.

The Chief Engineer reserves the right to request any documentation to ensure the safety program is being conducted in accordance with the written program and applicable rules and regulations. The Contractor is to submit the documentation within twenty-four (24) hours of the Chief Engineer's request.

The Contractor will report the man-hours of all personnel employed on the Project as well as all recorded and lost time injuries on a monthly basis in conjunction with the monthly pay estimates.

C. Safety Representative

The Contractor shall have a safety representative for the Project on-site while Work is being performed. Superintendents are not to be designated as safety representatives.

The Contractor's safety representative must have completed the OSHA thirty (30) hour training or approved equivalent. Certification of training completion must be submitted to the Chief Engineer with the written safety program.

The safety representative's dedicated fulltime responsibility is to ensure that all Work is conducted in compliance with safety and health requirements and to develop and implement safety training programs and maintain safety records for all job personnel and in conjunction with the Contractor's management. The safety representative is to have specialized training and two (2) years experience in heavy highway and bridge construction safety and is subject to review by the Chief

Engineer. The Chief Engineer has the authority to request removal of the Contractor's Safety Representative if that representative is judged to be improperly or inadequately performing his or her duties; however, this authority in no way affects the Contractor's sole responsibility for performing its Work safely, nor does it impose any obligation upon the Commission or the Chief Engineer to ensure that the Contractor performs its Work safely.

D. Subcontractor Safety Representative

Ensure that all major subcontractors have an employee on-site designated as a safety representative. This employee may have responsibilities other than safety. This safety representative is to ensure that the subcontractor and its subcontractors and vendors meet all required safety rules and regulations. Superintendents are not to be designated safety representatives.

E. Special Safety Concerns

The following items are of special safety concern to the Commission and are to be given special attention. Detailed Plans to address these special safety concerns shall be submitted fourteen (14) days prior to starting Work:

1. Mandatory 100 percent fall protection for individuals performing Work above six (6) feet (all phases of Work including steel erection shall meet the requirements of 29 CRF 1926, Subpart M); Any Work performed in any aerial lift, and/or scissors lift will require 100% fall protection.
2. Excavation trenching cave-in protection (daily inspection documentation required);
3. Utility protection, including underground and overhead lines;
4. Electrical safety;
5. Crane safety; All cranes shall be equipped with anti-2 block switches (all cranes shall be required to have the boom down when not in use), OSHA 1926.550, OSHA 1910.180, ANSI B30.5 (1989), and PCSA No. 2 shall apply;
6. Any particularly hazardous operations (i.e., pile driving, caissons, cofferdams, etc.); and
7. Welding/cutting (all gas torches shall have anti-flashback valves).

F. Liability

Compliance with requirements for safety and/or Chief Engineer's review of the Contractor's safety program does not relieve or decrease the liability of the Contractor for safety.

No provision of these Contract Documents acts to make the Commission, the Construction Inspectors or any other party other than the Contractor solely responsible for safety. Article 16 of the General Conditions – Indemnification applies to protect, indemnify, defend and hold harmless all parties referred to therein from any and all actions, damages, fines, suits, losses and any other expenses arising from the Contractor's failure to meet all safety requirements and/or provide a safe Work site.

G. Basis of Payment

Safety and health equipment, operations, training, and dedicated personnel will not be measured or paid separately, but are considered incidental to the Contract requirements.

SP 111 PROHIBITION ON USE OF SLAG

Slag may only be used as a construction material when it is incorporated as a coarse aggregate into Portland cement and/or bituminous concrete mixes where such use is permitted in the following Special Provisions:

SP 302, SP 400, SP 451, SP 511, SP 511A, SP 511B, SP 511C and SP 526

All types of slag are prohibited for all other uses, including by way of example, but without limitation: aggregate base, pipe bedding, granular backfill, embankment, slope and channel protection, underdrains and all other uses where not incorporated into a specified concrete or asphalt mix.

SP 111 supercedes all applicable sections of the ODOT CMS, and all Supplemental Specifications that may allow the use of slag.

For purposes of this provision, the term “slag” means air-cooled blast furnace slag, blast furnace slag, open-hearth slag or any other byproduct of the iron and steel making process.

SP 112 ENVIRONMENTAL POLLUTION CONTROL

A. General

The Contractor shall provide all equipment, materials, and labor necessary to prevent and/or clean up the spillover of construction operations onto adjacent property, roadways, and waterways. This shall include, but not be limited to, dust, mud, trash, night lighting, diesel fumes, petroleum products used to fuel/lubricate construction equipment, and any environmentally hazardous material.

The Contractor shall comply with all Federal, State and Local laws and regulations controlling pollution of the environment. It shall take appropriate or necessary precautions including, but not be limited to, those measures shown on the storm water pollution prevention plan (SWP3), to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

The Contractor shall submit a written proposal on specific environmental pollution control methods and measures to be employed. Work shall not commence until methods have been submitted and accepted by the Commission.

B. Dust Control

Dust control shall apply to all construction operations and materials that may become airborne as particulate matter. Such operations shall include, but not be limited to, earthwork, drilling, blasting, and any vehicular traffic related to the Project.

In the event a dangerous or unacceptable dusting situation occurs, the Commission has the option to either:

1. Direct the Contractor to immediately remedy the situation to the Chief Engineer's acceptance; or

2. Shut down the Contractor's operations and have the remedial Work performed by others, at the Contractor's expense; or

3. Shut down the Contractor's operations until an acceptable condition exists.

No extension of time shall be allowed, nor shall additional compensation to be paid for shut down required under the terms of this provision.

C. Mud Control

The Contractor shall include in its environmental pollution control proposal and/or SWP3 a plan for removal of mud on vehicles leaving the construction site. This proposal shall also include an action plan for cleaning of public roads and/or storm drains should mud and/or dirt be deposited on the roads by vehicles, erosion, or any construction activity.

D. Trash Control

The Contractor shall include in its environmental pollution control proposal and/or SWP3 a plan for containing trash on site, trash disposal methods on site, if permitted by law, and off-site disposal hauling schedule.

E. Lighting Control

All lighting for night operations shall be in accordance with SP 106. Night lighting shall be shielded from direct illumination of adjacent residences and the traveling public. Should night operation be anticipated, illumination control measures shall be included in the environmental pollution control proposals.

F. Diesel Fume Control

The Contractor shall minimize generation of diesel fumes by using the highest-grade diesel fuel available and keeping equipment in good operating condition through a documented preventive maintenance program. Documents for diesel fuel purchases and maintenance program shall be made available within one (1) day of request to Inspectors to verify compliance.

Any piece of equipment generating excess visible exhaust after a half-hour warm-up period is subject to being shut down by Inspectors until condition is corrected. No extension of time nor additional compensation will be paid for such a shut down.

G. Measurement and Payment

Environmental pollution control measures will not be measured or paid for separately, but are considered incidental to the normal construction activity being performed.

SP 113 **NOT USED**

SP 114 EXISTING AND PROPOSED GUARDRAIL

In the event that guardrail elements have been damaged as a result of traffic impacts during the duration of this Project, or as directed by the Chief Engineer, the Contractor shall provide additional guardrail elements including installation and maintenance of traffic. Payment shall be in accordance with the appropriate guardrail items and Article 7 of the General Conditions. This shall include guardrail which is designated as rebuilt in the Plans and all other guardrail panels, posts, end sections and terminals located within the limits of the Project.

SP 115 NOT USED

SP 116 FURNISHING RIGHT OF WAY/UTILITY RELOCATIONS

The Commission will be responsible for the securing of all necessary rights of way in advance of construction. Any other exceptions will be indicated in the Contract.

Utility relocations are not expected to begin prior to the notice to proceed to be issued for this Project and are expected to occur on an as needed basis during the course of the Work. All utilities marked on the approved Plans, as relocated “By Others” will be relocated by the Utility Owner. All expense involved with relocating such utilities shall be borne by the Utility Owner. All utility relocations required for the convenience of the Contractor will be coordinated and paid for by the Contractor. The Contractor and Utility Owners are requested to cooperate by arranging its Work in such a manner that inconvenience to either will be held to a minimum.

SP 117 FIBER OPTIC CABLES

(09-11-19)

CenturyLink

A CenturyLink fiber optic cable is buried adjacent to the right-of-way fence of the westbound roadway and is encased underground at mainline structures as shown on the Plans. Extreme care must be taken by the Contractor to preserve and protect this cable during all phases of construction. Special care shall be exercised during outside shoulder repair and improvements to drainage outlets. Any excavation in this area for any reason is not to be performed without CenturyLink first locating the cable. After the cable has been located by CenturyLink, the Contractor shall excavate to within twelve inches (12”) of the cable depth as provided. A CenturyLink representative will then hand dig to expose the cable.

A live CenturyLink fiber optic cable in a two inch (2”) diameter steel pipe is attached to the existing mainline bridge parapets or beams in the area of parapet modifications as noted on the Plans. A CenturyLink representative shall remove the conduit attachment clamp hardware from the existing parapet prior to any parapet removals. Extreme care shall be taken including supporting and maintaining conduit at its present location during all the Contractors operations as to not damage the fiber optic cable. After completion of the Work, the CenturyLink representative shall attach the cable to the reconstructed parapet.

The existing "as built" Plans of the cable installation are included in the Plans for the Contractor's information.

CenturyLink shall be notified a minimum of two (2) days prior to any excavation over its lines and/or locating the cable or any Work in the vicinity of the cable.

The following shall be contacted for locating the cable:

Doug Holloway;
Office: (216) 426-6010
Mobile: (216) 906-6284

SP 118 **NOT USED**

SP 119 **NOT USED**

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SP 120A CONSTRUCTION SCHEDULE, WITH RESOURCE LOADING

(3-13-2017)

A. **General.** The Construction Schedule required for this project is the Critical Path Method Schedule ("CPM Schedule") prepared and accepted in accordance with GC Article 4.2. The intent of this specification is to provide the supplemental requirements elaborating on the specifications for the paper and electronic formats of the Construction Schedule pursuant to GC 4.3. These specifications also detail the applicable requirements to substantiate an extension of time request and the methodology for calculating the length of any time extensions that are approved by the Chief Engineer in accordance with GC 6.2.

B. **Schedule Representative.** The Contractor shall designate a Schedule Representative who shall be responsible for coordinating with the Commission during the preparation and maintenance of the Construction Schedule.

C. **Construction Schedule.** The Construction Schedule will be in CPM Schedule format and as described below.

1. Schedule Requirements. Submit a .xer file prepared in Primavera P6 software manufactured by Oracle, with the layout file submitted as well. The files shall be saved in v7.0 format using the applicable filenames set forth in Table 1 below. The Commission will "Import" or accept progress schedule files from the Contractor. All Calendars assigned to activities must be project level Calendars not Global or Resource Calendars; all Activity Codes shall be project level and not Global or EPS level Activity Codes; and no Project Codes shall be assigned.

Table 1 – Schedule Filename Convention
PPPPPP – Project Number

Progress Schedule	1st Submission	2nd Submission	3rd Submission
Interim Schedule	PPPPPP1IS	PPPPPP2IS	PPPPPP3IS
Baseline Schedule	PPPPPP1B	PPPPPP2B	PPPPPP3B
Schedule Update #1	PPPPPP1SU1	PPPPPP2SU1	PPPPPP3SU1
Schedule Update #2	PPPPPP1SU2	PPPPPP2SU2	PPPPPP3SU2
Delay Analysis	PPPPPP1TIA1	PPPPPP2TIA1	PPPPPP3TIA1
Weather Delay Analysis	PPPPPP1WD1	PPPPPP2WD1	PPPPPP3WD1
Recovery Schedule	PPPPPP1RS1	PPPPPP2RS1	PPPPPP3RS1

Provide a Workday schedule that shows the various activities of work in sufficient detail to demonstrate a reasonable and workable plan to complete the Work for all Interim Milestone, Substantial and Final Completion Dates (hereinafter "Completion Dates") defined in SP 103. Workday shall be defined as a calendar day that the Contractor normally works. Show the order and interdependence of activities and the sequence for accomplishing the Work. Describe all activities in

sufficient detail so that the Commission representative can readily identify the Work and measure the progress of each activity. The Construction Schedule must reflect the scope of work, required phasing and maintenance of traffic requirements to complete the Work for each Completion Date. Include activities for Shop Drawing and other submittal review and approval, fabrication review and review of mark-up Work, product review and procurement, fabrication, shop inspection and delivery including without limitation lead time, coordination drawing delivery, Punch List, Punch List correction, Project close-out requirements, Contract Completion and occupancy requirements.

The Contractor shall be responsible for assuring all Work, including all subcontractor Work, is included in the Construction Schedule. The Contractor shall be responsible for assuring that all Work sequences are logical and that the Construction Schedule indicates a coordinated plan.

Failure by the Contractor to include any element of Work required for performance of the Contract shall not excuse the Contractor from completing all Work within the required time. The Commission representative review of the Construction Schedule will be for compliance with the specifications and contract requirements. Acceptance of the Construction Schedule by the Commission representative will not relieve the Contractor of any of their responsibilities for the accuracy or feasibility of the Construction Schedule. Omissions and errors will be corrected as described in Section G and will not affect contract time.

Each Construction Schedule shall also provide the following:

a) Administrative Identifier Information:
   i. Project Number
   ii. County
   iii. Contract Signed Date
   iv. Completion Date
   v. Contractor's Name
   vi. Contractor's Dated Signature
   vii. Commission's Dated Acceptance Signature

b) Project Activities:

   i. Activity Identification (ID). Assign each activity a unique identification number. Activity ID length shall not exceed 10 characters. Once accepted, the Activity ID shall be used for the duration of the project.

   ii. Activity Description. Each activity shall have a narrative description consisting of a verb or work function (e.g.; form, pour, excavate) and an object (e.g.; slab, footing, underdrain).

   iii. Activity Original Duration. Assign a planned duration in working days for each activity. Do not exceed a duration of 15 Workdays for any construction activity. Do not represent the maintenance of traffic, erosion control, and other similar items as single activities extending to the Completion Date. Break these Contract Items into component activities in order to meet the duration requirements of this paragraph.

   iv. Activity Calendar. Each activity shall be assigned a calendar in the schedule that defines only those days as Workdays as those which the Contractor ordinarily anticipates performing the activity. This would include both the number of days worked per week and the specific days

on which the Contractor anticipates working the activity. For example, if a Contractor anticipates working an activity four days per week, then the calendar in the schedule would show four Workdays. If the Contractor anticipates working on an activity only on the weekend, the Contractor would show only Saturday and Sunday as Workdays in the schedule. The Contractor shall provide a list of the calendars for each activity with its initial schedule submission and an explanation of each of the calendars Workdays.

v. Activity Relationships:
- All activities, except the first activity, shall have a predecessor(s).
- All activities, except the final activity, shall have a successor(s).
- Use only finish-to-start relationships with no leads or lags to link activities, or use start-to-start relationships with lags no greater than the predecessor duration to link activities.
- Use of finish-to-finish relationship is permitted when both activities are already linked with a start-to-start relationship.

c) Project Milestones:

i. Start Project: The Contractor shall include as the first milestone in the schedule, a milestone named “Notice to Proceed.” The date used for this milestone is the date the Notice to Proceed is issued by the Commission.

ii. End Project Milestone: The Contractor shall include as the last activity in the project schedule, a milestone named “End Project Milestone” representing the date scheduled to achieve Final Completion. The date used for this End Project Milestone is considered the project completion date.

iii. Start Milestones: The Contractor shall include Start Milestones for all Construction Access and Recommencement dates defined in SP 103. The Start Milestones shall be labeled as shown in SP 103. The Contractor may include additional Start Milestones but, as a minimum, must include all contractual milestones established in SP103 for commencing phases of the Work.

iv. Finish Milestones: The Contractor shall include Finish Milestones representing the date scheduled to achieve all Interim Milestones and Substantial Completion defined in SP 103. The Finish Milestones shall be labeled as shown in SP 103. The Contractor may include additional Finish Milestones, but at a minimum contractual milestones defined in SP103 for completing the phases of the Work.

v. For multi-season projects, it is the intent of the Commission that the second season recommencement will occur on the date specified in SP 103 even if there are time extensions granted to the first season interim milestones. As a result of this, the first season’s Substantial Completion Interim Milestone shall be only tied to the second season Construction Recommencement Milestone with a finish-to-start relationship with zero lag.

d) Level of Effort Activities: Use level of effort activities to show the duration of specified contract Work periods, phases and lane closures. The level of effort activity type is allowed to have a start-to-start relationship with the first activity

in a series of activities and a finish-to-finish relationship with the last activity in a series of activities.

e) Constraints: Use constraints sparingly in the schedule. If constraints are used, use only Early Constraints or Late Constraints.

f) Calendars: The Contractor shall identify their proposed work hours and calendars. Weather, seasonal (winter) and environmental shutdown periods shall be shown using non-work calendars. The activity can be assigned to a calendar indicating time periods of non-work. These custom calendars can be created to show days, weeks, or months of non-work. Weather and Seasonal Conditions, as shown in Table 2, shall be evenly dispersed into each respective month in the Construction Schedule calendars as non-work days, and be included in the planning and scheduling of all Work. The days specified as Weather and Seasonal Conditions in the calendars shall occur on regular days of Work on which Work is otherwise progressing on the critical path. All calendars developed by the Contractor shall be established as Project Calendars, with the calendar name including the project year, project number and describing the function (i.e. 120345 – 5 day workweek, 120345 – earthwork, 120345 – structures, 120345 – asphalt). No Global Calendars shall be incorporated into any progress schedule submission. The Section in Table 2 that is applicable to the Project and utilized when considering requests for extension of time due to weather or seasonal conditions is established by the Ohio Turnpike mileposts within which the majority of the Work takes place as follows:

West Section - Milepost 0.00 to Milepost 100.00
Central Section - Milepost 100.00 to Milepost 190.00
East Section - Milepost 190.00 to Milepost 241.26

Table 2 – Weather and Seasonal Conditions

Month	Anticipated Workdays Lost		
	West Section	**Central Section**	**East Section**
January	6	10	9
February	6	8	8
March	6	8	7
April	5	7	6
May	5	6	6
June	4	5	5
July	4	5	5
August	4	4	4
September	4	5	5
October	4	5	5
November	5	7	6
December	6	9	9

g) Resources: The Contractor shall identify the total resource hours for each activity in the schedule and shall provide the Contractor's resource loading curves in media and format required by the Commission representative.

h) Activity Codes: The Contractor shall, at a minimum, include Project Activity Codes for Area, Phase, and Responsibility for each activity. Work Breakdown Structure is permitted, but not required. No Global Activity Codes shall be incorporated into any progress schedule submission.

i) Schedule Options: The schedule may only be calculated using retained logic. Show open ends as non-critical. Schedule durations are to be contiguous. Total float shall be calculated as finish float. Ignore relationships to and from other projects.

2. Submission Requirements. Submit all schedules within the time frames specified. Submit the schedule and information in electronic file format. Submit the following information along with the electronic back-up of the schedule data:

a) A hard copy of the baseline schedule in CPM format including the Administrative Identifier Information discussed in Section C.1.a on the first page of the schedule. For each activity on the schedule, indicate the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Start Date, Finish Date, and Calendar ID. Use arrows to show the relationships among activities. Identify the critical path of the project on the Gantt Chart (bar chart) in red. The critical path is defined as the longest path of activities in the project that determines the End Project Milestone. The activities that make-up the critical path of activities are the "Critical Activities."

b) A hard copy of the Six Week Look Ahead Schedule in CPM format. This schedule will have all the requirements of the baseline schedule in Gantt Chart (bar chart) format except that it shall be limited to those activities that have an early start or early finish within a six week period of the data date.

c) A complete Scheduling/Leveling Report (SCHEDLOG.TXT file generated by the Primavera scheduling software application) which includes Schedule Settings, Statistics, Errors, Warnings, Scheduling/Leveling Results, Exceptions, Activities with unsatisfied constraints, Activities with unsatisfied relationships, and Activities with external dates. The statistics shall include, number of Activities, number of Activities Not Started, number of Activities In Progress, number of Activities Completed, number of Activity Relationships, and number of Activities with Constraints. Total number of activities on the critical path, percent complete, activities without predecessors, activities without successors, and activities out of sequence.

D. **Float.** Use of float suppression techniques, such as preferential sequencing (arranging critical path through activities more susceptible to Commission caused delay), lag logic restraints, zero total or free float constraints, extending activity times, or imposing constraint dates other than as required by the contract, shall be cause for rejection of the Construction Schedule or its updates.

1. Definition of Float: Float is the length of time along a given network path that the actual start and finish of activity(s) can be delayed without delaying the completion of the Work required to achieve a Completion Date.

2. Ownership of Float: The Construction Schedule shall be used as a tool for scheduling and reporting sequenced progress of the Work using Start, Finish and End Milestone dates occurring before the Interim Milestone and Completion dates established in SP103. Float is a resource of the Project and the use of Float associated with an activity is not permitted without the concurrence of the Chief Engineer. Efficiencies gained as a result of favorable weather within a calendar month, where the number of days of normally anticipated weather is less than expected, will also contribute to the Float. A Construction Schedule showing portions of the Work being completed in less time than the respective dates established in SP103, and accepted by the Commission, will be considered to have Float. No time extensions will be granted unless a delay occurs which impacts the

project's critical path, consumes all available Float and extends the Work beyond a Completion Date.

3. Negative Float: Negative float not associated with an eligible delay will not be a basis for requesting time extensions. Any extension of time will be addressed in accordance with Sections G and H. Scheduled or actual Work that extends beyond the relevant contract Interim Milestone (or phase) or Completion Date(s) may be used in computations for assessment of Liquidated Damages. The use of this computation is not to be construed as an order by the Commission to accelerate the Work.

E. **Monthly Update.** Each month the progress shall be updated from the prior data date to the current data date. Work added and/or excusable delays encountered since the prior data date must be represented as a schedule revision as described in Section F.

1. Update Requirements. On the fifth day of each month, during the term of the contract, submit an updated schedule and all required information with a data date of the last day of the preceding month. Submit the monthly updated bar chart on paper and a copy of the updated schedule in electronic format per Section C.2. The Commission representative shall “accept” or “reject” the schedule update within 5 days of receipt of the updated CPM Schedule. For each updated schedule, identify the actual start and finish dates for all completed activities and the actual start date and remaining duration for all activities in progress. Correct out-of-sequence progress listings generated by the Scheduling Statistics Report on the critical path. The project schedule shall be reviewed at each monthly progress meeting. Any corrections shall be made prior to the next monthly progress meeting.

   Submit the following with each updated schedule:

   i. A hard copy of the updated schedule in CPM format signed by the Contractor.

   ii. A hard copy of the Six Week Look Ahead Schedule in CPM Format

   iii. Provide a written narrative that identifies any changes or shifts in the critical path and submit reasons for the changes or shifts in the critical path.

   iv. A complete Scheduling/Leveling Report (SCHEDLOG.TXT) file generated by the Primavera scheduling software application.

   v. A hard copy or .pdf of the Claim Digger Report (generated by the Primavera Software application) providing a comparison between this updated schedule and the previous Monthly Updated Schedule.

   vi. Electronic files of the foregoing (formatted as described above)

2. Early Completion Schedule. An Early Completion Schedule is defined as an updated schedule submitted by the Contractor in which the End Project Milestone precedes the Final Completion Date established in SP103. If after incorporating necessary revisions in accordance with Section F, the End Project Milestone precedes the Final Completion Date by at least the number of days shown in Table 3 the Chief Engineer will initiate a Change Order amending the Final Completion Date to the End Project Milestone shown on the accepted Early Completion Schedule. The amended Final Completion Date will be effective upon execution of that Change Order and all contract provisions concerning the Final Completion Date such as incentives, disincentives, excusable delays, compensable delays,

and Liquidated Damages will be measured against the amended Final Completion Date.

The Contractor may elect not to execute the Change Order amending the Completion Date; however, in so doing, the Contractor waives its rights to delay damages in meeting the projected early End Project Milestone, and agrees that the time between the End Project Milestone and the Final Completion Date is used as Float.

Table 3 – Early Completion Dates	
Original Project Duration	**# Days Prior to Contract Completion**
One year or less	30
One year to two years	60
Two years or more	90

3. Late Completion Schedule. A Late Completion Schedule is defined as an updated Construction Schedule submitted by the Contractor in which a Finish Milestone or End Project Milestone exceeds the respective Interim Milestone or Completion Date established in SP103. In the event a Finish Milestone or End Project Milestone is more than 10 days beyond the respective current Interim Milestone or Completion Date and a schedule revision is not warranted, the contractor must proceed with submitting a recovery plan for acceptance in accordance with subparagraph GC 4.3.6.1.

F. **Revisions.** The Work may require and/or the Contractor may make revisions to the Construction Schedule. Addition of new activities or new calendars or changes to existing activities, calendars or logic constitute a revision. All revisions must be reported in narrative form on a cover sheet accompanying the monthly update schedule. Any revision which modifies the critical path or impacts a date for achieving a Finish Milestone, an End Project Milestone, an Interim Milestone, or Substantial or Final Completion must be represented on a companion schedule submitted with the monthly update schedule or as a fragnet within the monthly update schedule. A fragnet is defined as the sequence of new activities that are proposed to be added to the existing schedule. The fragnet shall identify the predecessors to the new activities and demonstrate the impacts to successor activities. If submitted as a fragnet, the Contractor shall compute two Finish Dates for the impacted Milestone Date. The first Finish Date shall be computed without consideration of any impact by the fragnet. The second Finish Date shall be computed with consideration of any impact by the fragnet. The Contractor shall also submit a written narrative stating the reason for the proposed revisions. The Commission representative shall recommend that the Chief Engineer “accept” or “reject” proposed revisions within 10 days of receipt of appropriate report, schedules and narrative. All accepted revisions will be incorporated into the updated Construction Schedule.

G. **Time Extensions for Delays in Accordance with Article GC 6 with the Exception of Weather in Subparagraph GC 6.2.1.3.** The Work may require and/or the Contractor may request an extension of an Interim Milestone or Substantial or Final Completion Date. The Contractor shall perform the following to fulfill the required Time Impact Analysis necessary to request and compute the duration of the requested time extension under CG Article 6. Submit two paper copies and two electronic copies of each analysis performed as follows:

1. Determine project progress prior to circumstance(s) necessitating the time extension. The previous accepted monthly update, updated to the date of the

circumstance alleging to have caused delay, shall be used to display the prior progress of the project. This schedule is referred to as the Un-impacted Schedule

2. Prepare a fragmentary network (fragnet) depicting the circumstance that is believed to have delayed the project.

3. Insert the fragnet into the Un-impacted Schedule, run the schedule calculations and determine the finish date. This schedule is referred to as the Impacted Schedule.

4. Compare the Impacted Schedule's Finish or End Project Milestone dates with the Un-impacted Schedule's respective Finish or End Project Milestone date in order to determine the duration of any warranted time extension. All Finish and End Project Milestone dates shall be evaluated separately for time extensions and any time extensions granted shall apply only to the dates the analysis shows to be impacted. No time extensions will be granted unless a delay occurs which impacts the project's critical path, consumes all available Float and extends the Work beyond the current Interim Milestone or Completion dates.

5. Submit the Impacted Schedule with the request for time extension. Include a narrative report describing the effects of new activities and relationships to Interim Milestone and Completion dates. All approved time extensions will be incorporated into the monthly update with the fragnet used to determine impacts incorporated into the schedule.

H. **Time Extensions for Delays Due to Weather in Accordance with Subparagraph GC 6.2.1.3.** The Contractor may request and/or the Chief Engineer will determine an extension of any Interim Milestone or Completion date due to weather days exceeding those within each respective month described in Table 2. The Contractor shall perform the following to fulfill the required Time Impact Analysis necessary to request and compute the duration of the time extension under GC Article 6. Submit two paper copies and two electronic copies of each analysis performed as follows:

1. The previously accepted monthly update shall be used to display progress of the Work and planned activities for the next 30 day period that incurred weather days. Make a copy of the schedule file to use for the analysis. This schedule is referred to as the Non-weather Schedule.

2. Prepare a list of actual weather days believed to have delayed the Work and the activities that were impacted.

3. Utilizing the calendar(s) of those impacted activities, remove any planned weather days.

4. Insert the actual weather day(s) into the calendar(s) for the planned Work as a non-work day. Run the schedule calculations and determine the relevant Finish or End Project Milestone date. This schedule is referred to as the Weather Schedule.

5. Compare the Weather Schedule's Finish or End Project Milestone date with the Non-weather Schedule's respective Finish or End Project Milestone date in order to determine the duration of any warranted time extension. All Interim Milestone and Completion Dates shall be evaluated separately for time extensions and any time extensions granted shall apply only to the dates the analysis shows to be impacted. No time extensions due to weather will be granted unless a delay occurs which reduces production of Work on the critical path by more than fifty (50)

percent, consumes all available Float and extends the Work beyond the current Interim Milestone or Completion Date.

6. Submit the weather schedule with the request for time extension on a monthly basis. Include a narrative report describing the effects of weather days to Interim, and Final Completion dates.

I. **Basis of Payment.** The Critical Path Method Progress Schedule will not be measured or paid for separately, but is considered incidental to the Contract.

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SP 202 PORTIONS OF STRUCTURE REMOVED

(10/20/2016)

A. Description

This Item shall consist of furnishing the necessary labor, material and equipment to remove and dispose of the portions of structure as required for the specified reconstruction of the existing bridges excluding portions of the structure to be removed under other Items in the Contract and cleaning existing beams of all cement paste residue resulting from the Contractor's removal operation. All applicable provisions of Section 202 of the Specifications shall apply.

The Contractor shall remove the designated portions of the existing bridge to the limits shown on the Plans, specified in the Specifications or to the limits directed by the Chief Engineer. Portions of the structures to be removed shall include but not necessarily be limited to the following:

1. Bridge deck slab, abutment slabs, parapet, fence and all other miscellaneous items indicated in the Plans.

2. Deck expansion joints including specified support members as indicated on the Plans.

B. Concrete Removal

During removal operations, the Contractor shall make full provisions for maintenance and protection of vehicular traffic under and adjacent to the bridge. Reference Special Provision SP 527 – “Falsework, Temporary Bracing and Protective Structures” for the requirements to prevent falling debris.

The Contractor shall saw cut the perimeter of the area of concrete to be removed. The minimum saw cut depth shall be one (1) inch. The Contractor shall make provisions to not saw cut through reinforcing steel that is to remain.

The concrete deck slab, parapets, and abutment slab shall be saw cut and removed in sections with the following restrictions:

1. Before any sawing is commenced, the outlines of the top flanges and cover plates of all stringers shall be drawn on the bridge deck and one (1) inch ± diameter pilot holes made to the outside of these lines to confirm the width of the flanges. Pilot holes shall be drilled to the outside of the stringers at each saw cut location. In no case shall pilot holes be drilled over the beam flanges.

2. The saw cut longitudinal over the beam shall be limited to a maximum depth of one and one-half (1½) inches. Sawing outside the fascia beam (sawing of the parapet) shall be stopped two (2) inches ± outside the confirmed limits of the beam flanges or cover plates.

3. The Contractor’s removal procedure as well as its general sawing pattern shall be subject to the approval of the Chief Engineer. The Contractor’s removal procedure shall be submitted in accordance with Article 14 of the General Conditions.

4. Pneumatic hammers may be used in the beam areas if the operation is observed and approved by the Chief Engineer, and then only to a depth not penetrating the lower reinforcing steel mat. The Chief Engineer has the right to terminate hand sawing or hammering over the flanges any time

the Chief Engineer feels the bridge integrity is in jeopardy or damage to the reinforcing steel or flange (cover plate) is imminent. Pneumatic hammers used for this operation shall not be heavier than thirty-five (35) pounds.

5. The use of hydraulic or pneumatic hoe-rams or shears to line punch a section of the deck in lieu of, or in combination with a saw cutting operation or for the removal of the concrete deck slab, abutment slabs, parapets, and adjacent support areas is prohibited with the exception of the following and only with specific approval by the Chief Engineer.

   These conditions are as follows:

   a. Punching through the deck to provide lifting holes for total slab removal.

   b. Limited localized areas on the concrete deck where sawing, including the vermeer saw, cannot practically make the complete cut.

Any damage that results from the Contractor's operations to the cover plates and/or flanges, or to the reinforcing steel to remain shall be repaired or corrected by the Contractor to the satisfaction of the Chief Engineer, all at the sole cost and expense of the Contractor.

Other concrete shall also be removed by means of approved pneumatic hammers employing pointed and blunt chisel edged tools. The weight of the hammers shall be not more than thirty-five (35) pounds for removal within eighteen (18) inches of portions to be preserved. Outside the eighteen (18) inch limit, a hammer heavier than thirty-five (35) pounds, but not to exceed ninety-five (95) pounds, may be used subject to approval of the Chief Engineer.

Pneumatic hammers shall not be placed in direct contact with reinforcing steel that is to be retained in the rebuilt structure. Where bond between existing concrete and reinforcing steel that is to be retained has been destroyed, the unbonded concrete adjacent to the bar shall be removed to a depth which will permit new concrete to bond to the entire periphery of the bar so debonded. A minimum of one and one-half (1½) inch clearance around the perimeter of the steel shall be provided.

Existing reinforcing steel, which is cut flush to a concrete removal surface and is not to be covered with new concrete, shall be recessed a minimum of one (1) inch (1”) below the surface of the concrete. The resulting hole shall be filled with a non-shrinking, non-metallic epoxy mortar meeting the requirements of CMS 705.20. Other existing reinforcing steel shall be cut and/or retained as indicated in the Plans or as directed by the Chief Engineer, to serve as dowels in the rebuilt structure. These bars shall be cleaned of all concrete fragments and foreign matter. Necessary labor, equipment and material required to cut and clean existing reinforcing steel and to recess existing reinforcing steel below the surface of concrete and to grout fill the resulting hole shall be provided by the Contractor and shall be included with Item SP 202 - Portions of Structure Removed, for payment.

Care shall be used in working around reinforcing steel. Any reinforcing steel damaged during concrete removal shall be replaced by the Contractor at no additional cost to the Commission. Special care shall also be used in working adjacent to superstructure steelwork. Any structural steel or paint damage shall be repaired by the Contractor at no additional cost to the Commission.

When so directed by the Chief Engineer, the Contractor shall wet down concrete thoroughly during removal operations to prevent spread of dust. All necessary labor, equipment and material shall be provided by the Contractor and included with Item SP 202 - Portions of Structure Removed, for payment.

If any section loss of the existing structural steel as determined by the Chief Engineer is uncovered during removal of the existing deck, the Contractor shall repair the affected area as directed by the Chief Engineer. Payment for this repair work when directed by the Chief Engineer shall be as provided under Article 7 of the General Conditions.

The use of explosives and headache balls are not permitted.

C. Construction Stresses

No part of the structure shall be subjected to unit stresses that exceed by more than one-third ($^1/_3$) the allowable unit stresses, as given in AASHTO "Standard Specifications for Highway Bridges" due to erection, removal and construction methods, or to the use or movement of construction equipment onto or across the structure.

When equipment having a gross weight in excess of 40,000 pounds is to be placed on the structure and used for removal and construction purposes, structural analysis calculations by a Professional Engineer registered in the State of Ohio showing the stresses produced by the equipment and associated loads shall be submitted to the Chief Engineer at least forty-eight (48) hours prior to the Work for review and approval.

D. Disposal of Removed Material

All concrete, steel, reinforcing steel, etc., removed from the structure, unless otherwise specified, shall become the property of the Contractor and shall be promptly removed by him from the site according to the provisions of SP 105.

E. Protective Structures

Protective structures for catching falling debris and water from the demolition operation shall be in accordance with Special Provision SP 527 - "Falsework, Temporary Bracing and Protective Structures."

F. Basis of Payment

Portions of structures removed as specified and/or required by the reconstruction and cleaning of cement paste residue from existing beams shall be measured as a unit and shall be paid for at the Contract lump sum price bid. This price shall be payment in full for all material, equipment, labor and incidentals necessary to complete this Work.

Payment shall be made under:

Item	Unit	Description
SP 202	Lump Sum	Portions of Structure Removed

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SP 509 EPOXY COATED REINFORCING STEEL

(11-21-12)

This Item shall consist of furnishing and placing epoxy coated reinforcing steel of the quality, type, size and quantity designated. All sections of Section 509, Reinforcing Steel, of the Specifications shall apply, with the following exceptions and additions.

A. 509.03 Care of Material

All systems for handling coated bars shall have padded contact areas free of dirt and grit.

Coated bars, bundled for shipping and tagged for identification, shall have provisions for preventing bar-to-bar abrasion. Bundling bands shall be padded.

Bundled coated bars shall be lifted with a strong back, multiple supports of a platform bridge to prevent sagging abrasion.

Bars or bundles shall not be dropped or dragged.

Coated bars shall be stored prior to installation, on wooden or padded cribbing.

B. 509.08 Support

Delete 509.08 in its entirety and replace with the following:

The top and bottom mats of all longitudinal and transverse epoxy coated reinforcing steel shall be supported by approved epoxy coated or plastic coated devices with spacing not exceeding three (3) foot centers in each direction. Broken concrete, bricks, etc. shall not be used for support of epoxy coated reinforcing steel. Coated support devices shall have a shape that is easily enveloped by concrete.

C. 509.09 Epoxy Coated Reinforcing Steel

Delete 509.09 in its entirety and replace with the following:

Plastic coated or epoxy coated bar supports and tie wires shall be employed to protect the coating from physical damage during placement and to prevent electrical coupling between mats.

Bars shall be carefully handled and installed so that patching at the job site will be kept to a minimum. All damage shall be repaired in accordance with ASTM A 775, Section 12.4.

Where repair is required, the damaged areas shall be cleaned, repaired, and adequate cure time allowed before placing concrete.

D. Basis of Payment

Payment shall be made under:

Item	Unit	Description
SP 509	Pound	Epoxy Coated Reinforcing Steel, Grade 60

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SP 511B CLASS HP4 CONCRETE, FOR SUPERSTRUCTURES

(09-17-2018)

A. Description

This item shall consist of furnishing and placing Class HP4 concrete for the bridge superstructure, abutment slab and sidewalk, and Portland cement concrete using Type I cement for all parapets, in accordance with these Specifications, and in reasonably close conformity with the lines, grades, and dimensions shown on the Plans. All applicable provisions of Item 511 of the Specifications shall apply except as modified herein.

B. Materials

The cement for parapets shall conform to Section 701.04 (Type I) of the Specifications.

Admixtures used in the concrete mixture must be compatible and shall be dispensed in accordance with the manufacturer's recommendations. Admixtures shall be obtained from a single source. In all cases, admixtures shall be tested in trial mixtures with project materials and proportions under simulated ambient conditions.

The 703.02 coarse aggregate shall be crushed carbonate stone, and 703.02 fine aggregate shall be natural sand.

Adequate quantities of all materials, sufficient to complete the proposed pour, shall be on hand at the batch plant prior to all pours.

Course aggregate stockpiles shall be saturated. Saturation shall be completed a minimum of twenty-four (24) hours prior to use; however, the application of water by sprinkling shall continue as directed by the Chief Engineer.

C. Proportions

The following quantities per Cubic Yard shall be used:

Aggregate Type	Fine Aggregate (lb)	#8 Coarse Aggregate (lb)	#57 Coarse Aggregate (lb)	Total (lb)	Cement Content (lb)	GGBF Slag (lb)	Micro-silica (lb)	Water to Cement-itious Ratio +/- 0.02
Gravel	1245	360	1315	2920	400	170	30	0.42
Limestone	1245	360	1335	2940	400	170	30	0.42
Slag	1245	315	1155	2715	400	170	30	0.42

All coarse aggregate shall have an absorption of 1.00% or greater as defined per ASTM C127. The weights specified in the table were calculated for materials of the following bulk specific gravities (SSD): natural sand and gravel 2.62, limestone sand 2.68, limestone 2.65, slag 2.30, fly ash 2.65, GGBF slag 2.90, Microsilica solids 2.20, and Portland cement 3.15. For aggregates of specific gravities differing more than plus or minus 0.02 from these, the weights in the table shall be corrected.

D. Formwork

In addition to the requirements of the CMS, the Contractor shall provide an inspection walkway with a minimum width of 36 inches on at least one side of the superstructure in order for the inspectors to have inspection access to both the front and back of the finishing machine during placement and finishing of the deck concrete. Cost for meeting this requirement shall be considered incidental to superstructure deck concrete pay item.

E. Slump

Provide a maximum concrete slump of 8 inches at the placement site for Class HP4 concrete (if pumped - at the end of the pump line). Concrete using Type I cement shall conform to Section 499.03 of the Specifications.

F. Entrained Air

Class HP4 concrete shall contain seven (7) +/- two (2) percent of entrained air at the time and place of concrete placement (if pumped - at the end of the pump line). Concrete using Type I cement shall contain six (6) +/- two (2) percent of entrained air at the time and place of concrete placement.

G. Concrete Delivery

On the day of the placement, the Contractor shall perform a “refresher” placement meeting to be attended by the complete work crew involved in the concrete placement to review the procedures for the concrete placement as outlined at the Pre-Placement meeting. The Chief Engineer and/or its representatives shall be present at this meeting. At the conclusion of the “refresher” meeting, the Chief Engineer will contact the ready-mix plant to approve release of the concrete for placement. No concrete will be accepted on-site without the Chief Engineer’s release. The ready-mix plant dispatcher is to document the name of the Chief Engineer or its representative and the time of the release on the initial batch slip.

H. Placing Concrete

The Contractor shall submit, for approval, the method of placing concrete and the location of all equipment. The Contractor shall have a representative of the concrete supplier on the Project site at each placement. If concrete is to be placed by pumping, a spare or backup pumper shall be required. Spare or backup vibrator, generator, water pump, extension cord, and any other equipment required to place concrete shall be required.

The Contractor shall designate an individual who will be responsible for the entire operation of the pour and make that person known to the inspectors and testing lab.

Prior to any concrete being placed, it shall be tested for slump and air upon arrival at the site, and at the point of placement (end of pump line if used). The first three (3) truckloads, at a minimum, shall be tested in this manner to establish consistency and amount of slump and air loss, permitting batching out of specification to ensure specification concrete at the point of placement. After consistency is established, each load of concrete will continue to be tested for slump and air but only at the point of placement. Any concrete placed without this testing is subject to removal.

Prior to placing concrete, the forms and rebar must be cleaned of all mud, dirt, loose tie wires, ceramic stud welding disks, and debris. Throughout the concrete placement, the forms and rebar must be kept clean by a constant effort of the Contractor. No debris, including cigarette butts, dried concrete, mud, etc., shall be deposited in the placement area.

Tie wire must be installed in such a manner that concrete cover on the tie wire is the same as concrete cover on rebar.

All superstructure concrete required for side road or ramp structures over the Turnpike shall be placed from the local road or ramp. Pumping of the concrete from Turnpike roadways will not be permitted unless specifically approved by the Chief Engineer. Concrete pumpers shall be set up in such a manner as to prevent excess free fall of concrete in the pump lines. If the flow of concrete through the pumper hose is stopped, the end of the hose shall be buried in the concrete to prevent the hose from emptying. Pumpers shall be repositioned if so directed by the Chief Engineer to prevent excess free fall. Pumpers, booms and pump lines must never be directly over Turnpike roadway.

Full four feet (4') by eight feet (8') plywood sheets shall be placed under pump lines to protect epoxy coating and ties on rebar. Metal pump lines and pump line couplings must never come in contact with rebar. Double tying of rebar under plywood sheets to prevent slippage of rebar shall be required.

The deck formwork, beam flanges, abutment subgrade, and reinforcing shall be thoroughly sprinkled prior to placement of the concrete.

Cleaning of hand tools by banging or tapping on the rebar is prohibited.

The Contractor shall protect the Turnpike traffic from splashing concrete, falling debris, and dripping water, at all times, in accordance with Special Provision SP 527 – "Falsework, Temporary Bracing and Protective Structures". Also, in accordance with SP 527, the Contractor shall provide plastic sheeting or other approved material to control water used for concrete placing and curing from falling on Turnpike roadways.

I. Curing and Loading – General

Storage tanks for curing water shall be on site and filled before a placement will be permitted to start. Storage tanks shall remain on site throughout the entire cure period. They shall be replenished, as required, with a shuttle tanker truck or a local water source such as a fire hydrant. Care shall be taken to avoid thermal shock or excessively steep thermal gradients due to the use of cold curing water. Curing water shall not be more than twenty (20)^{o} F cooler than the concrete, because of surface temperature stresses which could cause cracking.

In no case shall the curing time be less than seven (7) days.

The Contractor shall protect the Turnpike traffic from dripping or streams of cure water in accordance with SP 527.

J. Curing – Concrete Decks, Abutment Slabs, Approach Slabs and Sidewalks

The top surface of the concrete shall be cured by 511.14 Method A, Water Curing followed by Method B, Membrane with the exception that two thicknesses of wet burlap shall be used in lieu of using a single thickness of wet burlap and polyethylene film. All other provisions of this section shall apply.

K. Curing – Parapets

Concrete parapets shall be cured by 511.14 Method B, Membrane utilizing ChemMasters Silencure–A or an equivalent equal.

L. Curing and Loading – All Other Concrete

All other concrete shall be cured by 511.14 Method A, Water Curing.

M. Surface Finish

All exposed surfaces of the parapets shall be rubbed and brushed immediately after the concrete has obtained its initial set, enough to remove the forms without damaging the freshly poured concrete. Immediately after the parapets are rubbed they shall have the membrane sealer applied as required in Section J.

All exposed surfaces of the parapets, and vertical faces of deck edges shall have a rubbed finish in accordance with Section 511.15 of the Specifications.

Finishing aids, including monomolecular films, will not be permitted.

N. Pre-Placement Meeting

A pre-placement meeting shall be scheduled after review and approval of the Contractor's submitted placement procedures and prior to each major placement.

O. Pre-Placement Testing

In coordination with the Chief Engineer and the Testing Lab, the supplier shall batch a minimum of four (4) cubic yards of Class HP4 concrete, to be used for pre-placement laboratory testing and placing a test slab. The concrete shall be delivered to the job site or a location in close proximity to the job site to simulate job conditions, as directed by the Testing Lab and the Chief Engineer. In conjunction with the laboratory testing, the concrete shall be placed as a test slab in forms provided and installed by the Contractor on a base prepared by the Contractor as designated by the Chief Engineer. The test slab shall be a minimum of 20' x 10' x 6" unless otherwise directed by the Chief Engineer. The slab shall be cured in accordance with Sections H and I of this Special Provision. It shall then be used for testing the setup of the groove machine in accordance with Section P of this Special Provision. Then, at the direction of the Chief Engineer, the test slab shall be removed and disposed of offsite by the Contractor unless otherwise waived by the Chief Engineer. The cost for complying with this requirement shall be in accordance with "Basis of Payment."

Slump, air, and temperature shall be checked upon arrival at the site and twenty (20) minutes after site arrival. As directed by the Testing Lab, additional four (4) cubic yard batches shall be provided by the supplier until the concrete meets slump, air, and temperature requirements.

P. Concrete Test Specimens

On all structures, six (6) test cylinders will be made from each fifty (50) cubic yards, or fraction thereof, of concrete that is incorporated into the Work.

From the six (6) test cylinders, a seven (7) day compressive strength shall be determined from one (1) cylinder. At twenty-eight (28) days, three (3) cylinders

are to be tested and the average compressive strength recorded and defined as the "strength test." One (1) cylinder shall be held in reserve as a spare.

The remaining cylinders shall be used for determining when silane surface treatment may be applied to the new concrete surfaces in accordance with the requirements of SP 536.

When necessary, to permit early removal of falsework or opening to traffic of six (6) tons or less, five (5) concrete test beams shall be made and tested according to standard methods. Adequate beams shall be made in order to obtain an average modulus of rupture as required by Section 511.14 of the Specifications.

Methods of sampling, curing and testing concrete test specimens shall be in accordance with the "American Society for Testing Materials," applicable sections. All beams and cylinders shall be field cured in the same manner as the concrete it represents.

Responsibility of Contractor - To facilitate testing and inspection the Contractor shall:

1. Furnish any necessary labor to assist the designated testing agency in obtaining and handling samples at the Project, including, but not limited to, wheelbarrows, plywood runway, etc.

2. Wooden cure boxes shall be provided and maintained by the Contractor, for the sole use of the testing agency, unless other methods are specifically approved by the Chief Engineer, for safe storage and proper curing of concrete test specimens on the Project site for the first twenty-four (24) hours as required by "Method of Making and Curing Concrete Test Specimens in the Field" (ASTM C31).

No separate payment will be made to the Contractor for testing and/or sampling and any associated work will be considered incidental to the associated pay item.

Concrete used for slump and air tests, and excess concrete removed from the placement stream for sampling shall not be returned to the placement but shall be discarded.

Acceptance of Concrete - The strength level of the concrete will be considered satisfactory so long as the "strength test" equals or exceeds the specified strength.

Test results failing to meet the above requirements will be the basis for determining replacement of the concrete at the expense of the Contractor or a proportionate credit to the Commission.

Q. Bridge Deck Grooving

The provisions of 511.17 shall be followed, with the exception of the following: the test slab is to be used for testing the setup of the groove machine prior to commencement of the Bridge Deck Grooving on the deck slab. The surface of the deck slab, abutment slabs and approach slabs shall all be grooved. If necessary to complete the required grooving, the Contractor shall utilize a hand held or walk behind unit.

R. Method of Measurement

The quantity shall be measured as per Section 511.24 of the Specifications and shall include all labor, materials, equipment and incidentals necessary to complete this item of work. Concrete not meeting strength will not be accepted.

S. Basis of Payment

The payment shall be made at the Contract unit price bid for the following:

Item	Unit	Description
SP 511B	Cubic Yard	Class HP4 Concrete, Superstructure Deck Slab
SP 511B	Cubic Yard	Class HP4 Concrete, Abutment Slab
SP 511B	Cubic Yard	Class HP4 Concrete, for Pre-Placement Testing
SP 511B	Cubic Yard	Class S Concrete, Barriers and Parapets, Using Type I Cement

SP 516A CRACK REPAIR USING EPOXY INJECTION

(09-25-15)

A. Description

The Contractor shall furnish all labor, tools, equipment, materials, and incidentals required to repair cracks in existing concrete where shown on the Plans or directed by the Chief Engineer and as specified herein.

B. General

The locations of cracks to be repaired are shown on the Plans. The cracks shall be repaired using one of the following methods: epoxy adhesive and gel, non-shrink, non-metallic grout or polyurethane grout as described by the pay item.

C. Materials

1. Epoxy Adhesive

The epoxy adhesive shall be suitable for the rehabilitation of reinforced concrete, shall be insensitive to moisture before, during, or after cure, and shall be capable of being applied under normal or adverse conditions. It shall be a high strength, low viscosity, self-bonding, rapid curing, two (2) component mixture with each component containing one hundred (100) percent solids. The epoxy adhesive shall not shrink or expand after installation.

2. Epoxy Gel

The epoxy gel shall be used to seal the surface of the cracks prior to the injection of the epoxy adhesive. The epoxy gel shall be appropriate for the size of cracks involved and shall be compatible with the epoxy adhesive to be used. The epoxy gel shall be suitable for the rehabilitation of reinforced concrete, shall be insensitive to moisture before, during, or after cure, and shall be capable of being applied under normal or adverse conditions. It shall be suitable for horizontal, vertical, and underside-of-slab type applications. It shall be a high strength, low viscosity, self-bonding, rapid curing, two (2) component mixture with each component containing one hundred (100) percent solids. The epoxy gel shall not shrink or expand after installation.

3. Non-shrink, Non-metallic Cementitious Grout

A non-shrink, non-metallic, cementitious grout shall be used to repair cracks which are too large in thickness to be repaired using epoxy injection. The grout shall be pourable and shall not exhibit bleeding or segregation.

4. Polyurethane Grout

The polyurethane grout shall be suitable for the rehabilitation of reinforced concrete, shall be insensitive to moisture before, during, or after cure, and shall be capable of being applied under normal or adverse conditions. It shall be suitable for horizontal, vertical, and underside-of-slab type applications. It shall be high strength, low viscosity, self-bonding and rapid curing. The polyurethane grout shall not shrink after installation.

D. Surface Preparation

Cracks shall be cleaned to remove efflorescence or other contaminants that could prevent proper bonding of the grout to the concrete. Cleaning shall be done by flushing the crack with water or a cleaning solution recommended by the grout manufacturer. The crack should then be blown out and dried with compressed air. If injection holes are drilled along the crack, they shall also be cleaned to remove drilling residue.

E. Mixing

Mixing of the epoxy adhesive, gel and non-shrink grout components or polyurethane grout components shall strictly adhere to the specifications of the respective manufacturer.

F. Application

All installation requirements of the respective manufacturers shall be adhered to, particularly the requirements regarding the temperature of both the repair product and the concrete to be repaired. Entry ports shall be installed as required. Crack repairs shall be done at all times in the presence of the Chief Engineer.

1. Epoxy Adhesive and Gel

a. Epoxy Gel

Epoxy gel shall be applied according to the manufacturer's recommendations to seal the crack surface prior to epoxy injection. Gel surface shall be finished flush with the original concrete surface.

b. Epoxy Adhesive

After the crack surfaces have been properly sealed and cured and the entry ports installed, the epoxy adhesive shall be injected according to the manufacturer's recommendations to completely fill the cracks.

2. Non-shrink, non-metallic grout shall be applied according to the manufacturer’s recommendations.

3. Polyurethane grout shall be applied according to the manufacturer’s recommendations.

G. Curing

1. Epoxy Adhesive

Curing shall conform to manufacturer's recommendations.

2. Epoxy Gel

Curing shall conform to manufacturer's recommendations.

3. Polyurethane Grout

Curing shall conform to manufacturer's recommendations.

H. Manufacturer

1. Epoxy Adhesive

The epoxy adhesive material shall be "Sikadur Hi-Mod LV" as manufactured by Sika Chemical Company, or approved equal.

2. Epoxy Gel

The epoxy gel material shall be "Sikadur Gel" as manufactured by Sika Chemical Company, or approved equal.

3. Non-shrink, Non-metallic Grout

The grout shall be “Sika Grout 212” as manufactured by Sika Chemical Company or approved equal.

4. Polyurethane Grout

The polyurethane grout material shall be "Sikafix HH Polyurethane Grout" as manufactured by Sika Chemical Company, or approved equal.

I. Basis of Payment

Payment shall be at the Contract unit price bid for:

Item	Unit	Description
SP 516A	Lin. Ft.	Crack Repair Using Epoxy Injection

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SP 516G **REPLACE EXPANSION BEARING DEVICE**
(09/15/2015)

A. Description

This Work shall include furnishing all labor, material and equipment necessary to remove the existing expansion bearing devices and install new bearings. The Contractor shall perform the Work in such a manner as to not endanger the stability or integrity of the structure during the bearing replacement operations. Replacement rockers, when designated as the replacement bearing, shall be set so that they will stand vertically at the center of both the sole plate and masonry plate at a temperature of sixty (60)^{o} F. All applicable provisions Item 516 shall apply.

Replacement operations include but are not limited to the following:

1. Jacking and blocking beams to remove sole plate from bottom flange of beam.

2. Grinding the bottom flange of the beam to a bearing fit.

3. Removing existing bearing and masonry plate.

4. Clean and/or repair bearing seat area as required.

5. Furnishing and installing a new bearing unit, including shim plates, as detailed in the Plans. Perform welding work as indicated.

6. Perform necessary sandblasting and repainting of all previously painted surfaces damaged during the procedure plus clean and paint all new steel surfaces in accordance with SP 514A and SP 525A.

B. Requirements

The Contractor shall be responsible for the design and installation of an adequate support and jacking system capable of raising the structure under live load and will be responsible for properly arranging all temporary supports so as not to damage or induce overstress in any existing bridge members and diaphragms. The structure shall not be raised more than necessary to accomplish the required work.

Any damage to structural members, connections or parts that are to remain as part of the permanent construction shall be corrected and/or repaired by the Contractor at its expense to the satisfaction of the Chief Engineer. The Contractor's detailed procedures for replacing the bearings shall be designed by a registered structural engineer and shall be submitted in triplicate, to the Chief Engineer for approval. The submittal shall include details of the proposed temporary support and jacking system, indicating materials, member sizes, spacings, support locations, jacking points, reaction and removal procedures.

C. Method of Measurement

The quantity will be measured as the actual number of bearings replaced.

D. Basis of Payment

Work under replacing expansion bearing devices will be paid for at the Contract unit price per each bearing replaced and shall be full compensation for all labor,

materials and equipment necessary to perform the Work, complete and accepted including the cost of shim plates, jacking, cleaning and painting required to replace the bearing.

Item	Unit	Description
SP 516G	Each	Replace Expansion Bearing Device

SP 516J REPLACE FIXED BEARING DEVICE

(09/15/2015)

A. Description

This Work shall include furnishing all labor, material and equipment necessary to remove the existing fixed bearing devices and install new bearings. The Contractor shall perform the Work in such a manner as to not endanger the stability or integrity of the structure during the bearing replacement operations. All applicable provisions Item 516 shall apply.

Replacement operations include but are not limited to the following:

1. Jacking and blocking beams to remove sole plate from bottom flange of beam.

2. Grinding the bottom flange of the beam to a bearing fit.

3. Removing existing bearing and masonry plate.

4. Cut off anchor rods flush with beam seat.

5. Clean and/or repair bearing seat area as required.

6. Furnishing and installing a new bearing unit, including shim plates, as detailed in the Plans. Perform welding work as indicated.

7. Perform necessary sandblasting and repainting of all previously painted surfaces damaged during the procedure plus clean and paint all new steel surfaces in accordance with SP 514A and SP 525A.

B. Requirements

The Contractor shall be responsible for the design and installation of an adequate support and jacking system capable of raising the structure under live load and will be responsible for properly arranging all temporary supports so as not to damage or induce overstress in any existing bridge members and diaphragms. The structure shall not be raised more than necessary to accomplish the required work.

Any damage to structural members, connections or parts that are to remain as part of the permanent construction shall be corrected and/or repaired by the Contractor at its expense to the satisfaction of the Chief Engineer. The Contractor's detailed procedures for replacing the bearings shall be designed by a registered structural engineer and shall be submitted in triplicate, to the Chief Engineer for approval. The submittal shall include details of the proposed temporary support and jacking system, indicating materials, member sizes, spacings, support locations, jacking points, reaction and removal procedures.

C. Method of Measurement

The quantity will be measured as the actual number of bearings replaced.

D. Basis of Payment

Work under replacing fixed bearing devices will be paid for at the Contract unit price per each bearing replaced and shall be full compensation for all labor, materials and equipment necessary to perform the Work, complete and accepted

including the cost of shim plates, jacking, cleaning and painting required to replace the bearing.

Item	Unit	Description
SP 516J	Each	Replace Fixed Bearing Device

SP 519 PATCHING CONCRETE STRUCTURES

(11-21-12)

A. Description

This item shall consist of furnishing the necessary labor, materials and equipment to repair all spalled, deteriorated and delaminated concrete areas of the structures that will remain as part of the reconstructed bridges or pipe headwalls. All applicable provisions of Section 519 of the Specifications shall apply, except as modified herein and the following shall be considered as supplemental to provisions set forth therein.

B. Inspection

The Contractor shall provide all necessary material, equipment, labor and incidentals to permit inspection of the concrete units. The Contractor's Superintendent shall accompany the Chief Engineer in making an examination to mark the areas of repairs to be made. It is the intent that the structural integrity of any structure unit (single pier, single abutment, single headwall, etc.) not be compromised during the performance of the repairs. The Contractor shall perform the removal and replacement of deteriorated concrete in a manner that will ensure the structural integrity is maintained during the progression of the Work to the satisfaction of the Chief Engineer. Payment for all material, equipment, labor and incidentals necessary to complete this inspection shall be included in the lump sum price bid for Item SP 527. If the Contract does not have an Item SP 527, payment for the above shall be considered incidental to this item.

C. Removal of Deteriorated Concrete

The perimeter of damaged areas to be patched shall be sawcut a minimum of one (1) inch deep.

Where there is no bond between the existing concrete and a reinforcing bar, or where more than one-half the diameter of a reinforcing bar is exposed, the adjacent concrete shall be removed to a depth that will provide a minimum of one and one-half inches of clearance around the bar. The Contractor shall use care with existing reinforcing bars, which are to remain in place and extend into new work, so that the bars are not damaged. Existing reinforcing steel shall not be cut. Deteriorated reinforcing steel with greater than twenty percent (20%) loss of section and an exposed length of thirty (30) diameters or more shall have a new reinforcing bar of comparable size added for the full exposed length.

All requirements of Section 519.03 of the Specifications shall apply.

D. Preparation of Surface

All surface areas to be patched and the exposed reinforcing steel within shall be thoroughly cleaned by abrasive blasting (steel cleaned to SA-1 quality) prior to the cleaning specified in Section 519.04 of the Specifications. Cleaning shall precede application of the patching material or erection of the forms by not more than twenty-four (24) hours. All damaged and new reinforcing steel shall be treated per section 509.09 of the specifications.

E. Placing Concrete

Placement of the concrete shall be performed within five (5) calendar days of concrete removal at any one (1) structure unit (single pier, single abutment, single headwall, etc.) All requirements of Section 519.06 of the Specifications shall apply.

F. Method of Measurement

The quantity shall be the actual area in square feet of the exposed surfaces of all completed patches, irrespective of the depth or thickness of the patch. If a patch includes corners or edges of such members as beams, columns, etc., all of the exposed surfaces shall be included, or if a patch extends completely through a member or a slab, both exposed surfaces shall be measured.

G. Basis of Payment

Payment shall be made at the Contract price for:

Item	Unit	Description
SP 519	Sq. Ft.	Patching Concrete Structures

SP 519C PATCHING CONCRETE STRUCTURES WITH TROWELABLE MORTAR

(2013-01-08)

A. Description

This item consists of the removal of all loose and disintegrated concrete, preparation of the surface, and the mixing, placing, finishing and curing of the patches as directed by the Chief Engineer. The Work shall be performed upon concrete bridge components in accordance with these specifications, and in reasonably close conformity with the Plans and the manufacturer's specifications and recommendations.

B. Materials

The patching material shall be:

Sikatop 122 and 123
Thermal-Chem Product No. 3
Polycarb Mark 193.4 and 194
Five Star Highway Patch
UPCO Bostick 964
Euclid Chemical Euco Verticoat
Master Builders Emaco
Duralcrete and Duralcrete Gel
Chesterton 791 Quartz Polymer
Sonneborn Gel Patch

The materials shall be tinted to cure to the color of the existing concrete. All materials shall be stored and incorporated in the Work as recommended by the manufacturer. A manufacturer's representative shall be present at the job site until such time as he and the Chief Engineer are sure that the Contractor is qualified in all aspects of patching concrete structures with the selected material.

If the Contract Plans call for patching with trowelable epoxy mortars, only those mortars, which have 100% epoxy components shall be used. The Contractor shall furnish documentation as to the type of mortar being used.

C. Removal of Concrete

The Chief Engineer shall sound the structure and outline the areas to be removed. All loose, soft, honeycombed, and disintegrated concrete, plus one-fourth inch (¼") depth of sound concrete shall be removed. Where the bond between the concrete and a reinforcing bar has been destroyed, or where more than one-half (½) of the periphery of such a bar has been exposed, the adjacent concrete shall be removed to a depth that will provide a minimum one-half inch (½") clearance around the bar except where other reinforcing bars make this impractical. After completion of the removal operation, the Chief Engineer will re-sound the areas to ensure that only solid concrete remains. All Work shall be done in a manner that will not cut, elongate or damage the reinforcing steel in any way. Concrete may be removed by chipping or hand dressing. Chipping hammers shall not be heavier than the nominal sixteen (16) kg (thirty-five (35) pound) class. Reinforcement, which is loose, shall be adequately supported and tied back into place. Reinforcement that is damaged during the Contractors' operations shall be replaced at no cost to the Commission.

D. Surface Preparation

Cleaning shall precede application of the patching material by not more than twenty-four (24) hours. The surface to be patched and the exposed reinforcing steel shall be thoroughly cleaned by sandblasting followed by an air blast. It may be necessary to use hand tools to remove scale from the reinforcing steel. The surface shall be made free of spalls, laitance and all traces of foreign material. If necessary, detergent cleaning shall precede blast cleaning to ensure the removal of contaminants that are detrimental to achieving an adequate bond. The prepared surface shall be left in a condition as recommended by the manufacturer. Any additional surface preparation shall be in accordance with the manufacturer's recommendations for the patching material, which is used. All unshaped surfaces that will receive new material shall be mechanically roughened.

E. Patching

The mixing, proportioning, placing and curing procedures and tools, equipment, labor and materials used shall be in accordance with the manufacturer's specifications and recommendations. The surface of the repair area shall be flush with the surrounding area.

F. Inspection and Sounding of Concrete Patched

After curing and before final acceptance, all patched areas shall be sounded. All unsound areas and areas exhibiting cracking shall be removed and repatch according to this note.

All sounding, and replacement of rejected areas will be the responsibility of the Contractor and included in the unit bid for this item.

G. Method of Measurement

The quantity shall be the actual area in square feet of the exposed surface of all completed patches, irrespective of depth or thickness of the patch complete, in place and accepted. If the patch includes corners or edges of members, all of the exposed surfaces shall be included. The cost of all labor, equipment, incidentals and materials shall be included in the unit price bid for this item.

All labor, materials and equipment required by the Chief Engineer, to access the repair areas for sounding the concrete, shall be provided by the Contractor at no extra cost to the Project.

H. Basis of Payment

Payment will be made at the Contract price bid for:

Item	Unit	Description
SP 519C	Sq. Ft.	Patching Concrete Structures With Trowelable Non-Epoxy Mortar
SP 519C	Sq. Ft.	Patching Concrete Structures With Trowelable Epoxy Mortar

SP 536 CONCRETE WEATHERPROOFING

(12-05-12)

A. Description

This Item shall consist of the necessary labor, materials and equipment to prepare and treat Portland cement concrete surfaces, as specified in the Plans, with an approved sealer in accordance with these Specifications.

B. Materials

The materials shall meet the following performance requirements:

1. Absorption

The absorption of treated concrete under total immersion shall not exceed one (1) percent after forty-eight (48) hours or two (2) percent after fifty (50) days (ASTM C642, non-air entrained concrete).

2. Scaling Resistance

Treated concrete shall pass ASTM C672 Scaling Resistance test with a rating of "No Scaling" after one hundred (100) cycles (non-air entrained concrete) as compared to "Severe Scaling" on untreated concrete. Concrete shall be proportioned and mixed in accordance with ASTM C642.

3. NCHRP 244, Series II - Cube Test

3.1 Weight gain - not to exceed twenty-five (25) percent of untreated cube.

3.2 Absorbed chloride - not to exceed twenty-five (25) percent of untreated cube.

4. NCHRP 244, Series IV - Southern Exposure

4.1 Absorbed chloride - not to exceed ten (10) percent of untreated concrete.

5. Skid Resistance

When used on the bridge deck and approach slabs, certification is to be provided indicating no reduction in skid resistance from untreated concrete.

6. Waterproofing after Abrasion

When used on the bridge deck and approach slabs, compliance is required with Alberta Transportation and Utilities Specification B 388-90 for sealer Type 1B.

7. Weatherproofing material is to be of low volatile organic content that will be less than 2.9 pounds per gallon using E.P.A. Test Method 24.

Approval of material will require the submittal of appropriate test data from approved independent testing facilities showing compliance with the material performance requirements. Drums or containers of the sealer or sealer

components shall be delivered to the job site unopened and with the manufacturer's numbered seal intact.

C. Manufacturer's Representative

The Contractor shall give the manufacturer's technical representative notice of the intended date of application. The Contractor shall have the manufacturer's representative present during the testing and initial installation.

D. Surface Condition

Surfaces to which sealers are to be applied shall be dry and free from dust, dirt, oil, wax, curing compounds, efflorescence, laitance, coatings and other foreign materials and shall be structurally sound. Weak sections and spalled areas shall have been repaired before application of the sealer.

Cast-in-place concrete shall be in place twenty-one (21) days before sealing. Cavities that require grout filling shall have been filled, cured and air-dried for five (5) days. Where permitted by the manufacturer, the restrictions for application above may be modified with approval of the Chief Engineer.

E. Surface Preparation

The surface shall be thoroughly cleaned to remove dust, dirt, oil, wax, curing components, efflorescence, laitance, coatings and other foreign materials. The use of chemicals and other cleaning compounds to facilitate the removal of these foreign materials shall be approved by the sealer manufacturer or its representative before use. The sealer shall be applied within forty-eight (48) hours following surface preparation.

Cleaning equipment shall be fitted with suitable traps, filters, drip pans and other devices to prevent oil and other foreign material from being deposited on the surface.

Required cleaning methods for the following categories are:

1. New exposed concrete surfaces, which are water cured.

   A water blast at 7,000 p.s.i., minimum.

2. New exposed concrete surfaces where curing compounds have been used.

   a. A water blast at 7,000 p.s.i., minimum or

   b. A sandblast followed by air brooming or power sweeping to remove dust and sand from the surfaces and opened pores. All curing compound shall be removed.

F. Application

Concrete sealer shall be applied as follows:

1. Epoxy Sealer

   Apply epoxy sealer at surface temperature of fifty degrees (50°)F or above with a brush, squeegee, roller or spraying equipment. Two (2) coats of epoxy sealer shall be applied. Elapsed time between coats shall

be in accordance with the manufacturer's recommendation. Both coats shall be from the same manufacturer. The second coat only shall be tinted to Federal Color Standard No. 37722 (white), unless otherwise specified on the Plan. Pigment content shall be limited so as not to reduce sealing effectiveness of the second coat. Epoxy sealers shall be free from sags and runs. Epoxy sealers shall only be used on parapet concrete surfaces of the non -Turnpike overhead bridges.

2. Non-epoxy Sealer

A non-epoxy sealer shall be applied according to the manufacturer's recommended mode of application and under the observation of the Chief Engineer. When spray equipment is used, the sealer shall be sprayed onto concrete surfaces in a one-pass operation. On vertical surfaces, a second pass may be required within ten (10) to fifteen (15) minutes to achieve absorption at the application rate prescribed under Coverage. Polyester resin sealers are limited in application to parapet concrete surface area only. Clear non-epoxy sealers shall be tinted with a vanishing dye that does not damage the concrete.

a. Do not proceed with application of the sealer if the ambient temperature is below forty degrees (40°)F or when the ambient temperature is expected to fall below thirty-two degrees (32°)F within twelve (12) hours after application.

b. Do not proceed with application of the sealer if rain is anticipated within two (2) hours after application.

c. On horizontal surfaces, the sealer shall be uniformly sprayed to saturate/flood the surface. Proper quantities are being applied when the sealer stands for a few seconds before completely penetrating.

d. If recommended by the manufacturer, the sealer shall be broomed in. On smooth-finish or dense concrete, all excess material shall be squeegeed off after ten (10) minutes to assure that no excess solids remain, which can cause excessive slickness.

e. On vertical surfaces, the sealer shall be uniformly sprayed to saturate/flood the surface. Proper quantities of penetrating sealer are being applied when excess sealer runs six (6) to twelve (12) inches below the spray pattern. If recommended by the manufacturer, the sealer may be applied with a brush or roller.

f. If the applicator is unable to complete the entire application continuously, the location where the application was stopped shall be noted or clearly marked.

G. Test Application

Prior to final application, the Contractor shall apply sealer to measured test coverage areas on horizontal and vertical surfaces of the different components of the structure to be sealed for the purpose of demonstrating the desired physical and visual effect of an epoxy application, or of obtaining a visual illustration of the absorption necessary to achieve the specified coverage rate for a non-epoxy sealer. In the latter case, the applicator shall use at least one-half (1/2) gallon of

sealer following the manufacturer's recommended method of application for the total of the test surfaces. Horizontal test surfaces shall be located on the deck and on the safety curb or sidewalk, and vertical test surfaces shall be located on an abutment parapet and pier face so that the different textures are displayed.

H. Coverage

Epoxy sealer shall be applied to concrete surfaces as designated on the Plans at the rate of 120 square feet per gallon for each coat. This specified coverage shall be obtained regardless of the number of passes per coat.

Non-epoxy sealers - A minimum of one gallon of non-epoxy sealer shall be applied for each: 100 square feet of surfaces subject to abrasive wear (bridge decks, bridge deck shoulders and sidewalks); 125 square feet of curbs and vertical surfaces of beams and deck slabs subject to direct roadway drainage; and 150 square feet of surfaces not subject to abrasive wear or direct roadway drainage (for example, parapets, barriers, abutments, pier caps and median dividers.)

I. Appearance

The sealer shall result in a uniform appearance. Also, the second coat of epoxy sealer shall be opaque.

J. Traffic

Traffic may be allowed on a deck only after a non-epoxy sealer appears totally dry.

K. Precautions

Precautions shall be followed as indicated on the manufacturer's SDS.

L. Protection of Adjoining Surfaces and the Public

When applying a sealer, the Contractor shall protect by masking off, or by other means, adjoining surfaces of the structure that are not to be sealed. The Contractor shall also make provisions to protect the public when applying sealer to the fascia of a bridge and/or portions of the underside of the deck of a bridge that spans an area used by the public.

Asphalt and mastic type surfaces shall be protected from spillage and heavy overspray. The sealers shall not come in contact with joint sealers, which have not been allowed to cure according to the manufacturer's instructions. Joint sealants, traffic paints and asphalt overlays may be applied to the treated surfaces forty-eight (48) hours after the sealer has been applied. When a siloxane sealer is applied, the adjoining and nearby surfaces of steel, aluminum or glass shall be covered where there is a possibility of sealer being deposited on the surfaces.

M. Environmental Requirements

Protect plants and vegetation from over-spray by covering with drop cloths.

N. Equipment

Water blast equipment shall be capable of providing pressures up to 7,000 p.s.i.

Application equipment shall be that which is recommended by the sealer manufacturer. The spray equipment, tanks, hoses, brooms, rollers, coaters, squeegees, etc., shall be thoroughly clean, free of foreign matter, oil residue and water prior to applying the concrete sealer.

O. Mixing

Mixing shall be according to the manufacturer's recommended procedures. Material shall be mixed to a uniform consistency, which shall be maintained during application.

P. Storage

Sealer components shall be stored in tightly sealed containers in a dry location and as recommended by the manufacturer.

Q. Method of Measurement

The quantity shall be the actual area in square yards of surfaces sealed and shall include surface preparation, material, application, and pre-qualification testing costs.

R. Basis of Payment

Payment for completed work will be made at the Contract prices for:

Item	Unit	Description
SP 536	Sq. Yd.	Concrete Weatherproofing, Median Wall
SP 536	Sq. Yd.	Concrete Weatherproofing, Barriers and Parapets
SP 536	Sq. Yd.	Concrete Weatherproofing, Substructure
SP 536	Sq. Yd.	Concrete Weatherproofing, Deck, Abutment Slabs and Approach Slabs

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SP 614 **MAINTAINING TRAFFIC**
(10-13-2022)

A. Description

This item shall consist of maintaining and protecting the motoring public and the Work while the Contract is in force. All provisions of Ohio Department of Transportation Construction and Material Specification (CMS) Item 614 shall apply. In the case of conflicting requirements, the Ohio Turnpike and Infrastructure Commission (Commission) SP 614 will govern. Traffic control sign and support material shall conform to SP 730.

B. Requirements

1. Ohio Turnpike Traffic

(a) Traffic Control General

The Contractor's responsibility to the safety of both the motoring public and the construction workers and equipment while performing the requirements of the Contract, shall be in accordance with Contract Documents and the latest revision of the Ohio Manual of Uniform Traffic Control Devices (OMUTCD).

The Contractor shall schedule its operations to maintain the maximum number of traffic lanes open to traffic at all times. No Work will be permitted that reduces the number of lanes, except as noted in the Plans, or as directed by the Chief Engineer.

The Contractor shall notify the Chief Engineer in writing of all traffic restrictions and upcoming maintenance of traffic (MOT) changes, as permitted by the Contract Documents. The Contractor shall ensure the written notification is submitted in a format approved by the Chief Engineer and in a timely manner in order to meet the required time frames set forth in the table below. This notification shall be received by the Chief Engineer prior to the physical setup of any applicable temporary traffic control devices.

Information should include, but is not limited to, all construction activities that impact or interfere with traffic and shall list the specific location, type of work, road status, date and time of restriction, duration of restriction, number of lanes maintained, number of lanes closed, detour routes, if applicable, and any other information requested by the Chief Engineer.

Notification Time Table		
Item	Duration of Closure / Restriction	Notice Due to Chief Engineer
Mainline	>= 2 weeks	14 calendar days prior to closure
	< 2 weeks	2 business days prior to closure
Non-Mainline Ramps, Bridges, and/or Roads	>= 2 weeks	21 calendar days prior to closure
	> 12hours & < 2 weeks	14 calendar days prior to closure
	< 12 hours	4 business days prior to closure
Start of Construction & Traffic Pattern Changes	N/A	14 calendar days prior to implementation

Any unforeseen conditions not specified in the plans requiring traffic restrictions shall also be reported to the Chief Engineer using the Notification Time Table.

The Commission will monitor the MOT set-up, including the placement and use of flaggers, and may order adjustments, additions and/or replacements as deemed necessary to ensure the safety of the motoring public. The Contractor is responsible at all times for proper MOT zones and for maintaining all operations in a safe and effective manner. If the Contractor is given notice that any temporary traffic control device (TTC) is set improperly, the Contractor shall correct the deficiencies **immediately**. If deficiencies are not immediately corrected by the Contractor, the Commission reserves the right to correct the deficiencies, remove the MOT zone and/or suspend the Work of the Contractor. Any costs incurred by the Commission for correcting these deficiencies shall be withheld from the funds due the Contractor as per GC-9.6 of the General Conditions.

An Incident Management Coordination Meeting shall be held by the contractor at least 7 days prior to the first MOT zone being implemented, unless waived by the Chief Engineer. Attendees shall include the Chief Engineer, OSHP, Commission's Safety Services Manager, Maintenance Forces and towing services and local first responders within the Project limits. The purpose of the meeting is to familiarize all attendees with all MOT phases, Work area access locations, communication platforms, and alternate route plans, and to identify potential hazards.

(b) Lane Closure - Mainline

(1) The Contractor shall not perform Work over or adjacent to any open lanes of traffic without implementing the appropriate MOT zone. Conform to the requirements of the plan, Commission standard drawings, and the OMUTCD, for the installation, maintenance, and operation of all traffic controls and traffic control devices. When the plans or construction drawings do not cover a specific traffic control situation, place the necessary traffic control devices per the OMUTCD and use the procedures required by the OMUTCD.

In long term MOT zones, where construction warning signs are mounted on posts, the signs shall be furnished, installed, covered and removed by the Contractor. Sign covers will be provided by the Commission and installed by the Contractor where required, including but not limited to, all speed limit signs. Sign covers shall be returned to the Commission at the end of the Contract. Post mounted signs shall be uncovered and covered by the Contractor as directed by the Chief Engineer and as needed to display the appropriate signs as shown on the Plans. Post mounted signs will be mounted at a height of five (5) to seven (7) feet as measured from the bottom of the sign to the nearest edge line. Damaged or missing sign covers shall be replaced by the Contractor.

For short term and intermediate zones, the Contractor shall supply, install, maintain, and remove signs and support material conforming to SP 730. All roll-up signs furnished to the Project shall be new. Velcro overlays on roll-up signs are not permitted. Safety and protective devices furnished by the Contractor will remain the property of the Contractor and shall be removed from the Project site upon completion of the Work, or as directed by the Chief Engineer. When not in use all temporary signage and support material shall be removed from the mainline pavement. They may be placed either 50 feet from the edge of pavement or 6 feet behind guardrail.

(2) All Work that requires lane and/or shoulder closure(s) shall be accomplished in accordance with SP 104.

(3) The length of the single lane traffic zone shall not extend more than 1/4 mile beyond the last active Work area.

(4) The Contractor's use of night work zones shall comply with SP 104 – Access to Turnpike and Restrictions and SP 106 – Hours of Work.

(c) Roadway Closure - Mainline (Rolling Roadblock or Traffic Switch)

The directional roadways may be closed for short periods of time for removal and/or placement of structural steel and overhead sign structures or for other activities as determined by the Chief

Engineer. The roadway closure may be accomplished by implementing a Rolling Roadblock (RRB or sequenced lane closures) subject to the following controls and the approval of the Chief Engineer. A traffic switch may be used to establish a maintenance of traffic contraflow phase.

(1) RRB may only be utilized between the hours of 12:00 a.m. and 5:00 a.m. or as otherwise approved by the Chief Engineer. Prior to approving an alternate time, the Chief Engineer will consult the OTIC Permitted Lane Closure charts. RRBs will only be allowed during hours when the chart has no shading at all.

(2) The duration of RRB closures shall not exceed 20 minutes. If additional closures are necessary, traffic must be allowed to return to normal flow before the next closure begins. (Note: A twenty (20) minute RRB will provide approximately ten (10) minutes of work time at the Project site).

(3) All travel lanes shall be available to traffic upon opening the RRB, unless otherwise approved by the Chief Engineer.

(4) RRB or Traffic Switch Pre-Planning Meeting - Prior to scheduling the RRB or Traffic Switch Coordination Meeting with Commission Maintenance and Ohio State Highway Patrol (OSHP), the Contractor shall meet with the Chief Engineer to plan all activities which need to take place prior to the RRB or Traffic Switch, all activities that will need to occur during the RRB or Traffic Switch and plan the concluded MOT pattern once RRB or Traffic Switch is complete. All subcontractors of the Contractor directly involved with Temporary Traffic Control Operations are required to attend this Pre-Planning Meeting. This meeting shall occur at least 10 days prior to the anticipated RRB or Traffic Switch.

Seven days prior to the RRB or Traffic Switch, the contractor is required to provide an execution plan for review and approval. The plan shall contain all operations, phases and sequences. The plan shall include specific details of all MOT changes including but not limited to pavement markings, pavement marking removal, signage, temporary barrier, impact attenuators, etc. The plan shall be color coded by operational phase and or sequence depicting final MOT alignment and signage. Resources of the prime contractor and all sub-contractors are to be included in the plan for labor and equipment detailing quantity, type and responsibility which will be committed to the operation.

(5) RRB or Traffic Switch Coordination Meeting - All RRB or Traffic Switch shall be coordinated during a meeting attended by the Contractor, Chief Engineer, OSHP and Commission's Maintenance Forces a minimum of forty-eight (48) hours prior to performing the RRB or Traffic Switch. Decisions made at the meeting shall be documented on a form approved by the Chief Engineer.

(6) Job Briefing Meeting - Three (3) hours prior the RRB or Traffic Switch Work, the Contractor will hold a job briefing meeting with all Contractor staff, subcontractor staff and inspection staff that will be involved in the work activities during the RRB or Traffic Switch implementation. The Job Briefing shall cover all roles and responsibilities of each individual person, specific details of work activities to be performed under the RRB or Traffic Switch work window, safety precautions, communications, time frame to perform the work and all equipment to be used at a minimum.

(7) Contractor Provided Services - For RRB Operations, the Contractor will provide closure of all affected interchange ramps, service plaza ramps, mainline crossovers, maintenance access points and any other potential point of entry to mainline which will require closure during the RRB. At each Interchange and/or Service Plaza Ramp requiring closure, the Contractor will provide a Contractor vehicle with appropriate amber flashing safety lights, as specified for all construction vehicles, a light plant if required, radio or cell phone communication device and a competent staff member of the Contractor's firm in proper PPE (Flagger Attire). At each crossover and access point other than Interchanges or Service Plaza Ramps, the Contractor shall provide standard 42-inch traffic (grabber) cones or traffic drums spaced at 5-foot on center, across the access point / crossover width and just beyond, nested together with yellow caution tape.

Commission Maintenance and Highway Patrol personnel and vehicles used for the RRB will be provided by the Commission at no cost to the Contractor. However, the Contractor's zone person and zone vehicle will be utilized in all RRB. Additional Contractor personnel and vehicles may be required to assure control of all access points.

(d) Worksite Traffic Supervisor

The Contractor shall employ a certified Worksite Traffic Supervisor (WTS) other than the Superintendent, subject to the approval of the Chief Engineer. The WTS must be certified from one of the following organizations or others as approved by the Chief Engineer:

(1) Ohio Department of Transportation (ODOT) Prequalified Worksite Traffic Supervisor (WTS),

WTSPrequalification@dot.ohio.gov. *Note: ODOT prequalification expires 5 years from the date the test was last successfully passed.*

(2) American Traffic Safety Service Association ATSSA, Certified Traffic Control Supervisor (TCS), phone number 540-368-1701. *Note: ATSSA requires recertification every four (4) years.*

(3) The National Safely Council, Temporary Traffic Control Design & Supervision Training, phone number 1-800-621-7619. *Note: OTIC will only accept certificates dated within the five (5) years preceding the date of submittal.*

(4) National Highway Institute, Design and Operation of Work Zone Traffic Control, phone number 1-877-558-6873. *Note: OTIC will only accept certificates dated within the five (5) years preceding the date of submittal.*

(5) Ohio Contractors Association (OCA) / Traffic Control Supervisor (TCS) Course, only if taken after May 5, 2004, phone number 1-800-229-1388 *Note: OTIC will only accept certificates dated within the five (5) years preceding the date of submittal.*

A copy of each WTS's certification and 24-hour contact information shall be provided to the Engineer at the preconstruction conference. If the designated WTS will not be available full time (24/7), the Contractor may designate an alternate WTS to be available when the primary is off duty. Each WTS shall have a WTS certification containing the date of issue and shall be from any of the approved organizations. At the time of the preconstruction conference, the WTS certification date of issue shall be within the 5 years prior to the Original Completion Date of the project.
The duties of the WTS are as follows:

1. Attend preconstruction meeting and all project meetings where traffic control management is discussed.

2. Be available for meetings or discussions with the Chief Engineer upon request or within 24 hours.

3. Be aware of, and coordinate, if necessary, all traffic control operations, including those of subcontractors and suppliers.

4. Ensure compliance with the contract documents for signs, barricades, temporary concrete barrier, pavement markings, portable message signs, and other traffic control devices; and facilitate any corrective action necessary.

5. Attend post-incident debriefings if required

6. Be on site for all major MOT phase setups or traffic switches.

All costs associated with the WTS shall be considered incidental to the performance of SP 614 Maintaining Traffic.

(e) Crossing Active Lanes with Construction Equipment

The following procedure shall be used when it is necessary to move construction equipment across an active lane of traffic. This procedure is limited to moves which can be completed in twenty (20) seconds or less.

(1) The Contractor shall obtain prior approval from the Commission's Maintenance Department for all crossings.

(2) The Contractor shall coordinate all movements with the Commission's Maintenance Department.

(3) The Contractor shall station a flagger with a Commission radio at the point of crossing.

(4) The Contractor shall set a single lane closure adjacent to the equipment, thus limiting the crossing to one (1) lane only.

(5) A Commission's Maintenance vehicle (driven by the Commission's Maintenance foreman or assistant foreman) will drive into the zone with amber flashing light and hazard lights on. This vehicle shall proceed through single lane zone at fifty (50) mph (posted speed limit in construction zone) at a time when this will create a fifteen (15) to twenty (20) second gap in the flow of traffic.

(6) The flagger with the Commission radio at the crossing point shall inform the Commission's Maintenance vehicle as soon as the crossing is completed.

This process is limited to rubber tired or smooth "street track" construction equipment that is capable of crossing the active traffic lane quickly (less than twenty (20) seconds).

Any rubber tired or smooth "street track" construction equipment that requires more than twenty (20) seconds to cross an active traffic lane, may cross provided the procedures for rolling roadblocks under Section B.1.(c) above are followed, subject to the approval of the Chief Engineer. If approval is not given, the equipment must be loaded onto a trailer, taken to the next interchange, turned and returned to the desired location.

Crossing active Turnpike lanes by construction equipment that requires protection of the pavement (such as laying down plywood, etc.) shall not be permitted. Equipment of this type must be loaded onto a trailer and taken to the next interchange, turned around, and returned to the desired location.

Costs for any MOT requirements for equipment crossings shall be included in the lump sum price bid for Item SP 614 - Maintaining Traffic.

(f) The Contractor's vehicles and equipment shall be operated in the direction of traffic. A qualified flagger shall be employed where the Contractor's equipment and vehicles, as well as material delivery and haul vehicles, merge into, exit from or cross Turnpike traffic as detailed in B.1.(h) above. The Contractor's equipment and vehicles, including material delivery and haul vehicles shall conform to CMS 614.03. Amber flashing safety light(s) shall be turned on during Work area ingress/egress, but not while travelling at posted speeds in active traffic lanes. The Contractor's equipment shall be stored at a storage area, the location of which shall have prior approval of the Chief Engineer. Pavers, rollers and other equipment may be parked in areas along the highway when paving operations are scheduled to continue within the next workday. When parking along the highway, the equipment shall be located either thirty (30) feet from the edge of pavement or 6 feet behind guardrail with a minimum of 125 feet of guardrail preceding the equipment. Adequate barricades and lights shall be placed on the pavement side of the equipment to identify the limits of the equipment. All other equipment, including private vehicles, shall be stored at the Contractor's approved storage area.

(g) Prior to use, all cones, drums, sign supports, barricades, impact attenuators and other temporary traffic control (TTC) devices that are certified to meet National Cooperative Highway Research Program Report 350 (NCHRP-350) Test Level 3 or Manual for Assessing Safety Hardware (MASH) standards. Non-MASH compliant TTC devices will be allowed based on the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH) crash standards sunset dates. Do not use heavy non-yielding devices or supports that are not crashworthy.

(h) Temporary traffic drums and cones shall be as shown on the Commission's Standard Drawing TCR-2 and shall be in LIKE NEW CONDITION. LIKE NEW shall meet the acceptable criteria as defined and illustrated in the American Traffic Safety Services Association ("ATSSA") publication "Quality Standard for Work Zone Traffic Control Devices." Reflectorization on drums shall be cleaned on a monthly basis or as directed by the Chief Engineer. Damaged drums shall be replaced as directed by the Chief Engineer. Replacement drums shall be provided by the Contractor and payment shall be included in the lump sum price bid for Item SP 614 – Maintaining Traffic.

2. Non-Turnpike Roadways

Any MOT required on non-Turnpike highways or roadways shall be performed per Ohio Department of Transportation (ODOT) MOT specifications and standards and the Ohio Manual of Uniform Traffic Control Devices (OMUTCD) requirements and approved by the local

ODOT District. The contractor is responsible for obtaining any necessary permits from the maintaining agency.

3. Weather Conditions

The Contractor shall be aware of and prepare for changing weather conditions. When conditions dictate, or as directed by the Chief Engineer, the Contractor shall provide and utilize necessary equipment and personnel to prevent water from ponding along the milled surface and flowing into and/or across active traffic lanes.

4. Alternate Temporary Traffic Control Plan

If the Contractor so elects, he may propose an alternate method or methods for MOT, provided the intent of the above provisions are followed and no additional inconvenience to the traveling public results there from. If the Contractor elects to propose an alternate MOT phase, scheme or plan from that included in the Contract Documents, the Contractor shall prepare to-scale plans, equivalent to the level of detail or more as provided in the Contract Documents, which illustrate all advanced warning area signage, transition area(s) for tapers and shifts, signage and/ or pavement markings, buffer space, activity or work areas where work is taking place, staging areas for workers / materials / equipment, and termination area showing trailing buffer space and transitions of traffic returning to normal alignment. Details of any variation from the Contract Documents, such as the placement of temporary concrete barrier, temporary sheeting, temporary barrier vehicles, temporary signals, temporary impact attenuators, covering of existing signage, removal of pavement markings, etc. should also be provided. Both mileposts and stations shall be provided to identify all locations of signs or devices. The proposed alternate plan is to address the entire Project and/ or adjacent project MOT plans and any required corrections to already existing MOT. Traffic flow arrows shall be shown on the plans to clearly indicate each lane of traffic maintained. Alternate MOT plans shall include a summary of the original plan quantities versus proposed quantities for any affected bid item(s). The alternate MOT plans shall be prepared, signed and sealed by a Professional Engineer Licensed and Registered in the State of Ohio who is knowledgeable about fundamental principles of TTC and work activities to be performed. Alternate MOT plans shall be submitted to the Chief Engineer for review and approval. The Chief Engineer will require a fourteen (14) day review period to evaluate the proposed alternate MOT plan. No alternate plans shall be placed into effect until approval has been granted in writing by the Chief Engineer. All work and traffic control devices shall be in accordance with SP 614 and all other applicable portions of the CMS, as well as the current version of the OMUTCD and Commission's Standards. All costs associated with the proposed alternate MOT plan will be the sole responsibility of the Contractor. No additional compensation will be provided.

5. Work Zone Pavement Markings

Unless otherwise approved by the Chief Engineer, SP 614B work zone pavement markings (WZPM) shall be used on all bridge decks where the WZPM is not in line with existing/final markings. SP 614B should be used on bridge decks where a solid line (e.g., edge line, channelizing line, etc.) is being placed over top of a broken line (e.g., lane line, dotted line, etc.)

C. Measurement and Payment

Maintaining traffic shall be measured as a unit and shall be paid for at the Contract lump sum price bid. Unless separately itemized, the lump sum price bid for maintaining traffic shall include the cost of maintaining the roadways in a safe condition for public use, providing flaggers and its equipment, furnishing, cleaning, maintaining in an acceptable condition and subsequently removing temporary traffic control sign and support material, drums, cones, sign covers, arrow boards, message boards (when needed), temporary lighting, and other TTC items as required by the Contract Documents. The price shall be payment in full for all materials, equipment, labor and incidentals necessary to complete the Work as specified.

Item	Unit	Description
SP 614	Lump Sum	Maintaining Traffic

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SP 614ZP **ZONE PERSON WITH ZONE VEHICLE**
(08-16-2022)

A. Description
This item shall consist of furnishing a qualified zone person(s) (ZP) with zone vehicle (ZV) as described in this specification for the purpose of protecting the motoring public and the Work while the Contract is in force. The ZP shall have a full working knowledge of the Maintenance of Traffic Plans and Special Provisions.

A "work zone" is defined an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by temporary traffic control (TTC) devices such as, but not limited to, signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign to the END ROAD WORK sign or the last TTC device.

B. ZP Qualifications
The Contractor shall designate a ZP, (subject to the approval of the Chief Engineer), other than the Superintendent, to be responsible for the MOT. The ZP must be certified from one of the following organizations or others as approved by the Chief Engineer:

(1) Ohio Department of Transportation (ODOT) Prequalified Worksite Traffic Supervisor (WTS), WTSPrequalification@dot.ohio.gov.
Note: ODOT prequalification will expire 5 years from the date the test was last successfully passed.

(2) American Traffic Safety Service Association ATSSA, Certified Traffic Control Technician (TCT), phone number 540-368-1701.
Note: ATSSA requires recertification every four (4) years.

(3) National Highway Institute, Basics of Work Zone Traffic Control, phone number 1-703-235-0528.
Note: OTIC will only accept certificates dated within the five (5) years preceding the date of submittal.

C. ZP Requirements
The designated ZP shall have a full working knowledge of the project's Maintenance of Traffic plans and Special Provisions. The ZP shall have no other construction related duties.

A ZP with ZV shall be required as follows:

(a) The contractor has a work zone in place on Turnpike mainline, shoulder and/or Turnpike toll plaza ramps

While a work zone is in place, the ZP shall maintain the zone on a continual basis twenty-four (24) hours per day, seven (7) days per week.

If the contractor removes all TTC devices from the mainline as described in TCR-1 note 20 then a ZP is not required.

(b) The contractor has a work zone in place on a roadway above or below mainline Turnpike.

While zones are in place on a roadway above or below mainline Turnpike and the contractor is actively working on the project, the ZP shall maintain the zone on a continual basis.

While zones are in place on a roadway above or below mainline Turnpike and the contractor is not actively working on the project, the zone will be maintained by the Commission. The Commission will repair or replace any damaged or missing temporary traffic control devices. The Commission will notify the contractor of the replaced or repaired devices. It will be the Contractor's responsibility to replace and return the Commission's property.

D. ZP Responsibilities

The ZP shall supervise the set-up and removal of the TTC devices, as well as the maintenance of those devices while they are in place. The ZP shall be responsible that any damaged or missing TTC devices are repaired or replaced immediately. In addition, the ZP shall continually check the reflective surfaces of all the TTC devices to ensure that the devices are clean and are performing their intended function.

The ZP shall immediately respond to any incidents within the Project limits or close proximity thereto and communicate the details of the incident to the Commission's Communication Center. During traffic backups on the mainline, the ZP shall protect the back of the traffic queue by positioning the ZV 1,000 feet behind the rear of stopped traffic, while moving forward or backward as needed to maintain the proper distance. They shall utilize all necessary emergency lighting and remain off the roadway when possible.

The ZP will complete a work activity form, provided by the Chief Engineer, during each shift which will detail the ZP functions for that shift. This form will address existing or new TTC devices, confirm the review and corrective actions of any TTC devices and provide details of their status upon completion of the associated shift by that respective zone person. **The ZP shall have no other duties while performing this function.**

E. Zone Vehicle(s)

The Contractor shall provide a ZV that shall be used by the ZP only to maintain the Work zone. The ZV should be a pick-up truck, small stake body truck, or a similar type vehicle in good condition and shall be equipped with amber flashing safety lights. The ZV shall be equipped with a permanent, truck-mounted, fully operational, folding arrow board with a minimum size of thirty (30) inches by sixty (60) inches and displaying a minimum of fifteen (15) lamps on the panel face. The ZV shall be available for the MOT whenever there is a zone (lane closure, median crossing, etc.) in place that alters the normal flow of traffic on the Turnpike directional roadways. The Contractor shall submit, for approval by the Chief Engineer, the type of vehicle planned for this operation.

F. Communications

The Commission will furnish, install, maintain, and at the conclusion of the Project, remove a Turnpike radio for the ZV. At all times this vehicle shall be in the immediate vicinity of the Work with the radio turned on. The Contractor will be responsible for the return of the radio in issued condition at the completion of the Contract. Any costs incurred to the Commission for repairing damaged radios due to misuse or replacing missing radios shall be withheld from the funds due the Contractor as per GC-9.6 of the General Conditions.

G. Method of Measurement

The quantity will be measured as the actual number of hours worked by the ZP. Unit price shall be payment in full for all costs associated with providing the ZP and ZV.

H. Method of Calculation

The following is for informational purposes only. The number of work zones needed, and the duration of each work zone falls under means and methods of construction. For estimating purposes, the design engineer has calculated the number of hours needed for this pay item based on the following assumptions and the requirements noted in section C:

Phase 1
75 days x 24 hours = 1800 hours

Phase 2
75 days x 24 hours = 1800 hours

Long term stationary zones (more than 3-days)
____days x 24 hours = _____ hours

Intermediate term stationary zones (overnight to 3 days)
____days x 24 hours = _____ hours

Short term stationary zones (from 1 to 12 hours)
____zones x ___ hours = _____ hours

Total number of hours calculated: _____

I. Basis of Payment

Payment for this item shall include all labor, equipment, and material and incidentals necessary to provide a Zone Person with Zone Vehicle.

Payment shall be at the Contract unit price for:

Item	Unit	Description
SP614ZP	Hours	Zone Person with Zone Vehicle

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SP 614B PREFORMED WORK ZONE PAVEMENT MARKINGS

(02-20-2022)

A. Description

This Item shall consist of furnishing, installing, maintaining and subsequently removing preformed work zone pavement markings (“preformed makrings”). This Work shall be done in accordance with this Special Provision and in reasonably close conformity with the dimensions and lines shown on the Plans or established by the Chief Engineer. All applicable provisions of the Ohio Department of Transportation Construction and Material Specification (CMS) Item 614 shall apply.

B. Materials

Preformed markings shall consist of white or yellow retroreflective films (size and location as shown on the Temporary Traffic Control drawings). The preformed markings shall be of a type shown on a list of approved materials maintained by the ODOT Director (Office of Materials Management). The approved list of “740.06 - work zone pavement marking” can be found on the ODOT website.

The size, quality, and refractive index of the glass beads shall be such that the performance requirements for the preformed markings shall be met. The bead adhesion shall be such that beads are not easily removed when the material surface is scratched with a thumbnail.

The pigments shall be selected and blended to provide pavement markings, which are white or yellow, conforming to ODOT Supplement 1047 Appendix A.

With the Chief Engineer’s approval, use removable, non-reflective, preformed blackout tape to cover conflicting markings. Blackout tape shall be Black Line Mask 715 as manufactured by 3M or approved equal.

The preformed markings shall be pre-coated with a pressure sensitive adhesive and shall be capable of being adhered to asphalt concrete or Portland cement concrete in accordance with manufacturer's instructions without the use of heat, solvents or other additional adhesive means except the use of surface preparation adhesive and shall be immediately ready for traffic after application.

When stored in a cool, dry area indoors, the materials shall be suitable for use for one (1) year after the date of purchase.

C. Performance Requirements

1. General

The preformed markings must be readily removable when they are no longer required for traffic maintenance. They shall be capable of performing for the duration of normal construction operations and shall then be capable of being removed intact or in large pieces, either manually or with a recommended roll-up device.

D. Installation

Preformed markings shall be applied to clean, dry surfaces in accordance with the manufacturers' recommendations or a method approved by the Chief Engineer.

1. Layout

   The Contractor shall layout the locations of all work zone lines to assure their proper placement.

2. Surface Preparation

   The Contractor is required to apply the manufacturers' recommended surface preparation adhesive. Surface preparation adhesive may only be applied when road surface is clean and dry.

3. Pavement Moisture

   The Contractor can only apply preformed markings if there is no visible surface moisture on the pavement. The preformed markings can only be applied if there was no rainfall in the 24-hours prior to application, and there is no rain forecasted within 48 hours after application.

4. Application

   The Contractor shall apply preformed material using a manual highway tape applicator (MHTA) or a highway tape applicator (HTA)

   When installed, the preformed material shall be cut every twenty-five (25) feet. Preformed material shall also be cut at bridge expansion joints and pavement cracks in accordance with the manufacturers' recommendations.

E. Method of Measurement

Work zone pavement markings will be measured, complete-in-place, including gaps for the width specified.

The work zone pavement markings shall be maintained and replaced by the Contractor, without additional compensation, should failure occur during service.

F. Basis of Payment

Work zone pavement markings will be paid for at the Contract unit price, which price shall be full compensation for cleaning and preparing the pavement surface, for furnishing, placing, and the subsequent removal of all materials and for all materials, labor, tools, equipment and incidentals necessary to complete the Work.

Payment shall be made at the Contract unit price bid for:

Item	Unit	Description
SP 614B	Mile	Work Zone White Edge Line, 4 inch
SP 614B	Mile	Work Zone White Edge Line, 6 inch
SP 614B	Mile	Work Zone Yellow Edge Line, 4 inch
SP 614B	Mile	Work Zone Yellow Edge Line, 6 inch
SP 614B	Mile	Work Zone Yellow Edge Line, 8 inch

SP 614B	Mile	Work Zone Lane Line, 4 inch
SP 614B	Mile	Work Zone Lane Line, 6 inch
SP 614B	Mile	Work Zone Lane Line (Solid), 4 inch
SP 614B	Mile	Work Zone Lane Line (Solid), 6 inch
SP 614B	Mile	Work Zone Channelizing Line, 4 inch
SP 614B	Mile	Work Zone Channelizing Line, 8 inch
SP 614B	Foot	Work Zone Yellow Transverse Line, 12 inch
SP 614B	Foot	Work Zone Dotted Line, 4 inch
SP 614B	Mile	Work Zone Double Yellow Centerline, 4 inch
SP 614B	Foot	Work Zone Stop Line
SP 614B	Each	Work Zone Lane Arrow

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SP 614C **REMOVAL OF PAVEMENT MARKING**
(*09-11-2017*)

This Work shall consist of removal of existing pavement markings by either Grinding Method or Water-Blast Method as shown on the Plans and in accordance with these Special Provisions, except that grinding is not permitted on concrete pavement or bridges.

Pavement marking removal width shall be a maximum of line width plus one (1) inch each side of the line to be removed unless otherwise directed by the Chief Engineer. The removal depth shall be a maximum of five (5) mils or as otherwise directed by the Chief Engineer. Repair damage to the pavement that results from the removal of more than 5 mils of pavement thickness not directed by the Chief Engineer by approved methods. All associated costs of the repairs are solely borne by the Contractor.

Pavement markings shall be removed to the extent that ninety-five (95) percent of the existing marking is removed per linear foot of marking as determined by the Chief Engineer. Remove markings using the methods specified in the below table:

Type of Pavement		**Removal Method**	
		Grinder[1]	**Sand, Shot, or Water Blast**
Existing Asphalt	Temporary	Y	Y
	Permanent	N	Y
New Asphalt	Temporary	Y	Y
	Intermediate	Y	Y
	Permanent	N	Y
Existing Concrete	Temporary	Y	Y
	Permanent	N	Y
New Concrete	Temporary	Y	Y
	Permanent	N	Y
Y - Method is permitted to be used.			
N - Method is not permitted to be used.			
[1] - When a drum is mounted to a skid steer loader, the drum must be able to accommodate a minimum of 150 teeth.			

The line removal process shall be demonstrated to the Chief Engineer on a test section (100 foot test section) of existing line to be removed and approved by the Chief Engineer prior to the use. Excessive gouging, grooving, or roughness of pavement surface as determined by the Chief Engineer, will not be permitted.

Any damage to the pavement surface caused by the Contractor's operation shall be repaired at the Contractor's expense. The Chief Engineer, prior to performing the repair, shall approve repair methods and procedures.

GRINDING METHOD

A. Description

This Work shall consist of removal of existing pavement markings by grinding within the limits as shown on the Plans or as established by the Chief Engineer.

B. Removal Process

The pavement markings shall be removed by grinding using carbide tipped or hardened steel grinding heads or other heads as approved by the Chief Engineer. The grinding heads shall be arranged in a floating head unit capable of adjustment during the removal process.

Debris generated by the removal process shall be contained and removed by vacuum type equipment, which minimizes airborne dust and debris, and disposed of in accordance with SP 105.

C. Equipment

Pavement marking removal equipment shall consist of a truck-mounted unit. The truck shall have a minimum of 20,000 pound gross vehicle weight (GVW). There shall be a minimum of three (3) independent grinding heads per side. The grinding heads shall utilize 2.5 inches to 3.5 inches diameter steel blades arranged to generate a grinding head width varying from 6.5 inches to 7.5 inches.

The grinding heads shall be hydraulically driven and shall be capable of adjustment in the vertical, horizontal and rotational planes. All adjustments must be able to be made to compensate for variations in crowning of pavement and changing line width while the machine is in operation.

A vacuum truck, vacuum sweeper or similar device capable of collecting the paint chips and other debris from the roadway shall follow removal of the paint markings to collect debris.

WATER-BLAST METHOD

A. Description

The Work consists of removal of existing pavement markings by high-pressure water blasting within the limits as shown on the Plans or as established by the Chief Engineer.

B. Removal Process

The pavement markings shall be removed from asphalt or concrete roadway surfaces by using high-pressure water jets at locations designated on the Plans or as established by the Chief Engineer.

Debris generated by the removal process shall be contained and removed by vacuum type equipment, which minimizes airborne dust and debris.

Do not perform Work unless the temperature is a minimum of forty (40) ºF and rising and the pavement temperature is a minimum of thirty-five (35) ºF and rising.

Paint removal may be performed during inclement weather provided the water, paint chips and the vacuum clean up system contains debris.

Water used shall be potable water obtained from a fire hydrant, municipal source or well. Lake or river water will not be allowed. The use of chemicals, abrasive materials, grinders, detergents or salt water will not be allowed.

Water collected by the vacuum system shall be separated from the paint chips and other debris. Water shall not be allowed to run in to any lake, river or stream. Paint chips and debris collected by the vacuum system shall be properly disposed per SP 105.

Any damage to the pavement surface caused by the Contractor's operation shall be repaired at the Contractor's expense. The Chief Engineer prior to performing the repair shall approve repair methods and procedures.

C. Equipment

The equipment used for the paint removal shall be a self-contained vehicle licensed to travel on the public roadway and capable of traveling at highway speeds. The vehicle shall contain an ultra-high pressure (UHP) water pump and water tank. The UHP pump shall be capable of delivering a minimum of sixteen (16) gpm while operating at 36,000 psi. The truck shall have a hydrostatic drive, independent of the truck transmission, capable of infinitely varying the forward speed of the truck during paint removal from zero (0) to seven (7) mph.

A vacuum truck, vacuum sweeper or similar device capable of collecting the paint chips, water and other debris from the roadway shall follow removal of the paint markings to collect debris.

The paint removal vehicle shall have a multi-jet spray head, which is capable of rotating at 2000 rpm. The spray head shall contain a minimum of 16 nozzles.

The equipment shall be capable of removing a minimum of 3000 linear feet per hour of stripping four inches (4) to six inches (6) inches in width.

The spray head shall be capable of removing paint from either side of the vehicle.

D. Basis of Payment

Removal of pavement markings shall be measured per mile or per foot, as noted in the Plans, measured along the centerline of the pavement marking. Payment for this Item shall be at Contract unit price, which shall include all labor, equipment, materials and incidentals necessary in the removal of pavement markings and cleaning of affected pavement surfaces and disposal of all waste materials as per SP 105.

Payment shall be made for all accepted quantity, complete and in place, at the Contract unit price bid for:

Item	Unit	Description
SP 614C	Foot	Removal of Pavement Marking
SP 614C	Mile	Removal of Pavement Marking

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SP 619 **FIELD OFFICE**
(12-24-13)

A. Description

The Contractor shall provide a suitable Type B field office and field laboratory in an approved location for the exclusive use of the Chief Engineer and Inspectors for making reports, checking Plans, and Specifications, etc., for storing the Chief Engineer's records and for performing field testing of construction materials. This Item shall be performed in accordance with Section 619 of the Specifications unless otherwise specified herein.

Section 619.02 of the Specifications shall be amended to include the following:

1. Amend/Add the following items for a Type B field office:

   (a) Minimum floor space of 500 sq. ft.

   (b) Potable hot and cold water for each field office; as well as a sanitary electric water cooler supplied with cups and water, which shall be kept cool.

   (c) A means for maintaining a room temperature between 68 and 80 °F (20 and 27 °C).

   (d) Portable first aid kits (2).

   (e) A wireless broadband internet connection with a minimum 10 Mbps download and 2 Mbps upload speeds; and a network latency less than 50 milliseconds.

   (f) A color copier/printer/scanner to be provided with all necessary maintenance and paper supplies with the following specifications:

      i. Color Copy/Print Speed: 30 Pages Per Minute (Letter), 15 Pages Per Minute (Legal), 15 Pages Per Minute (Ledger) or higher
      ii. Duplex printing support
      iii. Automatic document feeder with 50 sheet duplexing document feeder
      iv. Copier Memory: 768 MB
      v. Installed HDD: 40 GB
      vi. Data encryption and HDD Erase Support included with machine
      vii. Internal Stapler Support
      viii. Paper Capacity - 250 sheet × 2 trays, 50-sheet Bypass tray
      ix. Network Interface: 10/100Base-TX, 1000Base-TX
      x. Analog Fax Support Included with machine
      xi. Color Scanning with following requirements:
         Up to 600 × 600 dpi
         Scan Area up to 11" × 17"
         Scanning Protocol Support - TCP/IP, SMTP, SMB, FTP, POP3, NCP

File Scan Types Supported: Single Page TIFF, JPEG, PDF, Multi- Page TIFF, PDF, and OCR PDF
Scanning Support for Scan-to-Email, HDD, SMB (Folder), URL, and TWAIN

xii. Network protocol support for TCP/IP
xiii. Client and Server Print Driver Support for PCL Print Drivers
xiv. Server Operating System Support for Windows Server 2008 and Windows Server 2008 R2 (32 Bit/64 Bit)
xv. Client Print driver support for Windows XP/Windows 7 (Both PCL/(32 Bit and 64 Bit))
xvi. Minimum print/copy resolution of 600 × 600 dpi
xvii. Secure printing with password or pin from client to copier

(g) An adequate number of tables and chairs are to be provided for the purpose of conducting project meetings.

(h) The Contractor shall hire a 3rd Party CLEANING SERVICE to clean the field office weekly with services not limited to:

i. Garbage removal/disposal
ii. Sweeping and wet mopping floors
iii. Cleaning desks, table tops, and chairs from dust accumulation
iv. Cleaning of air conditioning/heating vents

For projects requiring moisture and density control of construction materials, provide the field office with a lockable wood or metal storage box of sufficient size to store a nuclear density gauge and with a working electrical connection to charge the gauge.

Provide two independent lock systems: one that locks the box the gauge is stored in; and the second one that locks the box to the facility within which the box is housed. The second lock system may consist of bolting the box to the office floor or wall. The storage box must be at least 15 feet (5 meters) from any occupied work area.

Furnish a concrete cylinder curing box capable of holding at least eight 6 × 12 inch (150 × 300 mm) cylinders at 73 °F (23 °C) ± 3 degrees no matter what the ambient temperature is when constructing either Portland cement concrete pavement over 10,000 square yards (8000 m²) or over 50 cubic yards (38 cubic meters) of bridge structure repair or replacement concrete. The box will have a sealed lid.

The Contractor will maintain all utility services (e.g., electric, security, telephone, water) for the duration of the project.

The field office shall be set up, equipped and made ready for use at least three (3) days prior to the beginning of Work on the Project by the Contractor or any of its subcontractors and shall remain until all field records pertinent to the Project have been completed. It shall be maintained in good condition and appearance by the Contractor for the duration of the Project and shall then be removed and disposed of by the Contractor, after which the site shall be cleaned up and left in a neat and acceptable condition.

The Contractor shall arrange and pay for the installation and removal of individual-line telephone service at the field office for the official and exclusive use of the Chief Engineer and other representatives of the Commission. All telephone charges will be paid for by the Contractor.

The Contractor shall maintain drainage in the area of the field office at all times during construction and shall restore the area to original conditions after the Work is completed.

The Contractor shall comply with all local ordinances, State of Ohio Building Code and Department of Industrial Compliance requirements and/or safety regulations as it relates to the establishment and maintenance of the field office.

Section 619.04 shall be deleted and replaced with the following:

B. Basis of Payment

The field office will be paid at the Contract lump sum price bid, which price shall be full compensation for furnishing and maintaining facilities, all utilities, heat, electric, telephones, weekly cleaning and removal of facilities upon completion of the Contract. Payment will be made as follows:

1. 20% of the lump sum will be paid upon Field Office mobilization.
2. 20% of the lump sum will be paid upon Field Office demobilization.
3. The balance of the lump sum shall be paid in monthly payments equal to the balance of the lump sum divided by the number of months in the project's schedule.

Item	Unit	Description
SP 619	Lump Sum	Field Office

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SP 623 **CONSTRUCTION LAYOUT SURVEY**
(*12-05-2019)*

A. Description

In addition to the requirements of Item 623 of the Specifications, the Contractor shall be required to perform the following:

1. In order to meet established roadway grades, to assure the construction of the required thickness of deck slabs, and to assure the proper location of the reinforcing steel in the deck slabs; the Contractor shall obtain the elevations of the bridge beam seats and the top of new and existing steel beams after the complete removal of existing deck slab at the locations shown in the table for the final pavement elevations, and compute the deck thickness over the beams. The Contractor shall furnish the elevations to the Chief Engineer for final checking. If the computed deck thickness is found to be less than minimum thickness required, the top of final pavement elevations shall be adjusted as directed by the Chief Engineer. Formwork shall not proceed until a check of the final elevations has been performed by the Chief Engineer. The Contractor shall also compute the deck screed elevations, utilizing the dead load deflections. The Contractor is required to provide the information specified in this paragraph only when related Work Items are installed or modified in the Project.

   Prior to placing the approach slabs, the Contractor shall provide the Chief Engineer lane line and edge of pavement elevations at five foot (5') intervals of the as-built elevations of the abutment and deck slabs, and for a distance of five hundred feet (500') beyond the approach slab limits. After receipt of these elevations, the Chief Engineer will calculate and provide to the Contractor final elevations for the approach slabs and approach pavement. No approach slabs shall be poured nor shall paving commence until receipt of these final elevations from the Chief Engineer. The Contractor is required to provide the information specified in this paragraph only when related Work Items are installed or modified in the Project.

   The Contractor shall obtain elevation data at five foot (5') maximum increments along the cut line of the superstructure, abutment slabs, approach slabs and along the edge of asphalt pavement for five hundred feet (500') (minimum) beyond both ends of the structure. The Contractor shall review the data and identify all areas which do not provide a smooth profile. Corrective measures may be required immediately adjacent to the cut line and/or across the existing lanes. The survey data as well as the identified areas shall be submitted to the Chief Engineer for approval at least two (2) weeks prior to the superstructure concrete being placed.

2. The location of guardrail runs and impact attenuators shown on the Plans shall be approved by the Chief Engineer prior to installation. The locations of these items shall be field staked by the Contractor prior to installation for review by the Chief Engineer. The Chief Engineer may require adjustments to afford maximum protection for traffic. The Contractor is required to provide the information specified in this paragraph only when related Work Items are installed or modified in the Project.

3. The Contractor shall provide to the Chief Engineer survey data for verification of as-built conditions. The survey data shall include stationing, offsets, and elevations as required for the following items:

   a) Following substantial completion, provide to the Chief Engineer the vertical clearance measurements on both mainline and overhead bridges along each fascia beam at each painted edge line and lane line below each bridge. This Work shall be performed on all bridges, Mainline and overhead, within the Project limits whether the bridge includes work items or not. Clearances are to be obtained to the nearest 1/100th of a foot. The survey data shall be documented on an OTIC provided form and the form shall be sealed by a State of Ohio Registered Surveyor. This information is required only for projects with pavement or bridge related Work Items.

   b) Drainage items to include pipe runs, inlets, manholes, headwalls, underdrain runs and outlets, and all other drainage structures not listed herein. Invert elevations of inlets, manholes, underdrain outlets, headwalls, and other drainage structures shall be included. The Contractor is required to provide the information specified in this paragraph only when related Work Items are installed or modified in the Project.

   c) Structure items including, but not limited to, piling, foundations, bearing seats, and other elements deemed necessary by the Chief Engineer. The Contractor is required to provide the information specified in this paragraph only when related Work Items are installed or modified in the Project.

   d) Final cross sections for embankments, excavations, drainage swales, on-site borrow or waste areas. The Contractor is required to provide the information specified in this paragraph only when related Work Items are installed or modified in the Project.

   e) Limits of Work for such items as pavement, concrete barrier, guardrail, SNAPs, and other elements deemed necessary by the Chief Engineer. The Contractor is required to provide the information specified in this paragraph only when related Work Items are installed or modified in the Project.

B. Basis of Payment

Payment for the above-mentioned Work shall be included with the lump sum price for Item SP 623 - Construction Layout Survey.

Payment shall be made under:

Item	Unit	Description
SP 623	Lump Sum	Construction Layout Survey

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SP 730 **TRAFFIC CONTROL SIGN AND SUPPORT MATERIAL**
(01-13-2022)

A. Construction Signs

The contractor shall provide the project with new construction signs at the start of the project. Construction signs shall conform to the following:

Reflective Sheeting

a. Reflective sheeting shall conform to the requirements of the most current version of ASTM D4956, including supplementary requirement S2 and any exceptions and/or additions included herein.

b. Reflective sheeting used on retroreflective rollup signs shall be Reflexite Marathon, 3-M Diamond Grade, or approved equal material and shall conform to the requirements for a Type VI material except fluorescent orange signs shall conform to the following color specification limits:

Daytime color and maximum spectral radiance factor (peak reflectance) of the fluorescent orange sheeting mounted on aluminum test panels shall be determined instrumentally in accordance with the requirements of ASTM E 991. The values shall be determined on a HunterLab Labscan 6000 0/45 Spectrocolorimeter with option CMR 559, or approved equal instrument with circumferential viewing (illumination). Computations shall be done in accordance with the requirements of ASTM E 308 for the two (2) degrees observer. Color shall conform to the following requirements:

Color Specification Limits* (Daytime)

	1		2		3		4		Daytime Luminance Factor Y (%)	
Color	x	y	x	y	x	y	x	y	Min.	Max.
Fluorescent Orange	0.581	0.305	0.516	0.355	0.569	0.335	0.655	0.285	30	40
White	0.418	0.305	0.394	0.355	0.341	0.375	0.345	0.325	-----	-----

*The four (4) pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colormetric system measured with standard illuminant D65. Maximum spectral radiance factor 110 percent minimum.

The sign legend shall be permanently affixed to the sign face. Overlay patches are prohibited.

Construction signs shall conform to the requirements of Item 730.192, Reflective Sheeting Type H, or the above requirements for reflective sheeting if the sign is a rollup sign. In addition, sign substrates for signs

mounted on Type III Barricades and portable sign supports shall be of the same material that was used when the device was tested and found to be in compliance with the requirements of *National Cooperative Highway Research Program Report 350 (NCHRP-350)* , Test Level 3 or of other substrate materials allowed in the FHWA acceptance letter.

B. Sign Supports

The Contractor shall furnish portable sign stands for mounting temporary sign panels in accordance with the following:

Portable sign stands shall be Eastern Metal/USA - Sign Model x-603, Traffix Big Buster 60000 Series, MDI Windmaster Model 4860K, or approved equal and shall accommodate signs of the shape being utilized. Portable sign stands shall include decals, stenciling or some other durable marking system that indicates the manufacturer and model number of the stands. Such marking shall be of sufficient size so it is legible to a person in a standing position.

Portable sign stands including the sign and accessories shall conform to the requirements of NCHRP-350, Test Level 3 or AASHTO Manual for Assessing Safety Hardware (MASH). NCHRP-350 approved devices manufactured prior to 12/31/2019 will be permitted for use through December 31, 2024, provided they meet the ODOT Quality Standards for Temporary Traffic Control Devices (TTCDs). The Contractor shall submit a certification letter stating the brands and models of portable sign stands and a copy of the acceptance letter indicating compliance with NCHRP-350 or MASH prior to using the portable sign stands.

Tripod sign stands will not be allowed for use on any roadway.

Sign panels shall be installed and maintained such that the bottom of the sign is five (5) feet above grade.

C. Basis of Payment

The cost of furnishing construction signs and sign supports shall be included in Item SP 614 - Maintaining Traffic for payment.

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 800
REVISIONS TO THE 2019 CONSTRUCTION & MATERIAL SPECIFICATIONS

DATED 07/15/2022

101.02

On page 7, **Add** the following abbreviation below ASCE:

ASLA American Society of Landscape Architects

101.02

On page 9, **Add** "ITS Intelligent Transportation System" below "ITE Institute of Transportation Engineers".

101.02

On page 9, **Replace** "OTE Office of Traffic Engineering" with "OTO Office of Traffic Operations".

101.02

On page 10, **Replace "**REA Rural Electrification Administration" with the following:

REA Rural Electrification Act

101.02

On page 13, Delete the following:

~~QCQC Quality Control Qualifications Committee~~

101.03

On page 13, **Replace** the definition of Engineer with the following:

Engineer. Duly authorized agent of the Department acting within the scope of its authority for purposes of engineering and administration of the Contract. In managing the administration of the contract, the Engineer may confer with representatives of Industry including, but not limited to, the designer of record, landscape architects, environmental specialists, etc.

101.03

On page 14, **Add** the following definition below **Prebid Question**:

Professional Landscape Architect. A landscape architect registered with the Ohio Landscape Architects Board to practice landscape architecture in the State of Ohio.

102.16

On page 22, **Delete** the following:

102.16 Certificate of Compliance with Affirmative Action Programs. Before any Contract is awarded, the Department will require the Bidder to furnish a valid Certificate of Compliance with Affirmative Action Programs, issued by the State EEO Coordinator ~~dated prior to the date fixed for the opening of bids~~.

104.02.D

On page 25, **Replace** the first full paragraph with the following:

If the Contractor disagrees as to whether an alteration constitutes a significant change, use the notification procedures specified in 108.02.F.

104.02.D

On page 25, **Replace** item a. under Table 104.02-1 with the following:

a. the estimated quantity of a contract item exceeds four units (this minimum quantity does not apply to pavement markings measured in units of miles), and

105.19

On page 35, **Replace** 105.19 with the following:

105.19 Value Engineering Change Proposals. The Department will partner with the Contractor by considering a Contractor's submission of a Value Engineering Change Proposal (VECP) which may reduce the overall construction cost~~s~~ ~~and possibly time~~ on projects ~~that do not contain~~ not containing Design Build provisions ~~or incentive provisions based on time~~. ~~The purpose of this provision is to encourage the use of the ingenuity and expertise of the Contractor in arriving at alternate plans, specifications or other requirements of the contract.~~ Savings in construction costs ~~and possibly time~~ will be shared equally between the Contractor and the Department. The Department will partner with the Contractor by considering a VECP for time savings on projects not containing time-based award provisions. The economic value of the savings in time will be shared equally between the Contractor and Department, however the impacted completion date shall be adjusted to the full amount. Time savings VECPs may increase contract value if accepted by the Department. Time savings VECPs shall not consist of only acceleration and shall contain a substantial amount of material savings as determined by the Department.

The Contractor's costs for development, design and implementation of the VECP are not eligible for reimbursement. The VECP must not impair any of the essential functions and characteristics of the project such as service life, reliability, economy of operation, ease of maintenance, safety and necessary standardized features. The VECP designer may not be the ODOT designer of record. The submission of the VECP Value Engineering Change Proposal shall conform to Supplement 1113. ~~Acceptance of a VECP is at the sole discretion of the Director.~~

The Department will not approve VECPs with any of the following characteristics:

A. Consist only of non-performing items of work contained in the plans.

B. Include identified plan errors as part of the cost reduction, at the discretion of the Department.

C. Changes to any special architectural or aesthetic treatments or requires changes to NEPA commitments.

D. Requires concrete beams to be installed with less than 17' vertical clearance over a state highway.

E. Changes the type or buildup of permanent pavement.

F. Compromises controlling design criteria or would require a design exception as discussed in Volume I, Section 100, of the Location and Design Manual.

G. Proposes a time savings to any portion of work on a project which has an Incentive / Disincentive clause associated with Project award.

VECP engineering, design development and implementation costs are not recoverable. Contractor costs or delays due to the Department's review or rejection of the VECP are not recoverable.

The Department may reject the Contractor's initial VECP or portions thereof and may proceed with such revisions without any obligations to the Contractor if the Department already is considering revisions to the contract which are subsequently proposed as a VECP.

Acceptance of a VECP is at the sole discretion of the Director and may be rejected for any reason.

106.09

On page 38, **Replace** the entire section 106.09 with the following text:

106.09 Steel Products Made in the United States. Furnish steel products that are made in the United States according to the applicable provisions of State of Ohio laws, ORC 153.011 and 5525.21. "United States" means the United States of America and includes all territory, continental or insular, subject to the jurisdiction of the United States.

A. State Requirements. All steel products used in the Work for load-bearing structural purposes must be made from steel produced in the United States. State requirements do not apply to iron.

B. Exceptions. The Director may grant specific written permission to use foreign steel products in bridge construction. The Director may grant such exceptions under either of the following conditions:

1. The cost for each contract item used does not exceed 0.1 percent of the total contract cost, or $2,500, whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project.

2. The director determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

C. Proof of Domestic Origin. Furnish documentation to the Engineer showing the domestic origin of all steel products covered by this section, before they are incorporated into the Work. Products without a traceable domestic origin will be treated as a non-domestic product.

106.12

On page 39, **Add** the following section after 106.11.

106.12 Traffic Authorized Product. The Department may use Traffic Authorized Product (TAP) List for approval of products used in Intelligent Transportation Systems (ITS) or Traffic Signal Systems. The Office of Traffic Operations will maintain the TAP and the standard procedure for the TAP process. Inclusion of a product onto the TAP will be determined by Office of Traffic Operations with support from other Department offices. To be kept on the TAP, manufacturers must recertify their product according to the Department's standard procedure by February 28 of each year. When a product requires TAP acceptance, only provide products listed on the TAP at the time of delivery of the product to the project. Provide the Engineer documentation according to the Department's standard procedure that, at the time of delivery, the material provided is on the TAP.

106.13

On page 39, **Add** the following section after 106.12.

106.13 Certified Supplier. The Department may use Certified Suppliers for approval of manufactured materials. The Office of Materials Management (OMM) will maintain the Certified Supplier list and the standard procedure for the Certified Supplier process. Inclusion of a material onto the Certified Supplier list will be determined by OMM with support from other Department offices. Administration of the Certified Supplier Program will be in accordance with Supplement 1139.

107.07

On page 40, **Add** the following paragraph after the first paragraph:

Any illegal drugs, drug paraphernalia, mobile drug labs or dumps, weapons or firearms found on the Project Right of Way shall be considered a potential crime scene and shall not be handled or moved. Immediately notify law enforcement and the Project Engineer.

107.13

On page 46, **Replace** the last sentence in the last paragraph with the following:

The decision of the DCE will be made within 14 days and will be administratively final.

107.15

On page 47, **Replace** the second paragraph with the following:

In the event that the Engineer determines that damage to completed permanent items of Work results from traffic using a substantially completed section of Roadway, the Department may compensate the Contractor for repair of the damage as authorized by Change Order. Additionally, if traffic permanently damages beyond use and of the following temporary maintenance of traffic items, the Department may compensate the Contractor for replacement of the item as authorized by Change Order:

1. Arrow board.
2. Work zone signal, pole, or controller.
3. Lighting unit or pole.
4. Changeable message sign.
5. Work Zone Impact Attenuator
6. Truck Mounted Impact Attenuator
7. Digital Speed Limit Sign Assembly

107.15

On page 47, **Replace** the **A.** through **D.** with the following:

To receive compensation for the damage to permanent items of Work or temporary maintenance of traffic items named above, the Contractor must first meet the following requirements.

A. Notify the Engineer of each occurrence of damage in writing within 10 Calendar Days.

B. Contact the local law enforcement agency to determine if the accident was investigated and a report filed. If an accident report was filed, obtain the report and notify the motorist, and copy their insurance company, via certified mail informing both that the motorist is responsible for the cost of damage repairs. If the motorist does not respond within 30 days, make a second attempt to contact the motorist and copy the insurance company via certified mail.

C. If no response is received from the motorist or insurance company within 30 days of the motorist receipt of the second notice, send a letter to the Engineer within eighteen months of the event and include documentation of good faith effort to seek recovery from responsible parties.

D. The Department will make an adjustment according to 108.06 and 109.05 to compensate the Contractor for the added costs and delays, if any, resulting from the repair or replacement of damaged Work.

If there is no accident report on file and no means of identifying the responsible motorist, the Contractor may likewise be compensated to repair the damaged Work.

107.21

On page 50, Replace the paragraph with the following:

107.21 Prompt Payment. In accordance with ORC 4113.61, make payment to each subcontractor and supplier within 10 Calendar Days after receipt of payment from the Department for Work performed or materials delivered or incorporated into the Project, provided that the pay estimate prepared by the Engineer includes Work performed or materials delivered or incorporated into the

public improvement by the subcontractor or supplier. Contractors are prohibited from holding retainage from subcontractors that can provide a bond. For unbonded subcontractors and suppliers, promptly release any retainage held, as set forth in any subcontractor or supplier agreement, 30 days after the work is satisfactory completed. For the purposes of this section, satisfactory completed will be interpreted as when the subcontractor has completed all physical work and submitted any necessary documentation required by the specifications and the Department. No subcontract provision shall permit the Contractor to delay subcontractor's retainage payments until the Project's final payment.

108.02.B.

On page 53, **Add** the following item to Section B after number 7:

8. On-line surveys of Project participants may be used to evaluate Project goals and help identify issues either before or immediately after the Initial Partnering Session. The on-line survey is located on the Division of Construction Management's Partnering website:
http://www.dot.state.oh.us/Divisions/ConstructionMgt/Pages/Partnering.aspx

108.02.E.

On page 53, **Replace** Section E with the following:

E. Partnering Monitoring. Monitor the progress of the Partnering relationship based on the goals decided during the Initial Partnering Session. On-line surveys of Project participants may be used to monitor progress on Project goals and help identify issues as they arise. The on-line survey is located on the Division of Construction Management's Partnering website:
http://www.dot.state.oh.us/Divisions/ConstructionMgt/Pages/Partnering.aspx

108.02.I.

On page 59, **Replace** Section I with the following:

I. Partnering Close-Out Survey. On-line surveys of Project participants may be used to get participants' feedback and improve the Partnering process. The Partnering Close-Out Survey is located on the Division of Construction Management's Partnering website:
http://www.dot.state.oh.us/Divisions/ConstructionMgt/Pages/Partnering.aspx

108.06.C

On page 64, **Add** the following paragraph after the first paragraph under the table:

Lane closures within the project, 60 days or less as indicated in the contract documents, which are impacted by weather will be extended for the actual work days lost each month. Lane closures within the project, 61 days or longer as indicated in the contract documents, which are impacted by weather will be extended when the actual work days lost exceeds the number of anticipated work days lost each month as determined by Table 108.06-1.

108.06.D.4

On page 64, **Replace** item D.4. with the following:

4. Delays due to acts of the government or a political subdivision other than the Department.

108.07

On page 65, **Replace** the fifth paragraph in section 108.07 "The Director may stop deducting liquidated damages when:" with the following:

Provided the project is available for use as intended by the Contract and the Work remaining will not impact traffic, the Contractor may submit a request that the Department suspend the assessment of liquidated damages for a stated period of time. For the limited purposes of assessing liquidated damages, the closing of a shoulder is not considered an impact upon traffic. Submit this request within 30 days of the assessment of the liquidated damages. In addition to the written plan required to remain in control of the Work as stated above, this request should include at a minimum the Work left to be completed, the reason(s) the Work is incomplete or on hold, as well as, methods, resources and timelines for pursuing the same. This will define diligent pursuit of the work. Once accepted, and provided both of the following criteria are met, the Department may suspend the assessment of liquidated damages:

108.07

On page 65, **Replace** the subsections A through E with the following:

A. The Contractor is diligently pursuing the remaining Work.

B. Necessary items are completed and operational to provide an appropriate level of safety to the traveling public. These items include but are not limited to signs, pavement markings, guardrail, attenuators, signals and RPM's.

108.07

On page 65, **Replace** Table 108.07-1 with the following:

TABLE 108.07-1 SCHEDULE OF LIQUIDATED DAMAGES

Original Contract Amount (Total Amount of the Bid)		Amount of Liquidated Damages to be Deducted for Each Calendar Day of Overrun in Time
From More Than	To and Including	
$0.00	$500,000	$400
$500,000	$2,000,000	$600
$2,000,000	$10,000,000	$900
$10,000,000	$50,000,000	$1,650
Over $50,000,000		$3,970

109.01

On page 66, **Replace** the first paragraph with the following:

109.01 Measurement of Quantities. The Department will measure the quantities of Work and calculate payments based on the method of measurement and basis of payment provisions provided in these Specifications. When the following units of measure are specified, the Department will measure quantities as described below unless otherwise specified in the Contract Documents. ~~The accuracy of individual pay item estimate payments will be one decimal more accurate than the unit of measure denoted for the pay item.~~ The accuracy for both Daily Diary payment and Final Quantity payment will be in accordance with Supplement 1133.

109.01

On page 67, **Replace** the 7th paragraph with the following:

Cubic Yard (Cubic Meter) for Asphalt Concrete. Measure as specified in 401.12.

109.05.C.8.b

On page 81, **Replace** the second paragraph with the following:

b. Trucking that is subject to the prevailing wage law will be compensated according to 109.05.C.1, 109.05.C.2, 109.05.C.4, 109.05.C.6, and 109.05.C.10.

109.05.C.10

On page 82, **Replace** the last paragraph with the following:

In the event the Contractor declines to sign the Daily Force Account Record, the Department's records shall govern. Any resulting dispute must be pursued in accordance with 108.02.G.

109.07

On page 87, **Replace** the section with the following:

109.07 Inefficiency. The Department will compensate the Contractor for inefficiency or loss of productivity resulting from 104.02 Revisions to the Contract Documents. Use the Measured Mile analysis comparing the productivity of work impacted by a change to the productivity of similar work performed under un-impacted conditions to prove and quantify the inefficiency.

Provide notice as per 108.02.F when inefficiency or loss of production is experienced resulting from 104.02 Revisions to the Contract Documents.

Use the following calculation for the Measured Mile analysis:

Additional Crew Hours = (Unit Productivity Unimpacted Period - Unit Productivity Impacted Period)/Unit Productivity Unimpacted Period x (Number of Units During Impacted Period/Unit Productivity Impacted Period)

109.09

On page 87, **Replace** the second paragraph with the following:

Except for the final estimate, the Department will not pay an estimate until the Contractor certifies to the Engineer that the work for which payment is being made was performed in accordance with the contract. Certification will be made on forms provided by the Department.

109.12.A

On page 89, **Replace** the third paragraph with the following:

Notify the Engineer when the Project is complete and all of the Engineer's punch list items are complete. If the Engineer agrees the Project is complete, then within 15 business days the District Final Inspector will inspect the Work and categorize it as one of the following:

202.05

On page 96, **Replace** the 1st and 2nd paragraphs with the following:

202.05 Pavement, Walks, Curbs, Steps, Gutters, or Traffic Dividers Removed. As designated, remove and dispose of the existing concrete pavement, asphalt pavement, wearing course, brick, walks, steps, gutters, curbs, and concrete traffic dividers. If removing only a portion of an existing pavement, walk, step, gutter, curb, or traffic divider, saw or otherwise construct a neat joint at the removal limit.

If Pavement Removed is specified, remove all pavement layers, including asphalt, concrete, and brick, from the surface to the bottom of the pavement courses as shown on the plans. Pavement Removed does not include removal of any unbound aggregate or natural soil material. If Wearing

Course Removed is specified, remove all asphalt from the surface to the top of the concrete, brick, or both, or to the depth shown on the plans. If the existing surface is brick and Wearing Course Removed is specified, remove all brick from the surface. If Concrete Median Removed or Concrete Barrier Removed is specified, remove all the concrete to the depth specified in the plans.

202.13

On page 99, **Replace** the first paragraph with the following:

202.13 Basis of Payment. Payment is full compensation for all work involved in the removal and storage, reuse, or disposal of structures and obstructions, including excavation and backfill incidental to their removal, saw cutting, removing the contents of the underground storage and septic tanks and the custody, preservation, storage on the Right-of-Way, and disposal as provided in this specification.

202.13

On page 100, **Delete** the following:

~~202~~	~~Square Yard (Square Meter)~~	~~Base Removed~~
~~202~~	~~Each~~	~~Precast Traffic Divider Removed for Reuse or Storage~~

202.13

On page 100, **Add** the following below 202 Foot (Meter) Curb Removed for Storage:

202	Foot or Square Yard (Meter or Square Meter)	Concrete Median Removed
202	Foot (Meter)	Concrete Barrier Removed

203.02.B.

On page 101, **Delete** the entire section:

~~**B. Base.** Selected material of planned thickness placed on the subgrade as a foundation for other bases, or asphalt or concrete pavements. The base is a part of the pavement structure.~~

203.04

On page 103, **Replace** the second sentence of the fifth paragraph with the following:

The area is considered to contain hazardous waste or material and must be handled according to Department procedures and appropriate environmental agency regulatory requirements.

203.04.E

On page 104, **Delete** the entire section:

~~**E. Pavement Widening Construction.** Locate sound pavement edges, and cut and trim pavement to a neat line. Repair and restore damage caused by the equipment or methods. Include the cost of cutting, trimming, and disposal under Item 203 Excavation.~~

203.06.A.

On page 106, **Add** the following paragraph before the fist paragraph:

A. Soil and Granular Embankment. Use a footed drum roller having a minimum effective weight of 10 tons to compact cohesive soil, except that the Contractor may use a smooth drum vibratory roller if the quantity of embankment is 75 cubic yards or less and the roller is operating on a slope no steeper than 4:1.

For soil or granular material, when a test section is used, use a minimum compactive effort of eight passes with a steel drum roller having a minimum effective weight of 10 tons (9 metric tons).

205.02

On page 118, **Replace** the first line of the materials list of 205.02 with the following:

Portland Cement. 701.04, 701.15

206.02

On page 121, **Replace** the first line of the materials list of 206.02 with the following:

Portland Cement. 701.04, 701.15

251.03

On page 142, **Replace** the first sentence of the 3rd paragraph with the following:

Thoroughly compact the final lift using a Type I pneumatic tire roller conforming to 449.02.

252.03

On page 143, **Replace** the section with the following:

252.03 Correction of Subgrade. Shape and recompact the subgrade as the Engineer directs. Clean all vertical faces of the existing pavement, and coat them with asphalt material according to 401.06.

252.04

On page 143, **Replace** the 1st paragraph with the following:

252.04 Placement of Asphalt Concrete. Construct the pavement replacement by placing and compacting Item 301, 441 Type 2, or 442 19mm material in two or more lifts according to 449.03.

252.04

On page 143, **Replace** the first sentence of the 3rd paragraph with the following:

Thoroughly compact the final lift using a pneumatic tire roller conforming to 449.02.

253.03

On page 145, **Replace** the 2nd sentence of the 1st paragraph with the following:

Before placing asphalt concrete, clean all vertical faces of the existing pavement and coat them with asphalt material according to 401.06.

253.03

On page 145, **Replace** the 1st sentence of the 2nd paragraph with the following:

Thoroughly compact the final lift using a pneumatic tire roller conforming to 449.02.

301

On page 161, **Replace** the entire section with the following:

301.01 Description
301.02 Composition
301.03 Placement
301.04 Acceptance
301.05 Basis of Payment

ITEM 301 ASPHALT CONCRETE BASE

301.01 Description. This work consists of constructing a base course of aggregate and asphalt binder, mixed in a central plant and spread and compacted on a prepared surface. The requirements of Items 401, 402, and 403 apply with the additional requirements of this specification. The requirements of Item 440 apply except 440.04 and 440.06 do not apply.

301.02 Composition. Furnish aggregate for the mix that conforms to the following gradation:

TABLE 301.02-1 GRADATION

Sieve Size		Total Percent Passing
2 inch	(50 mm)	100
1 inch	(25.0 mm)	75 to 100
1/2 inch	(12.5 mm)	50 to 85
No. 4	(4.75 mm)	25 to 60
No. 8	(2.36 mm)	15 to 45
No. 16	(1.18 mm)	10 to 35
No. 50	(300 µm)	3 to 18
No. 200	(75 µm)	1 to 7

Submit for OMM's approval the desired percentage of the aggregate passing the No. 4 (4.75 mm) sieve and blend of individual components. The Contractor may use reclaimed asphalt concrete pavement according to 440.05. OMM will establish the required binder content within a range of 4.7 to 7 percent. Do not make changes in these JMF values due to unsatisfactory results or other conditions except as authorized by OMM.

Do not start mix production without a preliminary JMF approval and 48 hour notification to District Testing. Final approval of a JMF will be based upon field verification. The JMF can be rejected for failure to verify in the plant or at the project.

301.03 Placement. Ensure that the maximum compacted depth of any one layer is 6 inches (150 mm). Ensure that the temperature of the mixture when delivered to the paver is a minimum of 250 °F (120 °C). Ensure the temperature of the mixture is sufficient for the roller coverage to be effective in compacting the mixture.

301.04 Acceptance. The Department will base acceptance of the asphalt concrete mix on the item specified in the Contract item description. (i.e., 449)

301.05 Basis of Payment. Include the cost of asphalt material to coat vertical faces and seal joints and gutters in the contract unit price for Item 301. The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
301	Cubic Yard (Cubic Meter)	Asphalt Concrete Base ( )

302

On page 162, **Replace** the entire section with the following:

ITEM 302 ASPHALT CONCRETE BASE

302.01 Description
302.02 Composition
302.03 Placement
302.04 Acceptance
302.05 Basis of Payment

302.01 Description. This work consists of constructing a base course of aggregate and asphalt binder, mixed in a central plant and spread and compacted on a prepared surface. The requirements of Items 401, 402, 403, 440 apply with the additional requirements of this specification.

302.02 Composition

A. General. Furnish a mixture that conforms to the following gradation and properties:

TABLE 302.02-1 MIX COMPOSITION

Property	Limits
2 inch (50 mm)[1]	100
1 1/2 inch (37.5 mm)[1]	85 to 100
1 inch (25.0 mm)[1][2]	68 to 88
3/4 inch (19.0 mm) [1][2]	56 to 80
1/2 inch (12.5 mm)[1][2]	44 to 68
3/8 inch (9.5 mm)[1] [2]	37 to 60
No. 4 (4.75 mm)[1]	22 to 45
No. 8 (2.36 mm)[1]	14 to 35
No. 16 (1.18 mm)[1]	8 to 25
No. 30 (600 µm)[1]	6 to 18
No. 50 (300 µm) [1]	4 to 13
No. 200 (75 µm) [1]	2 to 6
Binder Content [3]	3.9 – 6.0 [4]
Blows [5]	70
Stability, lb [5] (N)	3000 (13,345) [Min]
Flow, 0.25 mm [5]	28 [Max]
Design Air Voids [6]	4.0
Voids in Mineral Aggregate %	12.0 [Min]

[1] Sieve, Percent Passing
[2] Provide aggregate to retain a minimum of 7 percent of the material on each of these sieves. This requirement applies to the gradation of the JMF and the mix production according to Item 403.
[3] See tables in 440.05
[4] Percent of total mix
[5] ASTM D 5581
[6] Percent, Supplement 1036

Use equipment that meets the requirements of a Level 3 laboratory as specified in Supplement 1041.

Produce batches of asphalt concrete base in the amount that will result in a compacted specimen 3.75 ±0.05 inch (95 ±1.3 mm) in height. This amount is about 4050 grams.

B. Compaction of Specimens. Fill the mold with asphalt concrete base by placing approximately one-half of the batch in the mold and spading it vigorously with a heated spatula or trowel 15 times around the perimeter and ten times in the interior. Place the second half of the batch in the mold and spade the mixture in the same manner.

C. Stability Correlation Ratios. Convert measured stability values for specimens that depart from the standard 3.75-inch (95 mm) thickness to an equivalent 3.75-inch (95 mm) value by multiplying the stability value by the appropriate correlation ratio as follows:

TABLE 302.02-2 STABILITY CORRELATION RATIOS

Approximate Thickness of Specimen, inches (mm)		Correlation Ratio
3 1/2	(89)	1.12
3 9/16	(90)	1.09
3 5/8	(92)	1.06
3 11/16	(94)	1.03
3 3/4	(95)	1.00
3 13/16	(97)	0.97
3 7/8	(98)	0.95
3 15/16	(100)	0.92
4	(102)	0.90

302.03 Placement. Provide and operate anti-segregation equipment in accordance with the requirements of 401.03.C excluding the use of remixing pavers. Use anti-segregation equipment for all project line items containing 1000 or more cubic yards (766 cubic meters) of Item 302 Asphalt Concrete Base. Ensure that the compacted depth of any one layer is a minimum of 4 inches (100 mm) and a maximum of 7.75 inches (190 mm). If the plan thickness is 7.0-7.75 inches (178 mm – 190 mm) and District Testing confirms the JMF and mixture production has 95% passing the 1.50 inch (37.5 mm) sieve, the 302 may be placed in two lifts if requested by the Contractor. One lift of plan thickness will be required if top size aggregate dragging occurs. Ensure that the temperature of the mixture when delivered to the paver is a minimum of 250 °F (120 °C). Ensure the temperature of the mixture is sufficient for the roller coverage to be effective in compacting the mixture.

302.04 Acceptance. The Department will base acceptance of the asphalt concrete mix on the method specified in the Contract line item description. (i.e. 449)

302.05 Basis of Payment. Include the cost of asphalt material to coat vertical faces and seal joints and gutters in the contract unit price for Item 302. The Department will pay for accepted quantities at the contract price as follows:

Item	Unit	Description
302	Cubic Yard (Cubic Meter)	Asphalt Concrete Base (_)

304.03

On page 165, **Replace** the second sentence of the first paragraph with the following:

Create the moisture-density curve according to AASHTO T 99, Method C or Method D, to determine the optimum moisture content.

401

On page 172, **Replace** the entire section with the following:

ITEM 401 ASPHALT CONCRETE FIELD OPERATIONS

401.01 Description
401.02 Materials
401.03 Equipment
401.04 Notification
401.05 Weather Limitations
401.06 Conditioning Existing Surface
401.07 Hauling
401.08 Placement Operations
401.09 Asphalt Binder Compatibility
401.10 Surface Tolerances
401.11 Opening to Traffic
401.12 Method of Measurement

401.01 Description. This specification describes the field operation requirements for placing all types of asphalt concrete material used in pavement surface, intermediate, and base courses. Deviations from these general requirements are covered in the specific requirements for each material type according to the appropriate contract item or items.

Use an approved Job Mix Formula (JMF). Control all field operations to ensure that the mixture placed is uniform in composition, conforms to the specification requirements, is free of any defect (ex. segregation, tenderness, lack of mixture and texture uniformity, raveling, flushing, rutting, holes, debris, etc.) within the Contractor's control at project completion.

401.02 Materials. Furnish materials conforming to:

Asphalt material (401.06, 401.08.D, 401.11)..... 702.01, 702.04, 702.09, 702.12, or 702.13

401.03 Equipment. Provide equipment meeting the requirements below.

A. Hauling Equipment. Use trucks for hauling asphalt concrete that have tight, clean, smooth metal beds. Equip all truck beds with a securely fastened, waterproof cover of suitable material to protect the mixture from wind and weather during transport. In addition to covers, insulate all truck beds if transporting asphalt concrete at prevailing air temperatures below 50 °F (10 °C) or if the haul distance exceeds 20 miles (32 km).

B. Spreading Equipment. Use self-contained spreading equipment of sufficient size, power, and stability to receive, distribute, and strike-off the asphalt concrete at rates and widths meeting the typical sections and other details shown on the plans. Use spreading equipment that has automatic control systems that maintain the screed in a constant position relative to profile and cross-slope references. Ensure control of the screed position is reasonably independent of irregularities in the underlying surface and of the spreader operation. Equip asphalt spreading equipment to prevent segregation of the asphalt concrete when the material moves from the hopper to the screed. Use means and methods approved by the asphalt spreader manufacturer consisting of but not limited to any combination of chain curtains, deflector plates, kickback panels, reverse augers, or other such devices.

When a safety edge is required, attach a device to the screed that confines the material at the end gate and extrudes it in such a way that results in a compacted wedge shape pavement edge of approximately 30 degrees and not steeper than 40 degrees. Ensure the device maintains contact with the prepared surface and allows for transition to crossroads, driveways, and obstructions. Do not use conventional single plate

strikeoff. Obtain the Engineer's approval for short sections of handwork when necessary for transitions, turnouts, or other areas.

The Engineer will base final approval of spreading equipment on the demonstrated capability of the equipment to place the mixture to the required cross-section, profile and alignment in an acceptable, finished condition ready for compaction.

Where the use of standard full-scale spreading equipment is impractical due to the size or irregularity of the area to be paved, use specialized equipment or hand methods approved by the Engineer to spread the asphalt concrete.

C. Anti-Segregation Equipment. When anti-segregation equipment is specified, provide a Material Transfer Vehicle (MTV) with paver hopper insert; a Material Transfer Device (MTD) with paver hopper insert; or a remixing paver specifically manufactured to eliminate segregation. Use paver hopper inserts with a minimum capacity of 10 tons (9 metric tons). Remixing may be done by the MTV, MTD, in the paver hopper insert, or by the remixing paver.

Provide and operate equipment in a manner that does not result in physical segregation and limits temperature differentials to less than 35 °F (19.5 °C) throughout the mixture as measured behind the paver and before rolling. Construct a test strip according to 401.08.B to demonstrate the equipment meets these requirements.

Use anti-segregation equipment when specified for paving intermediate and surface courses of uniform thickness on all mainline lanes of the traveled way including express lanes, collector-distributor lanes, continuous center turn lanes, acceleration/ deceleration lanes, and ramp lanes.

D. Compaction Equipment. Provide steel wheel or pneumatic tire rollers. Ensure the rollers fully and satisfactorily provide the required compaction, are mechanically sound, and meet asphalt industry standards. The Department retains the right to reject the use of rollers that are not in good repair or are not designed to do the work required.

Equip drums and wheels with the necessary accessories to prevent adhesion of the mixture.

401.04 Notification. Notify the Engineer at least 24 hours before starting paving. After starting, if paving operations stop for 1 week or more, notify the Engineer at least 24 hours before resuming paving.

401.05 Weather Limitations. Place asphalt concrete only if the surface is dry and if weather conditions are such to ensure proper handling, finishing, and compaction. Never place asphalt concrete if the surface temperature is below the minimum established in Table 401.05-1. Chemical warm mix asphalt (WMA) additives on the approved list may be used to allow placement in colder temperatures and to place asphalt concrete later in the year. Water-injected WMA does not apply.

TABLE 401.05-1 WEATHER LIMITATIONS

	Minimum Surface Temperature	
Course Thickness	Without Chemical WMA	With Chemical WMA[1]
3.0 inches (75 mm) and over [2]	36 °F (2 °C)	32 °F (0 °C)
1.5 to 2.9 inches (38 to 74 mm)	40 °F (5 °C)	32 °F (0 °C)
1.0 to 1.4 inches (25 to 37 mm)	50 °F (10 °C)	40 °F (5 °C)
Less than 1.0 inch (25 mm)	60 °F (16 °C)	50 °F (10 °C)

Variable Intermediate, 0 to 3.0 inches (0 to 75 mm)	40 °F (5 °C)	32 °F (0 °C)
[1] Only use chemical WMA additives on the approved list. Chemical WMA additive must be in-line blended per S-1053, Method A, at the asphalt concrete mix plant. [2] When paving on an aggregate base or subgrade, use a minimum air temperature of 40 °F (5 °C), or a minimum air temperature of 32 °F (0 °C) when using chemical WMA.		

In addition to the above surface temperature requirements, do not place surface courses if the air temperature is less than 40 °F (5 °C) without chemical WMA or 32 °F (0 °C) with chemical WMA.

For any surface course with a polymer modified asphalt binder, ensure that the paving surface and the air temperature are at least 50 °F (10 °C) without chemical WMA or at least 40 °F (5 °C) with chemical WMA. In addition, for 424 mixes ensure the paving surface and air temperatures are at least 60 °F (15 °C) without chemical WMA or at least 50 °F (10 °C) with chemical WMA.

Do not schedule the placement of any surface course with a polymer modified asphalt binder after November 1, regardless of pavement and air temperatures. Obtain the approval of the Engineer to place any surface course with a polymer modified asphalt binder after November 1. Use an approved chemical WMA additive during production, if approved, but the minimum pavement and air temperatures in Table 401.05-1 apply.

The use of chemical WMA, as described above, may be denied if density acceptance does not achieve at least a pay factor of 1.00.

401.06 Conditioning Existing Surface. Clean the surface on which the asphalt concrete is to be placed and keep it free of accumulations of materials that would, in the judgment of the Engineer, contaminate the mixture, prevent bonding, or interfere with spreading operations. Where approved subgrade, aggregate, or pavement courses previously constructed under the Contract become loosened, rutted, or otherwise defective, correct the deficiency according to the contract item or items involved before spreading a subsequent pavement course.

If a quantity of asphalt concrete is specified for use in spot leveling or patching, spread and compact the material needed to make the corrections as directed by the Engineer.

If placing asphalt concrete against a vertical pavement face, curb, gutter, manhole, or other structure, clean the surface of foreign material and apply a thick, uniform coating of certified 702.01 PG binder, 702.09 Hot Applied Asphaltic Joint Adhesive, or 702.13 SBR Asphalt Emulsion to provide 100 percent coverage.

401.07 Hauling. Before loading, apply a thin coating of an approved release agent to the inside surfaces of the truck bed to prevent adhesion of mixture to the bed surfaces. OMM maintains a list of approved release agents. Do not use diesel or fuel oil for this purpose. Any use of non-approved release agent, diesel, or fuel oil may result in suspension of truck, driver, or both for up to one year. Drain truck beds after applying the release agent and before loading.

Cover truck beds with the secure, waterproof cover before hauling. At the request of the Engineer, remove bed covers before dumping into the paver. The Engineer may reject loads exhibiting segregation. Obtain OMM approval before making any procedure changes for better mix handling.

The Engineer will verify the required temperature of the mixture on arrival at the project site based on the temperature range in the JMF and heat losses in transit.

Completely discharge the mixture into the spreading equipment within 90 minutes of loading. Ensure the entire quantity of mixture discharges smoothly into the spreading equipment.

Do not clean out truck beds on the roadway ahead of the paver. Provide a location away from the roadway or off the project for cleaning trucks. If there is excessive sticking of material in truck beds, the sticking is in areas of the truck that would indicate excessive cooling of the mix (front corners, bottom, etc.) due to a long haul, and it is not resolved in a reasonable time, the Engineer will require an insulated bed.

Do not exceed a haul distance of 50 miles (80 km) from the asphalt concrete plant to the paving site regardless of prevailing air temperature except by specific permission of the Department.

401.08 Placement Operations. Do not co-mingle multiple JMFs in the same asphalt paver. Spread the mixture at a rate calculated using the specified thickness and the compacted width of the pavement course being placed, and the weight-to-volume conversion factors established by OMM. If there is not an OMM established rate, the conversion factors in 440.07 apply. Maintain the actual rate of spreading equal to the required calculated rate within the tolerance specified in 401.08.A. For pavement courses specified for leveling, the actual rate of spreading may vary from the required calculated rate as approved by the Engineer to accomplish the intended purpose.

Spread the mixture using approved equipment or methods. Preheat screeds and extensions before placing any asphalt concrete. Use side plates sufficient to contain the mixture laterally during spreading. Use only screed extensions, rigid or extendable, having the same features as the main screed including, but not limited to, vibration, heating, pre-strikeoffs, and tamping bars. When using front-mounted hydraulically extendable screeds at a fixed paving width use full width auger extensions and full tunnel extensions. When using fixed screed extensions use full width auger extensions and full tunnel extensions. Do not allow a buildup of excess material in front of the screed. Where excessive buildup of material is not controlled, the Engineer will require paver changes to correct the problem.

Ensure the paver operation, screed, screed extension, and mix design provide a mat, before compaction, that is free of texture inconsistencies, shadowing, streaking, tearing, pulling, or other deficiencies. Take immediate action to correct the paver operation, screed, screed extensions, or mix design. The Engineer may stop placement until corrections are completed.

Use strike-off plates/strike-off extensions only on irregular areas such as mailbox turnouts, driveway turnouts, and other irregular non-travelled roadway areas. The Engineer may approve the use of strike-off plates/extensions on variable width shoulders if the use of a standard extendable screed extension with the same features as the main screed is not practicable. Perform supplemental hand forming and tamping where irregularities develop and where placing the mixture by hand methods.

Take prompt corrective action if placed mixture exhibits any defect (ex. segregation, tenderness, lack of mixture and texture uniformity, raveling, flushing, rutting, holes, debris, etc.) within the Contractor's control and as determined by the Engineer.

Coordinate the spreading operation with the rate of production and delivery of the mixture to attain uniform, continuous progress. Avoid erratic spreader operation due to irregular contact with the hauling vehicle, surging in the feed, distribution of the mixture, or other cause. Maintain sufficient control of the spreading equipment with regard to line and grade references so that the pavement course, when compacted as specified, is in reasonable conformance with the Contract Documents.

Do not displace or damage bridge deck waterproofing membranes during spreading operations on the membranes.

Cease the paving operation in the event of equipment breakdown, inability to consistently provide a mat free of physical segregation, inability to consistently meet the temperature differential requirements, or any combination. Do not resume paving until equipment is replaced with suitable equipment.

When anti-segregation equipment is required the Engineer may allow paving to continue if an isolated area of mat temperature differential is in excess of 35 °F (19.5 °C). The Engineer may require additional evaluation of the area to determine the acceptability of the material.

A. Application Rate. If a uniform course is specified, make checks and adjustments to maintain the application rate within a tolerance of ±5 percent of the required calculated weight per unit of area.

If a variable depth course is specified, place the mixture as shown on the plans.

B. Anti-Segregation Test Strip. When using anti-segregation equipment, perform a test strip a minimum of 1000 feet (300 m) in length on the first day or night of paving any JMF. Notify the Engineer a minimum of 24 hours before performing the test strip. Demonstrate to the Engineer that the selected equipment is not physically segregating the mix and consistently limits the temperature differential of the mat surface, measured transversely behind the paver and before rolling, to 35 °F (19.5 °C) or less. Document results of each test strip on Department form CA-FP-5. Remove equipment or JMF that provides a mat with physical segregation, does not meet the temperature differential requirement, or both. Perform a new test strip any time placement equipment or JMF is replaced. If the Contractor is unable to produce a satisfactory test strip in two attempts per JMF, cease paving and provide a written plan to the DCA for approval before continuing the paving operation.

C. Night Work. Do not start night work or carry on day work into night work without operating an adequate and approved lighting system. Night work is work performed from 30 minutes after sunset to 30 minutes before sunrise.

Operation of adequate lighting system consists of furnishing, installing, operating, maintaining, moving, and removing nighttime lighting to illuminate construction work areas for night work. Obtain the Engineer's approval of the lighting at the beginning of the project and before starting the paving operation by measuring the luminance.

Provide an illuminated zone around all operating machinery. Provide an illuminated zone of at least 5 Foot-candles (55 lux) of lighting luminance in the immediate vicinity of pavers, rollers, grinding equipment, material transfer vehicles, etc., and at least 1 Foot-candle (10 lux) at 25 feet (7.6 m) from this equipment. Provide an illuminated zone of at least 5 Foot-candles (55 lux) of lighting luminance in the immediate vicinity of coring equipment and at least 1 Foot-candle (10 lux) at 10 feet (3 m). Position the light sources so they don't interfere with or impede traffic in any direction and do not cause glare for motorists or point onto adjacent properties. Provide a photometer capable of measuring the level of luminance on each night project. Take luminance measurements at a height of 20 inches (500 millimeters) above the roadway.

Obtain the luminance level any time requested by the Engineer. Test the illumination levels on the site each time a change in lighting configuration is made. Replace non-functioning lamps immediately. Check the luminaires aiming daily. Clean the luminaires regularly. Correct any deficient lighting within one hour or the Engineer will terminate construction activities.

When the total project includes more than one continuous lane mile (including bridges) of surface course paving in combination with night paving and there is no pay item for anti-segregation equipment, provide anti-segregation equipment according to 401.03.C, for only the surface course. Construct a test strip according to 401.08.B. No additional payment will be made for this anti-segregation equipment.

D. Joints. Place the asphalt concrete mixture as continuous as possible. Set up joints at the proper height above the adjacent construction to receive maximum compaction. Where the edge of the new pavement is significantly rounded, trim it to a vertical face before placing the adjacent pavement. On projects where

traffic is allowed to cross the edge of the new pavement lane, complete the longitudinal joint of the adjacent lane or shoulder within 24 hours.

Construct longitudinal joints using string line or other controls as a point of reference to provide a straight longitudinal joint. Before placing adjacent pavement, trim any locations along the longitudinal joint that deviate horizontally from the point of reference. Maintain a consistent overlap of 1 to 1 1/2 inches (25 to 38 mm) on adjacent pavement when closing longitudinal joints. Where phasing for maintenance of traffic will not allow lapping cold longitudinal joints according to Standard Construction Drawing BP-3.1, provide a minimum of 6 inches (150 mm) offset between cold joints for each course placed.

Form hot longitudinal joints using pavers operating in contiguous lanes, one just ahead of the other. Maintain the distance between pavers in adjacent lanes such that it does not exceed the distance that a normal size load of mixture will cover. Alternate loads of mixture between the pavers. Do not allow rollers performing the initial rolling operation in one lane closer than 12 inches (0.3 m) to the longitudinal joint until the adjacent lane is placed. Instead of hot joint construction using multiple pavers, the Contractor may use full width construction with a single unit paver.

Seal all cold longitudinal joints by coating the entire face of the cold joint with a certified 702.01 PG binder or 702.09 Hot Applied Asphaltic Joint Adhesive to provide 100 percent coverage of the joint face and extend at least 1/2 inch (13 mm) on both surfaces.

Seal all cold transverse construction joints with a certified 702.01 PG binder, 702.09 Hot Applied Asphaltic Joint Adhesive, or 702.13 SBR Asphalt Emulsion to provide 100 percent coverage of the joint; or with a certified 702.04 or 702.12 emulsified asphalt applied at a rate of 0.25 gallon per square yard (1 L/m²). For surface courses, form or cut all transverse construction joints to a vertical before sealing.

E. Compaction. Unless otherwise directed, begin rolling at the sides and proceed longitudinally parallel to the centerline at a slow, uniform speed. On superelevated curves, begin rolling at the low side and progress toward the high side. After each coverage or complete round trip, move the roller towards the crown of the road to begin the next pass, overlapping the previous pass by at least one-half the width of the previous pass. Continue rolling until full coverage of the course is complete and all roller marks are eliminated.

When constructing a longitudinal joint, roll the joint then follow the applicable rolling procedure.

During compaction, take care to prevent displacement of the mat edge and changes to the surface profile. Where displacement or changes occur, correct the area immediately in a manner satisfactory to the Engineer. When constructing a safety edge, operate the rollers in a manner that does not damage or obliterate the tapered edge. Do not roll the taper.

Keep drums and wheels properly moistened with water, water containing a detergent, or water containing an approved additive. Do not use excess liquid.

Cease production if compaction causes bumps in the mix or the mix is excessively tender.

Compact shoulders using the same equipment and procedures as used on the mainline pavement. Along curbs, headers, walls, and in other areas not accessible to rollers, thoroughly compact the mixture with hot, hand tampers or with mechanical tampers. On depressed areas, the Contractor may use trench rollers or rollers fitted with compression strips.

Replace mixture that becomes loose, broken, contaminated, or otherwise defective with fresh, hot mixture. Compact it to match with the surrounding area.

401.09 Asphalt Binder Compatibility. If excess fat spots, regular random areas of flushing, or excess drain down occur on a project that are not attributable to over rolling, plant operation, or mix quality compared to the JMF, the Department will consider the neat asphalt binder incompatible with the polymer

additive or other mix materials. The Department will reject any on-hand asphalt binder because of incompatibility. The Department will determine if problem areas can be corrected, or if removal and replacement is required. Demonstrate to OMM through testing analysis the compatibility of another asphalt binder and that proper equipment is in place in order to be allowed to resume.

401.10 Surface Tolerances. If a longitudinal profile is specified by elevations on the plans, do not allow the completed pavement surface to deviate more than 1/2 inch (13 mm) at any point from parallel with the specified profile. Before placing the surface course, check the profile of the preceding course at 50-foot (15 m) intervals along the outside edge of each traffic lane and along any additional line described in superelevation tables, and submit to the Engineer a tabulation of all results that includes documentation of all deviations from the above tolerance. Perform corrective work necessary for compliance with the profile tolerance before placing the surface course. The requirements of this paragraph do not apply to small incidental areas of pavement less than 500 feet (150 m) in length.

Do not vary the transverse slope of the surface of any completed course from the specified slope by more than 3/8 inch in 10 feet (10 mm in 3 m).

For surface and intermediate courses, do not vary the surface of each completed course from the testing edge of a 10 foot (3 m) rolling straightedge by more than 1/4 inch (6 mm). Furnish straightedges, straightedges equipped with levels, or other devices such as approved profilers conforming to Supplement 1058 and using ProVAL software. Obtain the Engineer's approval of the equipment used.

For base courses, do not vary the surface of each completed course from the testing edge of a 10-foot (3 m) straightedge by more than 3/8 inches (10 mm). If using Asphalt Concrete Base as a subbase for a rigid pavement or base, do not exceed a variation of 1/4 inch (6 mm). Furnish straightedges, straightedges equipped with levels, or other devices satisfactory to the Engineer.

Check the surface of each course placed for variations in slope or surface exceeding the tolerances and at locations of suspected bumps when directed by the Engineer.

Correct variations in excess of slope or surface tolerance by removing mixture to neat lines and replacing, or by surface grinding in a manner satisfactory to the Engineer.

401.11 Opening to Traffic. Do not allow traffic, including construction traffic, on the compacted mixture until it has cooled sufficiently to prevent damage. Remove and replace, or otherwise correct in a manner satisfactory to the Engineer, any portion of the pavement course found to be defective in surface texture or composition regardless of whether the defect was identified before or after opening to traffic.

After completion of the surface course, seal gutters with certified 702.01 PG binder as directed by the Engineer. Apply the binder at a uniform width of approximately 4 inches (100 mm) and at a rate just sufficient to fill surface voids. The Contractor may open the surface course to traffic before sealing the gutters.

401.12 Method of Measurement. The asphalt concrete pavement thickness shown on the plans or stated in the Proposal is for calculating the weight required to be placed per unit of surface area. The Contractor is responsible for recording the net weight of each truckload of mixture to the nearest 100 pounds (50 kg) in triplicate on plant ticket forms approved by the Department. If the pay quantities are established by platform scales, provide a tare weight for each truck at the beginning of each day's operation and a minimum of every 4 hours of operation each day. The Engineer may require additional tare weight measurements at any time. The Engineer will have the right to monitor all weighing operations and may require reweighing trucks at any time or location. Correct any discrepancies immediately. Continued non-compliance will result in the Department taking necessary and appropriate action, such as, but not limited to, assigning a Department ticket writer to the plant. Send one copy of the plant ticket with each load delivered to the paver and present it to the Engineer.

The Engineer will convert the total of the weights recorded on the plant tickets representing mixture finished according to contract requirements to cubic yards (cubic meters) using a conversion factor established by OMM. OMM will establish this conversion factor from the approved JMF.

If a uniform course is specified, the Department will not pay for cubic yards (cubic meters) that exceed the quantity calculated from plan lines and dimensions.

402

On page 188, **Replace** the entire section with the following:

ITEM 402 ASPHALT CONCRETE MIXING PLANTS

402.01 Description
402.02 Mixing Plants
402.03 Calibration
402.04 RAP and RAS Processing Requirements
402.05 Warm Mix Asphalt
402.06 Post Blended SBR Polymer Binders
402.07 Mixing and Production
402.08 Loading and Hauling

402.01 Description. This specification consists of the minimum requirements for an asphalt concrete mixing plant, including approval, calibration, RAP and RAS management, Warm Mix Asphalt methods, polymer binders, loading and hauling, and mixing and production to produce asphalt concrete mixes according to Department specifications.

Control all production processes at the asphalt concrete mixing plant such that the mixture delivered to the paving site meets all specification requirements.

402.02 Mixing Plants. The Department will approve mixing plants before preparation of the mixtures. Schedule a date with the Department for approval inspection to take place at least 1 week before mix production. Do not produce mixtures for projects from un-approved plants.

Asphalt mixtures may be produced using the warm mix asphalt method according to 402.05 except as restricted by specification.

Store and introduce ~~antistrip~~ additives into the plant according to Supplement 1053. Obtain Department approval of the ~~antistrip~~ additive storage and feed systems before the start of production.

402.03 Calibration. Ensure the plant is calibrated according to Supplement 1101 when producing any asphalt concrete for the Department.

Before producing asphalt concrete for the Department, demonstrate to the Monitoring Team that the plant adequately meets the specification requirements. Calibrate the plant using procedures approved by the Department. Perform initial calibrations in the presence of the Monitoring Team. District Testing may request a letter of certification and certified data documenting the calibration results, instead of having the Monitoring Team present.

Verify the calibrations biweekly using a Quick Calibration. District Testing may request additional Quick Calibrations if there are mix production problems or plant operation concerns. If the difference between current calibration and the Quick Calibration is within ±2 percent, then the current calibration is acceptable. If the 2 percent variation is exceeded, perform a recalibration of the plant. Document the Quick Calibration procedure as specified in the QCP and post the procedure and results in plain view in the plant control room and plant laboratory for reference by the Monitoring Team. Document all data from calibrations in a format approved by OMM, and retain the data for review by the Monitoring Team.

If asphalt concrete is being produced from a batch type plant, verify the accuracy of the aggregate and asphalt binder weighing devices on a biweekly basis. Document the verification procedure as specified in the QCP and post the procedure and results in plain view in the plant control room and plant laboratory for reference by the Monitoring Team. Do not allow the deviation between the plant recorded weights and actual weights to exceed 1 percent. Record all data from verification of weighing devices in a format approved by OMM, and retain the data for review by the Monitoring Team.

Calibrate the asphalt binder meter according to Supplement 1101 Method A or B. When calibrating the asphalt binder meter according to Method B, perform daily aggregate and RAP weighbridge validations. Document which plants follow Method B in the Quality Control Program (403.03). If issues persist for Method B calibrations or documentation, the Department will require the plant to follow Method A. When performing a complete calibration for ODOT projects notify District Testing 48 hours in advance of the calibration.

402.04 RAP and RAS Processing Requirements. Process and use RAP by one of the following two methods.

A. RAP Processing Method 1-Standard RAP. For surface courses process RAP to less than 0.75 inches (19 mm) and place a 0.75-inch (19 mm) screen on the cold feed. For other courses place a 2-inch (50 mm) screen on the cold feed. Ensure that the RAP is the proper size to allow for complete breakdown in the plant. If mixing is incomplete, place a smaller screen on the cold feed.

B. RAP Processing Method 2-Extended RAP. Use Method 2 only with counter flow drum plants or mini-drum batch plant configurations meeting 402. Process RAP by means of fractionation or by additional in line processing. Fractionate RAP from one pile into multiple piles of various sieve sizes by processing over specific screens as specified in the approved Quality Control Plan. Typically, fractionated RAP is sized into two (coarse or fine) or three (oversize, coarse, or fine) piles. Test fractionated piles to show uniformity. For additional in line processing only process RAP from a uniform, tested and approved stockpile by passing the RAP over a double deck screen placed in-line between the RAP cold feed bin and the mixer. Use a 9/16-inch (14.3 mm) screen for surface and intermediate mixes and a 1.5-inch (37.5 mm) screen for base mixes. Do not use concurrent project RAP in a stream process.

C. RAS Processing and Usage. Ensure RAS is processed to have 100 percent passing the 1/2-inch (12.5 mm) sieve and at least 90 percent passing the No. 4 (4.75 mm) sieve. Ensure RAS has less than 1.0 percent deleterious materials and 0.1 percent metals by weight. Do not blend RAS from manufacturing waste and RAS from roofing tear-offs.

Introduce and control RAS in asphalt plants in the same manner as RAP is introduced and controlled. RAS for base courses may be preblended with RAP if using rate control equipment to ensure uniformity of blending and if satisfactory blend and production is achieved. RAS may be preblended with a small amount of virgin aggregate meeting 703.05 to minimize stockpile agglomeration. Other methods must be approved by OMM.

D. RAP and RAS QC and Management Requirements. Provide enough space for meeting all RAP and RAS handling requirements at a hot mix facility. Provide a clean, graded base for stockpiles that does not collect water. Test blended RAP and RAS stockpiles to assure uniform gradation and asphalt binder content.

If desired, when applying Method 1 Standard RAP requirements, use concurrent Department project RAP in a stream process in place of stockpiling and testing for uniformity but do so in the following manner. Concurrent project RAP must be taken from one existing mix type on the concurrent project or two existing mix types if both mix types are taken at the same time in one pass of the milling machine. If these requirements are not met, blend and test for uniformity and apply the stockpile requirements of this specification.

Maintain in the plant lab and control room an up to date and dated site map of all tested and untested RAP and RAS stockpiles. Give each stockpile a unique identification and identify if RAS piles are from un-used manufactured shingle waste or used roofing tear-off shingles. Provide in the plant lab RAP and RAS properties for each uniform, blended stockpile cross referenced with its identification. In addition, provide the date the stockpile processing was completed and the stockpile estimated size in tons. Provide signage at all RAP and RAS piles. Do not add to a stockpile once it is tested for uniformity. Provide signage at all uniform stockpiles to inform haulers that uniform piles are not to be added to.

Stockpiles and processing methods are subject to inspection and approval by the Department at any time. Rejection of stockpiles can occur for the presence of foreign or deleterious materials, lack of uniformity, incomplete mixing in the asphalt mixture, adding to piles, or moving RAP or RAS in a way not traceable through the QCP records and methods. OMM will resolve disputes over acceptability of RAP or RAS.

402.05 Warm Mix Asphalt. Warm Mix Asphalt (WMA) is defined as asphalt mixtures produced with various technologies, including water foaming and chemical additives, that have the capacity to be used with lower production temperatures (below 300 degree F), but can also be used at normal production temperatures to achieve improved compactability, in-place density, and sustainability and without a diminution of short- and long-term performance. WMA technologies may be used to produce asphalt concrete. Specify the use of warm mix asphalt in the QCP for approval by OMM. Notify District Testing before using and ensure the daily TE-199 Quality Control Report reports that WMA was used during production.

A. Water Injection System Use a water injection system approved by OMM for the purpose of foaming the asphalt binder. Only use equipment that has been proven stable and effective through project use on non-ODOT projects. Ensure equipment for water injection meets the following requirements:

1. Injection equipment computer controls are in the plant control room and are tied to the plant computer metering.
2. Injection equipment has variable water injection control controlled by the plant operation rate and the water injection can never exceed 2.2 percent by weight of asphalt binder.
3. Water injection rate cannot be manually overridden by the plant operator once in the computer.
4. Injection equipment stops water flow when a control or equipment failure in the injection system occurs.
5. The water injects into the asphalt binder flow before the asphalt binder spray hits aggregate. Do not allow water to touch aggregate before the binder spray.
6. Injection equipment includes water storage and pump control tied to the injection computer controls.
7. Water storage low water alarm installed in the control room.
8. Provide a PG binder sampling valve between the last piping tee on the tank side of the line and the injection equipment to sample PG binder before water is injected.

B. Other WMA Technologies. All other WMA methods or technologies will be reviewed by OMM for approval.

Chemical WMA may be used where WMA is allowed. Use chemical WMA additives on the approved list only. When chemical WMA is required by specifications, in-line blend according to Supplement 1053, Method A and produce mix using HMA mixing temperatures when producing for cold temperature paving. Ensure injection equipment for in-line blending meets the requirements of Supplement 1053, Method A when required to in-line blend. When chemical WMA is not required by specifications, the chemical WMA additive may be added in-line blend according to Supplement 1053,

added at the asphalt binder terminal, or to the tank at the mix plant. Ensure bill of lading from terminal and TE-199 documents that WMA was used, the amount used, and the product name used.

402.06 Post Blended SBR Polymer Binders. If an asphalt binder is modified by SBR at an asphalt concrete mixing plant, equip the plant with an automated SBR flow control and monitoring system. Obtain OMM's approval of the system before operating, and demonstrate the system calibration to District Testing. If District Testing waives the demonstration, provide a letter documenting calibration data for the flow system to District Testing for each project. Obtain written approval from OMM for the use of SBR and ensure the QCP contains methods for properly controlling and sampling SBR binder blends.

For drum mix plants, introduce the SBR directly into the asphalt binder line through means of an in-line motionless blender or other device approved by OMM that is able to provide a homogeneous blend. Ensure the in-line motionless blender design provides aggressive interaction of asphalt binder and SBR emulsion to provide a homogenous blend at the sampling port. Do not use swirl type blend.

Locate a sampling valve between the in-line blender and the plant drum, at least 12 ft (3 m) downstream of the in-line blender and at least 5 ft (1 m) downstream of a piping elbow. Ensure the sampling valve port is at least 1 inch (25.4 mm) in diameter. Ensure the sampling valve can be opened quickly for maximizing sample flow for the purpose of obtaining a proper sample.

In place of an in-line sampling valve, a sample may be taken from a 3 to 5 gal (11 to 19 L) surge tank as long as the tank is downstream of the required blender and the in-line flow can be quickly and directly diverted to the surge tank.

Continue mixing for a minimum of 20 seconds after SBR is added and long enough to provide a uniform mixture.

Ensure the SBR pumping and metering system is capable of adding the SBR within the limits of 702.01. For drum plants ensure the SBR pump is automatically controlled by an independent computer and interfaced with the asphalt binder flow to automatically maintain the SBR flow within specification limits. Produce asphalt mixtures for placement in automatic SBR control mode only.

Ensure the SBR meter is a magnetic flow meter consisting of a metering flow tube which utilizes Faraday's Law of Induction to measure the flow and includes a transmitter to transmit the flow signal to a totalizer located in the control room of the asphalt plant. Obtain OMM approval for use of any other type of SBR meter. Locate the SBR meter downstream of any recirculation lines. Provide a means for removing the SBR line at the in-line blender to be able to obtain a sample of the SBR for calibration purposes. Ensure the SBR meter is accurate to ± 2.0 percent over a flow range typical of that used at the asphalt plant (typically 0.8 to 12 gpm (0.05 to 0.76 L/s) at drum plants and 10 to 25 gpm (0.63 to 1.58 L/s) at batch plants).

Ensure the totalizer displays total volume measured and flow rate in standard engineering units. Ensure the totalizer is interfaced with a data logger that produces printouts of the logged data every five minutes for a drum plant or every batch for a batch plant. Ensure the logged data includes time, date, flow rate, and flow total except flow rate is not necessary for batch plant production.

402.07 Mixing and Production. Do not start mix production without a preliminary JMF approval and 48 hour notification of District Testing. Do not start each production day without the moisture contents of the aggregate, RAP, and RAS stockpiles to be used in the JMF tested according to 403.06. Ensure the moisture contents are entered into computerized plant controls. Ensure new moisture contents are tested and entered after weather events and as outlined in the Contractor's QCP.

Set the plant controls for the computerized plant at the JMF design total and virgin asphalt binder contents, recycled materials, and any other additives used at all times unless a change is authorized by District Testing. Follow 403.07 for JMF field adjustments.

Maintain the temperature of the mix at the plant within the range in JMF or according to the specification. Ensure the mixture is workable and temperature is sufficient for compaction at the point of placement.

For batch plants, after all of the aggregate is in the mixer, add the asphalt binder in an evenly spread sheet over the full length of the mixer. The mixing time is defined as the interval between the start of application of the asphalt binder and the opening of the mixer gate. Discharge all asphalt binder required for one batch in 30 seconds or less. After the asphalt binder is added, apply the mixing time determined by OMM but not less than 30 seconds.

When using a batch plant for base mix production, use screens with openings of sizes that result in a reasonably balanced separation of the dried and heated aggregate into a minimum of two bins.

A. Aggregate Preparation. Feed aggregates in their proper proportions and at a rate to permit correct and uniform control of heating and drying. Remove all aggregates in the plant that will produce a mix outside the temperature limits or that contain excessive moisture or expanding gases causing foaming in the mixture and return them to the proper stockpiles.

B. Asphalt Binder. Heat the asphalt binder and deliver it to the mixer within the temperature range specified in Table 702.00-1. Do not use asphalt binder while it is foaming in a storage tank.

For drum mix plants, introduce the SBR binder directly into the asphalt binder line as described in 402.06. For batch plants, add the SBR binder after the aggregate has been completely coated with asphalt binder. Continue mixing for a minimum of 20 seconds after SBR is added and long enough to provide a uniform mixture.

Take samples using approved, new, containers from the binder line between the last piping 'tee' and inlet into the plant unless a different storage method requires a different sampling location.

At a minimum, take a split sample of asphalt binder whenever the Department requests a sample.

For sampling SBR binder, the contents of the tank should be drained into a 5 gal (19 L) sampling bucket and stirred before filling the required sample container. Provide a sampling valve port that is in a position to safely obtain the required sample volume in the required 5 gal (19 L) sampling bucket. Provide a stable sampling rack to obtain a sample.

Balling or wadding of SBR or uncoated aggregate indicates improper mixing; cease production immediately and until corrected to District Testing satisfaction.

C. Stopped Production. Do not restart production after a shutdown required by 403 until OMM or District Testing accepts the proposed remedy.

Following a shutdown restart production in a manner acceptable to District Testing. When production problems cannot be solved within one day after a plant shutdown, a Contractor's approved Asphalt Level 3 Technician is required to be at the asphalt plant until a full production day is achieved with results satisfactory to the Monitoring Team as established in 403.06.

402.08 Loading and Hauling. Before loading, apply a thin coating of an approved release agent to the inside surfaces of the truck bed to prevent adhesion of mixture to the bed surfaces. OMM maintains a list of approved release agents. Do not use diesel or fuel oil for this purpose. Any use of non-approved release agent, diesel, or fuel oil may result in suspension of truck, driver, or both for up to one year. Drain truck beds after applying the release agent and before loading.

Load trucks in manner to minimize segregation of the mixture.

Equip all truck beds with a securely fastened, waterproof cover of suitable material to protect the mixture from wind and weather. Cover truck beds with the secure, waterproof cover after loading.

403

On page 190, **Replace** the entire section with the following:

ITEM 403 ASPHALT CONCRETE QUALITY ASSURANCE

403.01 Description
403.02 General
403.03 Quality Control Program (QCP)
403.04 Testing Facilities
403.05 Asphalt Mixture Sampling.
403.06 Quality Control Tests
403.07 JMF Field Adjustments
403.08 Quality Control Reports
403.09 Mixture Deficiencies
403.10 Verification Acceptance (VA)
403.11 Restricted Acceptance

403.01 Description. This specification outlines the asphalt concrete quality assurance program including the contractor requirements for controlling asphalt concrete mixtures during production through quality control (QC) testing and the Department Verification Acceptance (VA) program.

403.02 General. The Department will verify quality control by Department VA tests and monitoring reviews as specified. If the Contractor fails to operate according to their Quality Control Program (QCP), the Department will accept asphalt mixtures by Restricted Acceptance.

Restoration of VA procedures will be by the Department's Quality Control Review Group (QC Review Group) based on District recommendation and review of the Contractor problems, resolutions, and QCP. The QC Review Group consists of the Asphalt Materials Engineer, Office of Materials Management; the Administrator, Office of Materials Management; and the Pavement Engineer, Office of Construction Administration.

Acceptance does not relieve the Contractor of responsibility for supplying and installing a finished product conforming to all requirements of the Contract.

Supplement 1041 outlines the responsibilities and requirements for Contractor and Consultant employees engaged in all aspects of asphalt concrete production at any level, including, but not limited to, management, supervision, quality control, plant operations, materials management, paving operations, and hauling truck drivers.

403.03 Quality Control Program (QCP). Create and implement a Quality Control Program (QCP) for each paving season. The QCP will cover processes conducted to provide an asphalt mixture at the paving site that is uniform in composition, conforms to the specification requirements and that when placed is free of any defect (ex. segregation, lack of mixture and texture uniformity, raveling, rutting, holes, debris, etc.) within the Contractor's control at project completion. A minimum of 3 weeks before mix production, but no later than February 28, submit a hard copy of the proposed QCP to OMM for review and acceptance. Include a revision date on the cover sheet and revision sheet listing the date(s), section(s) and page(s) a revision was made, and a short description of what was revised, added, and removed.

Send a hard copy and a digital copy (if available) of the acceptance letter and accepted QCP to District Testing in every District in which work is performed. Keep copies of the letter and the QCP in each Contractor plant laboratory and plant operation control room. Digital copies of the QCP and letter in pdf format are allowed in each Contractor plant laboratory and plant operation control room with the following requirements: The file icon must be appropriately labeled and be on the computer desktop of a computer

in each area. Ensure the QCP contains page numbering and a Table of Contents inside the front cover locating all sections by page number. Remove out-of-date QCPs from the computer desktop.

Failure to comply with the approved QCP may result in removal of personnel in accordance with Supplement 1041, removal from VA, and adversely affect the Contractor's Prequalification rating.

As a minimum include in the program:

A. The assignment of quality control responsibilities. Quality control includes all efforts required to achieve a product meeting specifications. List individuals as required below and note their designated responsibilities to meet QCP requirements. Provide a Quality Control Manager holding a Supplement 1041 Level 3 approval and who is a company employee. Assign Level 2 technicians for all Level 2 QC testing duties, and provide a list designating their responsibilities and expected actions. Ensure only approved personnel handle and test samples at all times. If Level 2 consultant technicians are used, include a document in the QCP listing designated responsibilities and expected actions (if different from employee expectations). Provide a copy of the document to the Level 2 consultant technician. Define who is responsible at plants and specific methods for ensuring haul vehicles meet all requirements and proper bed release products are used. Provide a Field Quality Control Supervisor (FQCS), holding Supplement 1041 Field Quality Control Supervisor approval and who is a company employee, who is routinely and usually at the paving site during placement of any non-temporary asphalt concrete pavement. Ensure personnel obtaining and handling cores at the project site are approved Level 2 technicians, FQCS or personnel approved by OMM.

B. Means for annual training in ethical conduct according to company expectations of all company employees and consultants who are responsible for the mix design, production, testing, and placement of asphalt mix and their supervisors. Document how and when training is given, what the expectations are, how expectations are communicated and list all personnel trained. Describe the QC Manager's and supervisor's responsibilities and methods in ensuring ethical conduct is maintained throughout the year.

C. Provisions to meet the Department mix specifications. Include an example control chart according to 403.06.E.

D. Procedures for extra testing (e.g., job start, responses to poor test results or field mix problems, aggregate stock testing, reclaimed asphalt concrete pavement checks, moistures) and any other testing necessary to control materials not already defined in these Specifications.

E. Specify warning bands to be used by technicians for all tests and give specific instruction how the warning bands will be used for tests in concert with 403.06.F and Table 403.06.G-1 specification requirements.

F. Methods to maintain all worksheets, including all handwritten records, and other test and sample records from all plant(s) and, or project(s) for a minimum of eight years. Define the test record process. Define company records retention requirements. Provide copies of all test reports and forms used in the quality control process.

G. Procedures for equipment calibration and documentation for Level 2 lab equipment. Provide documentation that all Level 2 lab equipment has been calibrated at the time of the Level 2 lab approval inspection. Procedures for calibration record storage.

H. Method of Quick Calibration and documentation for each plant type.

I. Procedure for random sampling to be used at the plant and documentation method. Procedures for sample taking, tracking, handling and documentation method for all samples taken at the project paving site including taking of all cores used for density determination or density gauge correlation. Include how QC Managers will enforce random number sampling.

J. Procedures for handling and testing of the mix plant asphalt binder QC samples and subsequent corrective action of binder test failures of any sample (QC or Department). Include how samples will be labeled and stored. Failure to perform QC of asphalt binder samples is at the Contractor's risk. Any Department binder sample failures will result in penalties according to Supplement 1102. These include remove and replace, pay deductions, or other penalties for the asphalt mix represented by the Department's sample.

K. All procedures to meet the processing, testing and documentation requirements for RAP and RAS in 402.04 including test forms, record keeping, technician responsibilities, etc. Include the RAP method for each mix plant. Include in the QCP methods of validating RAP properties when using concurrent project RAP. Include additional methods and procedures to dictate how the processing of RAP by means of fractionation or by additional in line processing will be accomplished for mix plants using Method 2. Specify documentation method for RAP measurement. Include RAS usage methods before using RAS and include what Contractor requirements apply to the RAS processor. Include the Contractor's blending equipment type and operation and uniformity testing requirements for preblended RAP and RAS or RAS and virgin aggregate. Other methods must be approved by OMM.

L. Procedure for ensuring that every Contractor employee involved in the testing of asphalt mix and operation of the asphalt plant facility has read the QCP and has on site access to all applicable Department specifications, proposals, policies, and the current approved JMF.

M. Procedure for ensuring asphalt binder Bills of Lading with BOL load number, binder source and grade are reviewed against running JMFs and record of review listing the above information be kept in the plant lab for the duration of the project. Means to meet the handling and storage requirements of 402.06 and asphalt binder suppliers for all asphalt binders.

N. Means to meet delivered mixture uniformity/coating and hauling/trucking requirements.

O. Define the roles and responsibilities of the Field Quality Control Supervisors. Provide a detailed description of how the FQCS will handle all mat issues including segregation, tenderness, mat tears, debris, holes, etc. List approved Field Quality Control Supervisors.

P. Include a section for how the quality control, production and placement of SMA will meet 443, if the contractor plans to produce and place SMA.

Q. Specify the use of Warm Mix Asphalt (WMA) including water-injection or other WMA technologies per 402.05. Include an explanation of what WMA technology will be used at each facility and how it'll be incorporated into the mix.

R. Signature of the Quality Assurance Manager and, if different, the person in authority to enforce all operations covered by the QCP as outlined in this subsection.

403.04 Testing Facilities. Provide testing facilities at the plant site conforming to Supplement 1041.

403.05 Asphalt Mixture Sampling. Sample enough material to perform all required testing. Following sampling requirements as outlined below.

A. Quality Control Sampling. For quality control testing, the Contractor's technician will randomly select the truck in which to take a sample by using a random number procedure as outlined in the QCP. The Contractor's technician will give no indication to anyone of the time that the sample is to be taken. Include the random number, sample tonnage location, and time of sampling on the daily Quality Control Report (Contractor form TE-199) with each test.

Sample for quality control tests a minimum of one time for each 700 tons (635 metric tons), or for any portion of 700 tons, of asphalt concrete produced, for every production day. A production day includes the period of time from when mix production begins to the time the last load of asphalt leaves the asphalt plant, either from the mix drum or from any storage silo. Any planned break in plant production to

accommodate a new work shift triggers a new production day. Perform more sampling and testing than the minimum specified at the start of production. Tests, other than the required random sample tests, are at the Contractor's discretion according to the QCP but do need to be reported on TE-199 and declared as an extra sample.

Provide a clean area of sufficient size and a hard surface to perform sample splitting at the testing facility. Split samples by quartering and recombining only as described in AASHTO R 76, Method B for hard surfaces for the Department and Contractor's sample. Alternately, use a mechanical splitter per AASHTO R 47 meeting Type A followed by the quartering method. The split sample size required is generally 22 to 27 pounds (10,000 to 12,000 g). A mechanical quartering device approved by OMM may be used in lieu of the above but only split according to the procedure outlined in the Contractor QCP. Ensure that every quality control or 448 Sublot sample taken by the technician has a labeled split for the Department. Wrap and label split samples as to Lot or Sublot, time, location (tonnage), and accompanying Contractor test identification. The Monitoring Team will pick up all Department split samples within 4 workdays. Sample mishandling (careless identification, changing sample size, consistency, or pre-testing) will result in a change to Restricted Acceptance.

For 448 and 449 acceptance mixes not including 301, 302, and Type A mixes, conform to the procedures of Supplements 1035, 1038, 1039, and 1043. The District may require sampling from the road. Lots will be 3000 tons (3000 metric tons), and Sublots will be 750 tons (750 metric tons). However, when production is limited to less than 3000 tons (3000 metric tons), consider the quantity produced as a partial Lot. For partial Lots of 1500 tons (1500 metric tons) or less sample and test at least two sublot samples regardless of the tons produced. Split and test all sublot samples taken by the Contractor from locations selected by the Monitoring Team or Engineer. The Contractor may test a QC sample at the required Sublot sample location as both a QC and Sublot test provided the sample is tested for all required quality control properties. Test results will apply for both QC and sublot requirements. A change in the location of the Sublot sample must be approved by the Monitoring Team and be reasonably close to the original location. This allowance does not apply to any other samples including Department VA sample locations selected by the Monitor. Label Department split samples as Sublot or quality control samples.

Perform additional sampling per 403.11 if mix plant facility is under restricted acceptance.

403.06 Quality Control Tests. Prior to each production day, determine the moisture content of each aggregate, RAP, and RAS stockpile to be used in the JMF according to AASHTO T 255 and ensure the moisture contents are entered into the mix plant controls. Retest stockpiles after weather event prior to resuming production day and as outlined in the Contractor's QCP.

Perform quality control tests on all samples to control the asphalt concrete mix within the specifications. As required by mix type, ensure that these quality control tests measure the asphalt binder content, gradation, air voids, and Maximum Specific Gravity (MSG) according to the Contractor's QCP. Perform only asphalt binder content and gradation for 301, 302, and 424 Type A.

Additionally, perform more sampling and testing than the minimum during production when the quality control tests show the asphalt concrete being produced is outside the warning bands as shown in the Contractor's QCP. Immediately resolve problems indicated by any test result exceeding the warning bands and immediately retest to validate corrections have returned the materials to within the warning band limits. The Contractor may determine the method of testing of the asphalt concrete beyond the minimum specified and will detail the methods technicians will follow in the Contractor's QCP.

Should additional testing as required above not be performed, District Testing, after consultation with OMM, will require the testing frequency to be increased for the remainder of the project. If this occurs, District Testing will request an opinion from the QC Review Group for action(s) against the technician and/or Contractor including but not limited to warning, removal and/or a change of the facility to Restricted Acceptance.

Record the results of every test performed.

Perform the required quality control tests, control charts, and test requirement as follows:

A. Asphalt Binder Content. Determine the asphalt binder content of a sample of asphalt concrete by performing an Asphalt Content (AC) Gauge test according to Supplement 1043. Make all printouts available for review by the Monitoring Team at any time. Offset the AC Gauge for each JMF on each project at the project's start. Perform the offset using the solvent extraction method for every QC sample according to Supplement 1038 and the AC Gauge Verification and Offset Record until the offset is established. Use solvent extraction according to Supplement 1038 when an AC Gauge problem exists and for testing cooled samples that cannot adequately be tested in an AC Gauge test.

Total, for each day's production, the flow meter printouts for SBR polymer added at the asphalt concrete mixing plant. Calculate the percent of polymer versus neat asphalt binder in the mix each day and record on the TE-199. Hold calculation worksheets and printouts in the plant laboratory for review by the Monitoring Team. A +/- 0.2 percent tolerance from the target amount of SBR polymer will be used as a guide for an acceptable amount of SBR polymer, but consistently low will not be acceptable. Only take SBR PG-Modified Binder samples using a five-gallon (19 L) bucket. Take 1 gallon (4 L) to clean the valve port and discard. Take 2 gallons (7.5 L) again, stir its contents and transfer to the required sample containers.

Determine the moisture content of the asphalt concrete for each AC Gauge test according to Supplement 1043. Maintain the moisture content at 0.8 percent or less.

B. Gradation. Perform the gradation test on aggregate remaining after removing the asphalt binder with a solvent from an asphalt concrete sample used in an AC Gauge test (solvent sample) or on aggregate remaining after removing the asphalt binder with a preapproved asphalt ignition oven according to Supplement 1054 and from an asphalt concrete sample used in an AC Gauge test (ignition oven sample). Use only an asphalt ignition oven to obtain an aggregate sample from an asphalt concrete sample having a polymer modified PG Binder. District Testing may make an exception to this for SBS polymer as long as no issues arise. Correct each solvent sample for ash. Perform all other gradations on solvent samples, ignition oven samples, or on samples obtained according to the Contractor's QCP.

The gradation results of all the sieves must be representative of the JMF. If the Contractor fails to control the entire gradation, the Laboratory may require a redesign according to 440.

When the F-T value is specified for a mix, calculate it for each gradation analysis. Maintain the F-T value at +4 percentage points or less for these mixes during production.

Calculate the F/A ratio for every solvent sample or ignition oven sample analysis. Maintain the F/A ratio so no F/A ratio is greater than 1.2 for all mixes. Use the asphalt binder content determined by the AC Gauge for calculating the F/A ratio. If the F/A ratio is greater than 1.0, recalculate the F/A ratio using the effective asphalt binder content. Calculate the effective asphalt binder content on the calculation sheet using the asphalt binder content determined by the AC Gauge and attach it to the Quality Control Report. Use bulk and effective aggregate specific gravities and remaining values needed in the calculation from the approved JMF. Do not deviate from these values without OMMs approval. If the F/A ratio is greater than 1.0 for ignition oven samples, calculate the F/A ratio using the percent passing the No. 200 (75 μm) sieve from a washed gradation of the ignition oven sample according to AASHTO T 30.

C. Air Voids and MSG. Determine the air voids of the asphalt concrete by analyzing a set of compacted specimens and a corresponding MSG determination according to Supplement 1036. Use a Marshall or gyratory compactor meeting the requirements of Supplement 1041 to compact specimens. If the compactor was moved to the plant before production, calibrate it and present the results to District Testing. Ensure that the cure temperature and specimen compaction temperature are the same. Use a 1-hour cure for all mix samples used in voids analysis. The Contractor may use a 2-hour cure time if voids are

consistently near the low void warning band. In this case, use the 2-hour cure for all voids testing through the remainder of the project. Use the JMF lab compaction temperature. Do not reduce lab compaction temperature for warm mix asphalt. Use a compaction temperature tolerance of +/- 5.0 ºF (3.0 ºC). Compact specimens to design blows or N_{des}. Record on the TE-199 if the mixture produced was ran at the asphalt plant as a hot mix asphalt (HMA) or as a warm mix asphalt (WMA) produced according to 402.05 or another approved method.

Calculate the Voids in Mineral Aggregate (VMA) value for every set of compacted specimens according to Supplement 1037.

Calculate the average of all the MSG determinations performed each production day and report this average on the Quality Control Report. When the range of three consecutive daily average MSG determinations is equal to or less than 0.020, average these three average MSG determinations to determine the Maximum Theoretical Density (MTD). After the MTD is established, compare all individual MSG determinations to the MTD.

D. Other Requirements. Perform a LWT APA test once each day for the first 3 days according to Supplement 1057 if the produced mixture requires an LWT APA test. Compact the sample the same day the sample was taken, cure it overnight, and test it the following day. Give the test result and sample density to District Testing the day of the LWT APA test. Report the LWT APA data on the Quality Control Report.

Retain a split sample for each AC Gauge test and MSG test and all compacted specimens for monitoring by the Department. Maintain MSG samples in the state described in AASHTO T 209, Section 7.3 and keep sample at room temperature. The Contractor may dispose of the AC Gauge test samples after two days and all other split samples after seven days if the Department does not process the split samples.

Measure the temperature of the mixture and record. Validate the results on the load tickets at least once during each hour of production.

The Contractor may conduct additional testing of any type. Record such additional testing along with all other quality control records and have these records readily available for the Monitoring Team's review. District Testing may observe, review, and approve or disapprove the procedures at any time.

E. Control Charts. Maintain up to date control charts showing each individual test result and the moving accumulative range as follows all mixes:

1. Plot tests showing the percent passing for the 1/2 inch (12.5 mm), No. 4 (4.75 mm), No. 8 (2.36 mm), and No. 200 (75 µm) sieves, the percent asphalt binder content, the MSG, and the percent air voids. Round all percentages to the nearest whole percent; except, round asphalt binder content, the No. 200 (75 µm) sieve, and air voids to the nearest 0.1 percent.

2. Show the out of specification limits specified in 403.06.F and Table 403.06.G-1 and QCP Warning Band Limits on the control charts.

3. Label each control chart to identify the project, mix type and producer.

4. Record the moving accumulative range for three tests under each test point on the chart for air voids and asphalt binder content. Accumulative range is defined as the positive total of the individual ranges of two consecutive tests in three consecutive tests regardless of the up or down direction tests take. If more than the minimum required testing (i.e. 700 tons per sample per production day, 403.05.A) is performed do not include the result in accumulative range calculations.

F. Test Requirements for 301, 302, and 424 Type A. Control mixes as follows:

1. If a single asphalt binder content is more than ±0.5 percent beyond the JMF, immediately take and test an additional sample.

2. If the Range difference in any three consecutive asphalt binder content tests is greater than 0.7 percent (for 302 mix) or 0.6 percent (other than 302) immediately notify the Monitoring Team.

3. If the Range difference in any three consecutive gradation tests for the No. 4 (4.75 mm) sieve is greater than 10.0 percent, immediately notify the Monitoring Team.

4. Maintain gradations within design limits of mix type.

5. Maintain a minimum of 7 percent retained on the 1 inch (25.0 mm), ¾ inch (19.0 mm), ½ inch (12.5 mm), and 3/8 inch (9.5 mm) for 302 mix.

Stop production and immediately notify the Monitoring Team when either 6 or 7 occurs:

6. If two consecutive asphalt binder content tests are more than ± 0.5 percent beyond the JMF, notify the Monitoring Team and cease production until the problem is corrected.

7. If Range deviations as specified in 2 or 3 continue, cease production.

Range is defined as the difference between the largest and the smallest test result.

Any mixture sent to the paving site without stopping production and notifying the Monitoring Team, when required by this specification, will be considered non-specification material.

G. Test Requirements for all other mixes. Control all other mixes of Table 403.06.G-1 and as follows:

TABLE 403.06.G-1

Mix Characteristic	Out of Specification Limits[5]
Asphalt Binder Content[1]	-0.3% to 0.3%
1/2 inch (12.5 mm) sieve[1]	-6.0% to 6.0%
No. 4 (4.75 mm) sieve[1][8]	-5.0% to 5.0%
No. 8 (2.36 mm) sieve[1]	-4.0% to 4.0%
No. 200 (75 µm) sieve[1]	-2.0% to 2.0%
Air Voids[2]	2.5% to 4.5%
Air Voids[3]	3.0% to 5.0%
MSG[4]	-0.012 to 0.012
F/A	1.2 max
F-T	+4 max[6]
VMA	[7]

[1] Deviation from the JMF
[2] For Design Air Voids of 3.5%
[3] For Design Air Voids of 4.0%
[4] Deviation from the MTD
[5] Unless otherwise restricted by mix type specification
[6] When specified for mix type
[7] Not to exceed minimum requirements of mix type
[8] For 442 12.5 mm mixes do not exceed 63% max during production

Stop production and immediately notify the Monitoring Team when either 1, 2, or 3 occurs:

1. Any two tests in a row or any two tests in two days are outside of the specification limits of Table 403.06.G-1.

2. Any two tests in a row or any two tests in two days (QC and 448 sublot) exceeding 63 percent passing the No. 4 sieve for 442 12.5 mm mixes.

3. Any four consecutive moving accumulative ranges greater than specification limits of 2.50 percent for air voids or 0.60 percent for asphalt binder content occur.

Any mixture sent to the paving site without stopping production and notifying the Monitoring Team, when required by this specification, will be considered non-specification material.

H. Restart of Production. Do not restart production until an adequate correction to remedy problems is in place and the Monitoring Team is satisfied. Following a shutdown restart production in a manner acceptable to District Testing. When production problems cannot be solved within one day after a plant shut down a Contractor's representative holding Level 3 Asphalt Department approval is required to be at the asphalt plant until a full production day is achieved with results satisfactory to the Monitoring Team.

403.07 JMF Field Adjustments. During the first three days of production the Contractor may adjust the JMF gradation within the below limits without a redesign of the mixture. For projects with less than 3 days of production, give District Testing written notice of any JMF gradation adjustments within 1 workday following the last day of production. Limit adjustments of the JMF to conform to actual production, without a redesign of the mixture, to ±3 percent passing each of the 1/2 inch (12.5 mm), No. 4 (4.75 mm), and No. 8 (2.36 mm) sieves and ±1 percent passing the No. 200 (75µm) sieve. Do not exceed the limits in Table 424.03-1, Table 441.02-1, Table 442.02-2, and Table 443.03-1 in the adjusted JMF. The adjustment on the 1/2-inch (12.5 mm) sieve applies to 19.0 mm and Type 2 mixes only. Determine the need for any JMF gradation adjustments in the time specified. Should no adjustments be made, the Department will base acceptance on conformance to the original JMF. After the time period specified, the Department will allow no further adjustment of the JMF.

Should a redesign of the mixture become necessary, submit a new JMF according to the requirements for the initial JMF. A new acceptance lot will begin when a new JMF established by a redesign of the mixture becomes effective. Make any adjustment of this new JMF as provided for the original JMF. Record both the design JMF and the adjusted JMF in effect during production of an acceptance lot on the Quality Control Report for that lot. In the event that a new JMF is proposed and approved, also make a notation on the ticket for the first load produced under the new JMF.

403.08 Quality Control Reports. Use Contractor Form TE-199 for the Quality Control Report. Record all test results and sample identification on the Quality Control Report including the random number, sample tonnage location, and time of sampling with each test. Record on the TE-199 if the mixture produced was ran at the asphalt plant as a hot mix asphalt (HMA) or as a warm mix asphalt (WMA) produced according to 402.05 or another approved method. Also record if antistrip additives were used and the daily quantity used. After startup adjustments, report any plant operation changes on the Quality Control Report. Ensure that each Quality Control Report contains technician comments as to production quality, input materials received and condition, and includes any other quality control activities as specified in the QCP. Document all decisions regarding responses to test results on the Quality Control Report (referring to the particular test), including reasons why a particular problem may exist, what action was taken to correct the problem (plant operation or testing), and what communication with Department personnel took place. Attach computerized plant printouts representing samples tested to that day's report, if desired by the Monitoring Team, or otherwise keep them with the quality control records. Ensure that the technician records the test results for the AC content and percent passing the No. 4 (4.75 mm) sieve on the plant printout from the tonnage the quality control sample was taken. Keep remaining printouts in the plant laboratory for the duration of the project. Keep a copy of all quality control reports for a project in the Contractor's plant laboratory.

Deliver (fax, e-mail, hand) completed Quality Control Reports to District Testing by the end of each day in which testing is conducted. If desired by District Testing and always for unsigned E-mail versions, mail the originals. Ongoing problems with inadequate, incomplete, or illegible reporting will result in a change to Restricted Acceptance. The Contractor's technician must sign each Quality Control Report.

Retain copies of all records documenting the quality control inspections and tests as outlined in the Contractor's QCP per 403.03.F and furnish them to District Testing on request.

Provide delivery tickets of liquid or hydrated lime antistrip additive, if used, to District Testing at the end of the project and at the end of each construction year on a multiple year project. Provide the following information for each shipment: Letter of certification, Production date, Shipment date, Shipment destination, Batch or lot number and Net weight. The District Testing will verify the number of pounds of antistrip additive used is within 10 percent of the calculated amount of antistrip additive required for the total weight of asphalt binder, based on the JMF, used in the asphalt concrete. The Department may obtain samples of the hydrated lime at any time to verify quality. If the quality of the hydrated lime is in question, the Department may require independent laboratory testing.

Report test results to the accuracy of the following decimal places. When the figures to be dropped in rounding off are exactly one-half of unity in the decimal place to be retained, round the value up to the nearest number in the decimal place to be retained.

TABLE 403.08-1 REPORTING ACCURACY

	Single Test	Average
Asphalt Binder Content	0.01	0.1
No. 200 (75 µm) sieve	0.1	0.1
Other sieves	Whole number	Whole number
BSG, MSG, MTD	0.001	0.001
Air Voids	0.1	0.1
VMA	0.1	0.1
F/A	0.1	0.1
F-T	Whole number	Whole number
Mix Moisture Percent	0.01	0.01
LWT, inch (mm)	0.0004 (0.01)	0.004 (0.1)

Additionally for 448 and 449 acceptance mixes (excluding 301, 302, and 424 Type A), track the 448 Sublot and Lot tonnages through the project and identify on the Quality Control Report each random Sublot test as to Lot number and Sublot tonnage location. In addition to the Quality Control Report submit the TE-448 Department form with lot identification and actual sieve weights for each Sublot sample from the technician's gradation worksheets.

403.09 Mixture Deficiencies. Control all production processes to assure the Engineer that the mixture delivered to the paving site is uniform in composition; within the specification requirements and limits; conforms to the JMF: and that the placed mixture is free of any defect (ex. segregation, tenderness, lack of mixture and/or texture uniformity, raveling, flushing, rutting, holes, debris etc.) within the Contractor's control. Correct obvious pavement problems according to 401.08. If the Department has any suspicion that other mixture composition or pavement problems exist, the Monitoring Team will conduct an initial investigation through review of data and/or sampling of the asphalt pavement. Should a Department investigation determine that the Contractor's QCP is not controlling the mixture in a manner to achieve mixture quality as described above, the Contractor quality control data may be rejected. In that case the Department will conduct a thorough investigation by testing samples from the roadway and use those test results in determining disposition of the non-specification material.

A mixture is not uniform in composition if multiple random non-specification individual tests or any four consecutive non-specification moving accumulative ranges exist. The mixture can be rejected, production can be stopped and/or a redesign can be called for by the Department. OMM will not approve any redesign it determines is unsatisfactory to provide acceptable mix performance. Submit this new design for approval according to 440 and at no additional cost to the Department.

When any out of specification material, based on quality control tests not within the limits of 403.06.F and Table 403.06.G-1, is sent to the paving site the Engineer will determine disposition of the material according to Supplement 1102.

403.10 Verification Acceptance (VA). District Testing will perform VA by testing independent and split samples. If the random Department VA sampling and testing verifies the accompanying Contractor tests, the average of the Contractor's quality control tests for each day or night (for 449 acceptance mixes according to 449.04.A), the average of the Contractor's tests for each Lot (for 448 acceptance mixes according to 448.04) or daily average MSG (446, 447, 448, or 449 acceptance mixes other than 301, 302, and 424 Type A) will be used to determine acceptance.

A. Monitoring. The Department will establish District Monitoring Teams for the purpose of verifying all Contractor mixture production processes. Verification may be accomplished by obtaining split samples from Contractor QC or independent samples from the plant or roadway. If independent samples are taken split them for Contractor testing.

B. Sampling. District Testing will perform the VA by testing independent and split samples. The Department may take Daily samples for verification of plant operation.

For 446, 447, 448, and 449 acceptance mixes other than 301, 302, and 424 Type A the MSG VA testing will be performed by District Testing on a minimum of one in every four required District sampled Daily samples. Other properties can be tested for by the District as desired.

C. Department Verification Testing and Monitoring. For 446, 447, 448, and 449 acceptance mixes the Monitor will randomly choose one Department sample in a maximum of every four production days for VA testing to confirm Contractor testing and mix control. The Department can require samples from the project site (hopper, plate or truck). More frequent VA samples can be taken when desired. The Department VA sample location will be chosen randomly by the Monitor, including where to take the sample, if applicable. The Contractor technician will take the sample with the Monitor witnessing. The Monitor will keep the sample in the Department's possession until delivered to District Testing or testing is complete. The Monitor will have enough sample taken to split with the Contractor. The Monitor will split the sample in the Contractor lab. The Monitor will have the sample tested at District Testing or as noted below. The Contractor will test the split of the VA sample with the Monitor witnessing. The Department will use its VA test result, the Contractor result of the split, as well as the most recent previous day (or night) Contractor quality control and/or sublot test in the comparison for the Department VA testing.

The Monitor may opt to test the Department VA sample in the plant laboratory with the Contractor's permission, according to the Contractor's safety practices, and with the restriction of only the Contractor's technician physically placing a sample pan in the AC Gauge. However, if the Monitor tests VA samples on Contractor equipment, test a VA sample on District Testing equipment a minimum of one time in 15 production days from a given plant regardless of the number of projects or JMFs tested in the Level 2 lab. Record the results and testing location in the District Testing project record. One day may be added to the above Department sample testing frequency for each day production is less than 500 tons (450 metric tons).

For 446, 447, 448, and 449 acceptance mixes other than 301, 302, and 424 Type A the MSG VA testing will be performed by District Testing a minimum of one in every four days. The MSG VA may also include the District-sampled Daily samples, 448 sublot samples, or samples split with the Contractor at the plant. The MSG VA result will be compared to that days Contractor average of MSG QC test results. Any MSG split sample results will be compared with the Contractor split result.

For all mixes, the District may increase the number of VA testing samples if desired.

All Department VA test results will be given to the Contractor by a reasonable arrangement acceptable to both. Department VA sample testing not completed in a timely manner is of no value in verifying quality control testing quality for Contractor test acceptance and/or investigating problem causes. As such, if not completed in a timely manner, Contractor tests will automatically stand and the District will note the problem in the District's VA record.

TABLE 403.10-1 DEPARTMENT VERIFICATION ACCEPTANCE AND QUALITY CONTROL TEST COMPARISON

	Percent Asphalt Binder		**Percent Passing No. 4 (4.75mm)**		**MSG Comparison**
	VA [1]	QC/lot test [2]	VA [1]	QC/lot test [2]	VA [3]
301, 302, 424 Type A	±0.3	±0.4	±4.0	±5.0	
446, 447, 448, rest of 449 mixes	±0.3	±0.3	±4.0	±4.0	0.010

[1] District VA mix test deviation from Contractor split and from the approved JMF. For Basic mixes, use the tolerances in Table 403.06-2 when comparing District VA to JMF.

[2] District VA mix test deviation from most recent previous day (or night) QC and/or lot test.

[3] Deviation of District MSG VA compared to QC MSG daily average.

If the Department VA tests confirm Contractor testing is within the verification tolerances, but a pattern of high or low results exist that suggests mix control is not at the JMF, then investigate with the Monitoring Team's assistance to correct the problem to the Monitoring Team's satisfaction. Direct any questions regarding interpretation of circumstances to OMM.

D. Contractor Tests are Verified. Production is acceptable if:

1. The Monitoring Team verifies the Contractor's QCP is being fully followed; and
2. The Department VA tests are within the limits specified in 403.10.C; and
3. For 301, 302, and 424 Type A mixes, the remaining sieves do not exceed the limits of the applicable specification.

Failure on the Contractor's part to respond and resolve Monitoring Team concerns may result in a change to Restricted Acceptance.

Acceptance is per 446, 447, 448, or 449.

E. Contractor Tests Not Verified. If the Department VA test does not verify the accompanying Contractor tests within the verification tolerances, then the Monitoring Team will investigate. If the Department MSG VA test shows the MSG comparison tolerance in Table 403.10-1 is not met, a single Department tested MSG for that day and every prior production day back to when the Department MSG VA last met the tolerance will be used for each 446, 447, 448, or 449 acceptance mixes other than 301, 302, and 424 Type A Day/Lot density and QC air void determination.

If the deviation between the District and Contractor test is greater than the limits in Table 403.10-2 immediately cease production until resolved. If the deviation is less than the limits in Table 403.10-2 and discrepancies continue, perform additional tests to aid in problem solving.

TABLE 403.10-2 DEVIATION LIMITS

Property	Mix	Limits
Asphalt Binder Content	All	±0.5 %
No. 4 (4.75 mm) sieve	All, except 302	±6.0%
	302	±7.0%

The Contractor may request a review with the Department occasionally for the purpose of determining the cause of a comparison problem. Department decisions upon review are final. If a Contractor is requesting a review of every occurrence of lack of comparison and the Department test is always found correct, the Department may deny that Contractor further reviews.

Additional tests may include any testing necessary to resolve the problem. If the additional testing does not resolve the problem by one-half production day or 1000 tons (1000 metric tons), whichever occurs first, to the Monitoring Team's satisfaction, stop production, if not already, until problems are resolved. Contact OMM for assistance in resolving problems. If the District testing program is confirmed by the additional tests and Monitoring Team investigation and no reason to question the original test exists, then the original District VA tests will stand.

After the above investigation, one of the three following actions will occur:

1. **Mix Production Compares Well to the JMF**. If the District test and investigation shows mix is actually controlled well compared to the JMF in spite of the Contractor test, the District does not have to test additional samples if the Contractor testing problem is corrected.

2. **Mix Production Does Not Compare Well to the JMF.** If the District tests and investigation shows lack of Contractor mix control compared to the JMF the District will test the remaining Department split or Daily samples for the days or Lots represented by the original tests. The District will use the test results to calculate the acceptance. While working with the District, immediately take steps to correct the problem according to the QCP. Failure to achieve a quick resolution will result in a change to Restricted Acceptance.

3. **District Testing Problem**. If the District testing program has a problem as confirmed by the additional testing and District review, the District will correct the problem, throw out the original District test results and take new samples from the samples representing the days or Lots in question for the VA tests.

F. Contractor Department VA Removal and Restoration. For 446 and 447 MSG, for a given Contractor facility, if in a series of 15 or more Contractor/ Department MSG comparison tests (VA, Monitoring tests) the Contractor MSG is lower than the Department MSG by more than 0.002 and occurs a minimum of 65 percent of the time the facility will be removed from Department MSG Verification Acceptance and operate under 403.11. (At a minimum, a report will be issued annually of the Contractor/ Department MSG comparison status of each facility for this determination. This frequency may be increased.)

For all other mixes, if repeated problems with poor comparison of tests are not the District's fault; or poor comparison of Contractor tests to the JMF; or with plant operation, input materials, or any of the other requirements of Department specifications occur in a single project or successive projects, the District will request an opinion from the QC Review Group before notifying the Contractor of removal from Department VA. The District will immediately notify the Contractor of the removal with a follow up letter from District Testing. Once notified, acceptance of asphalt mixtures is by Restricted Acceptance. Restoration of the VA procedures may occur on a future project with a District recommendation to the QC Review Group based on consistent improved plant operation and mix control, a review of the Contractor problems and resolutions, and a review of the QCP by the QC Review Group.

403.11 Restricted Acceptance. If the Contractor is removed from Department VA, the following will occur.

The Contractor must bring its QCP and operation to a level acceptable to the District and QC Review Group before production continues. District Testing will ensure that the project C-95 (Contractor's Prequalification Rating survey) reflects the change to Restricted Acceptance in all of the appropriate C-95 categories. The Department will accept all material for Department projects from the facility under Restricted Acceptance. While the facility is under Restricted Acceptance, acceptance of small quantities under the small quantities policy will not apply.

Quality control testing requirements specified in 403.06 are modified as follows:

A. The required number of test series is a minimum of four each per production day or night. If a production day is less than 6 hours, the Department may reduce the frequency but not less than one test series per every 3 production hours. This requirement does not apply to 446 and 447 MSG as outlined below.

B. For 301, 302, and 424 Type A mixes, if the variation from the JMF for one test is ±8 percent passing the No. 4 (4.75 mm) sieve or ±0.3 percent asphalt binder content, investigate and correct the problem, then resample and test. Maintain the moving average of three tests within ±4 percent passing the No. 4 (4.75 mm) sieve and ±0.2 percent asphalt binder content. In addition to the Quality Control Report, maintain control charts according to 403.06.E for asphalt binder content and the No. 4 (4.75 mm) sieve. If the Range difference in any three consecutive tests is greater than 0.6 percent for asphalt binder content or 10.0 percent passing the No. 4 (4.75 mm) sieve, notify the Monitoring Team. If Range deviations as specified continue, cease production.

For 446 and 447 MSG, the Department will test a single daily MSG for each corresponding 446 and 447 Day/Lot density determination from the facility. The facility can be returned to Department MSG VA when the 65 percent criteria (see 403.10.F) is not exceeded in a series of 30 comparison tests.

C. Report each day's testing on a Quality Control Report, according to 403.08. Report all testing performed by the Contractor's technician on the Quality Control Report. After startup adjustments, report any plant operation changes on the Quality Control Report. Ensure that each Quality Control Report contains technician comments as to production quality, input materials received and condition, and includes any other quality control activities required in the QCP. The Contractor's technician must sign each Quality Control Report. Attach each day's computerized plant printouts to that day's report. The technician must note on the accompanying printout from which tonnage the quality control sample was taken with accompanying test results for asphalt binder content and percent passing the No. 4 (4.75 mm) sieve. Keep a copy of all Quality Control Reports for a project in the Contractor's plant laboratory.

The District will monitor according to 403.10, except notification for ceasing production does not have to be in writing. Additional samples may be obtained for Department testing at any time.

For 301, 302, and 424 Type A mixes, if the average of the Lot or partial Lot acceptance tests for any sieve other than the No. 4 (4.75 mm) sieve exceeds the specification limits, the pay factor is determined as follows:

TABLE 403.11-1 301, 302, 424 TYPE A PAY FACTORS

Number of Tests	1	2	3	4
Pay Factor	0.98	0.97	0.96	0.95

For 448 acceptance mixes, the Department will perform acceptance sampling and testing according to 403.05, 448.04, and 449.04 except the Lot size will be 5000 tons (5000 metric tons) with 1250 ton (1250

metric tons) Sublots. Sublots and acceptance samples may be taken from the roadway or plant at the Districts discretion. Department testing under Restricted Acceptance will receive a lower testing priority than other VA projects.

407.04

On page 202, **Replace** the section with the following:

407.04 Weather Limitations. Do not apply the asphalt material if the surface temperature is below the minimum placement temperature for the pavement course to be placed, as specified in 401.05.

421.02

On Page 210, **Replace** the entire section with the following:

421.02 Materials. Furnish materials conforming to:

Emulsified Asphalt (Binder)..... 702.16, Type C
Aggregate..... 703.01, 703.05
Water 499.02
Mineral Filler (Portland Cement) 701.04
Tack Coat..... 421.09

Use a quick-traffic polymer modified emulsified asphalt binder (Binder) conforming to 702.16, type C. Use only Binder certified according to Supplement 1032. Provide to the Engineer certified test data and a statement from the Binder supplier with each load of Binder that the Binder is the same base asphalt binder, polymer, polymer percentage as formulated and used in the mix design. Include the percent residue on the Bill of Lading.

Conform to 703.01 and 703.05 for aggregate, except as follows:

TABLE 421.02-2

Percent by weight of fractured pieces	100
Sand Equivalence (AASHTO T176)	55 minimum

Do not use aggregates designated with “SR” or “SRH.”

Provide an aggregate blend of 50 percent crushed carbonate stone (CCS) and 50 percent igneous diabase (ex. Ontario Trap Rock) for Surface Course (FR). Provide CCS aggregates for all other microsurfacing courses.

Provide a final blend of aggregates that conform to Table 421.02-3 Gradation A for the aggregate for surface courses, Gradation B for the aggregate for rut fill courses, and Gradation A or B for the aggregate for leveling courses. Stockpile tolerance will be based on target gradation stated in the mix design but will not exceed design gradation band for No. 200 sieve.

TABLE 421.02-3

Sieve Size		Total Percent Passing		
		A	B	Stockpile Tolerance
3/8 inch	(9.50 mm)	100	100	
No. 4	(4.75 mm)	85 to 100	70 to 90	± 5.0%
No. 8	(2.36 mm)	50 to 80	45 to 70	± 5.0%
No. 16	(1.18 mm)	40 to 65	28 to 50	± 5.0%
No. 30	(600 µm)	25 to 45	19 to 34	± 5.0%
No. 50	(300 µm)	13 to 25	12 to 25	± 4.0%
No. 100	(150 µm)	–	7 to 18	± 3.0%
No. 200	(75 µm)	5 to 15	5 to 18	± 2.0%

Screen the aggregate for oversize material prior to use using a 3/8 inch (9.5 mm) screen size. When a blend of aggregates is to be used to meet gradation A or B, proportion the aggregates in a separate stockpile and blend to a uniform consistency prior to screening. Screen the aggregate to complete the blending process and to remove any oversize material prior to use. If oversize material becomes present in the mixture, screen the aggregate directly into material support units.

For mineral filler, use Supplement 1028 Certified Portland cement conforming to ASTM C 150, Type I. Adjustments in the quantity of mineral filler added to the mixture are permitted to improve mixture consistency, mix time, or set time. Do not exceed ± 0.5% from the mix design during placement.

Use water conforming to 499.02. Add water to the mixture to control mixture consistency only and not to control mix time.

Use mix set additives as stated in the mix design to control the mixture's mix and set time. If mix set additives are used during production of mixture, include as part of the mix design. Ensure additives are compatible with the other components of the mix.

421.03

On Page 212, **Replace** the second paragraph of the section with the following:

Submit the mix design and proposed materials to OMM. Include a minimum of 11 pounds (5,000 g) of each aggregate, one quart (1 L) sample of Binder, 3.5 ounces (100 g) of mineral filler, and one pint (0.5 L) of additive, if used, and a complete mix design packet prepared by an AASHTO-accredited laboratory in Pavement Preservation. Prepare the mix design for gradations A or B and present all test data for all tests specified in Table 421.03-1. Determine the residual binder content and present related proportioning of total water (includes moisture in aggregate), mineral filler, and additive with tolerances for each in the final designed mixture. Verify during the mix design the compatibility of the aggregate, Binder, mineral filler, and other additives. Produce the mix design using the same materials that will be used on the project. Approved JMF's expire on December 31st.

421.03

On Page 213, **Replace** Table 421.03-1 with the following:

TABLE 421.03-1

ISSA Test No.	Description	Specification
TB-139	Wet Cohesion	
	30 minutes min. (set time)	12 kg-cm min.
	60 minutes min. (traffic)	20 kg-cm min or near spin
TB-114	Wet Stripping	90 percent min.
TB-100	Wet Track Abrasion Loss 1-hour soak 6 day soak	 450 g/m² max. 650 g/m² max.
TB-144	Saturated Abrasion Compatibility	2 g loss max.
TB-113	Mix Time @ 25 °C	Controllable to 120 seconds
	Mix Time @ 40 °C	Controllable to 45 seconds
TB-147	Lateral Displacement (For Leveling and Rut Fill courses only)	5%, max.
TB-109	Excess Asphalt by LWT Sand Adhesion	538 g/m² max.

421.03 A.

On Page 212, **Replace** list item number 2 with the following:

2. Has residual asphalt by dry weight of aggregate of 7.5 to 8.5 percent for leveling and surface courses or 6.5 to 8.0 percent for rut fill courses.

421.03.A

On Page 213, **Replace** the first sentence after Table 421.03-1 with the following:

Check the ISSA TB-139 (set time) and ISSA TB-113 (mix time) tests at the highest and lowest temperatures expected during construction.

421.03.B.8

On Page 213, **Replace** B.8. with the following:

8. Quantitative effects of moisture content on the unit weight of the aggregate per AASHTO T 19 from 0.0 to 10.0% moisture content.

421.04

On Page 213, **Replace** the first paragraph of the section with the following:

421.04 Quality Control Program (QCP). Create and implement a Quality Control Program (QCP) for each construction season. The QCP will cover processes conducted to provide a microsurface mixture at the project site that is uniform in composition, conforms to the specification requirements and project mix design, and that when placed is free of any defects (lack of mixing, inconsistent texture, inconsistent profile, excessive overlap at joints, streaking, drag marks, roughness, raveling, rutting, holes, and debris, etc.) within the Contractor's control at project completion. Submit a hard copy of the proposed QCP to OMM for review and acceptance. Submit by February 28 or a minimum of five (5) weeks before calibration. Include a revision date on the cover sheet and revision sheet listing

the date(s), what section(s) and page(s) a revision was made, and a short description of what was revised, added, or removed.

421.04.C

On Page 214, **Replace** paragraph C. with the following:

C. Provisions to meet the Department mix specifications including warning bands and action plans for aggregate, Binder, and tack coat materials to ensure they meet Department testing.

421.04 E.

On Page 214, **Replace** Paragraph E. with the following:

E. Methods to maintain all worksheets, including all handwritten records, and other test and sample records from the project for the duration of the contract or eight years, whichever is longer. Define the test record process. Define company records retention requirements. Provide copies of all test reports and forms used in the quality control process.

421.09

On Page 217 **Replace** the third and fourth paragraphs of the section with the following:

Remove all existing pavement markings so that less than 5% of the line remains visible. Repair damage to the pavement that results in the removal of more than 1/8 inch of pavement thickness. When a grinder drum is mounted to a skid steer loader, the drum must be able to accommodate a minimum of 150 teeth.

Seal visible joints and cracks longer than 2 feet (600 mm) in length and any joint or crack greater than 1/4 inch (6 mm) in width no matter the length using Item 423 Type II only. Apply crack sealant material at a width of 2 to 4 inches (50 to 100 mm) and at a thickness of not less than 1/16 inch (2 mm) and not greater than 3/16 inch (5 mm).

421.09

On Page 217, **Replace** the fifth paragraph of the section with the following:

Apply a tack coat to the existing pavement surface conforming to 702.16, Type C CSS-1hM, consisting of a minimum of 15% asphalt residue achieved by diluting with water. Apply the tack coat at a rate of 0.06 to 0.12 gallons per square yard (0.25 to 0.45 L/m²) that provides uniform coverage without excess run-off and allow tack to break before releasing to construction traffic. Adjust application rate of tack coat based on surface texture and porosity. Apply the tack coat only to areas that will be covered by the microsurface during the same day. Do not apply tack coat on top of a leveling course prior to placing the surface course.

421.12

On Page 219, **Replace** the next-to-last sentence in the first paragraph with the following:

Present a revised corrective action plan and obtain the Engineer's approval before resuming work.

421.12.A

On Page 220, **Replace** the entire section with the following:

A. Binder. Obtain and label a Binder sample from supply tanker and diluted tack coat sample from the distributor truck at the direction of the Engineer and give the samples to the Engineer the same day. Provide and sample the Binder and diluted tack coat in one-quart (1 L) plastic containers with plastic screw tops. Label and retain one sample per each additional day for the Department. Take more samples when requested by the Engineer.

Visually inspect Binder in supply tanker(s) to ensure uniform material with no separation or contamination. Verify temperature of binder and tack coat. Monitor and verify proportioning of asphalt emulsion and water into distributor and proper mixing before use or sampling. Perform a minimum of one Binder and tack coat cook-off each production day to determine the residue content of the Binder and tack coat and verify compliance. If residue content is in warning band or out of compliance provide the Engineer with corrective actions prior to using.

Ensure mixing equipment is set at design asphalt emulsion percentage during production. Do not exceed a tolerance of ± 0.3% residual content from the design residual content or the minimum and maximum content in the microsurface mix due to fluctuation in residual content in the Binder. If tolerance is exceeded, stop production. Correct the issue by correcting the Binder residual content by methods allowed by Supplement 1032 certified supplier or adjust the asphalt emulsion percent, if approved by the Engineer. Recalibrate the mixing equipment to the new adjusted asphalt emulsion percent to meet the design residual content of the microsurfacing mix for positive displacement mixing equipment.

421.12 B.

On Page 220, **Replace** the first and second paragraphs with the following:

B. Aggregate. Ensure the aggregate stockpile or final blended aggregate stockpile if two aggregates are used gradation does not vary by more than the stockpile tolerance in Table 421.02-3 compared to the approved JMF and does not exceed the design gradation band for No. 200 (75 µm) sieve. Ensure the percent passing does not change from the high end to the low end of the range for any two consecutive sieves.

Verify the blending and screening of aggregates at the stockpile site and sample the blended and screened aggregate for QC testing. When two aggregates are used, ensure that the 50/50 blend is within 5 percent based on each stockpile gradation and theoretical blend.

421.12 B.

On Page 220, **Replace** the second sentence in the third paragraph with the following:

Obtain three (3) aggregate samples from the stockpile and perform gradation testing on each sample according to AASHTO R 90, AASHTO R 76, Supplement 1004 (AASHTO T 11 where required), and moisture content per AASHTO T 255.

421.12 B.

On Page 220, **Replace** the fourth paragraph with the following:

At a minimum test one sample taken from the stockpile randomly during each production day. When two aggregates are used, sample a minimum of one sample from each stockpile and final blended stockpile randomly. Include additional testing when directed to sample and test by the Engineer. The Contractor may perform an additional aggregate test to verify results if first test is not in compliance with stockpile tolerance. Report and track all test results and monitor trends of the aggregate gradation within the stockpile.

421.12 D.

On Page 222, **Replace** list item number 8 with the following:

8. Total gallons (L) of tack coat used and residual asphalt content.

421.16

On Page 224, **Add** the following pay item to the list:

421	Square Yard (Square Meter)	Microsurfacing, Surface Course (FR)

422.02 C.

On Page 225 **Replace** the first sentence in the third paragraph of the section with the following:

If a staging location will be used for the chip seal aggregate first move the initially tested aggregates from the aggregate source stockpile to the staging location and construct a project-specific staging stockpile.

422.03

On Page 226 **Replace** the 1st sentence of the 3rd paragraph with the following:

Use Type II pneumatic tire rollers conforming to 449.02 with the exception of the requirements of Table 449.02-1 Roller Capacity.

422.06

On Page 228 **Replace** the second paragraph of the section with the following:

Remove all existing pavement markings so that less than 5% of the line remains visible. Repair damage to the pavement that results in the removal of more than 1/8 inch of pavement thickness. When a grinder drum is mounted to a skid steer loader, the drum must be able to accommodate a minimum of 150 teeth.

422.10 C.

On Page 231 **Replace** the first sentence of the section with the following:

C. Coarse Aggregate. At a minimum test one sample taken from the aggregate spreader box or project-specific stockpile at production start and sample and test one sample from the aggregate spreader box or project-specific stockpile randomly during the day.

422.10 C.

On Page 231 **Replace** the fifth sentence of the section with the following:

Sample and test aggregate according to AASHTO R 90, AASHTO R 76, and Supplement 1004 (AASHTO T 11 where required).

422.13

On Page 233 **Replace** the first paragraph of the section with the following:

422.13 Method of Measurement. The Department will measure Single Chip Seal or Double Chip Seal by the number of square yards (square meters) of aggregate, and the gallons (liters) of polymer emulsified binder, completed and accepted in place. The Department will determine the width by measuring the actual width of the chip seal. The Department will determine the length along the centerline of each roadway or ramp. The Department will determine the gallons (liters) of polymer emulsified binder applied according to Item 109.

422.14

On Page 234 **Replace** the Basis of Payment table with the following:

Item	Unit	Description
422	Square Yard (Square Meter)	Aggregate, Single Chip Seal, Type ___

422	Gallons (Liters)	Emulsion, Single Chip Seal, Type ____
422	Square Yard (Square Meter)	Aggregate, Double Chip Seal, Type ____
422	Gallons (Liters)	Emulsion, Double Chip Seal, Type ____

423.02

On page 234 **Delete** the following:

~~Type III~~ .....~~702.17.C~~

423.03

On page 235, **Delete** the following from the first sentence of the first full paragraph:

For Type II~~, III,~~ and IV crack sealants, heat the sealant in a kettle or melter constructed as a double boiler, with the space between the inner and outer shells filled with oil or other heat-transfer fluid.

423.03

On page 235, **Replace** the first sentence of the third full paragraph with:

For Type II ~~and III~~ crack sealants, use a mechanical applicator wand head capable of placing the crack sealant according to the tolerances of 423.07 while filling the cracks.

423.06

On page 236, **Delete** the following:

Mixing Type II ~~and III~~.

423.06

On page 236, **Add** the following sentence after the second sentence:

Type II crack sealant may also be prepackaged per 702.17.B.

423.06

On page 236, **Delete** the last sentence of the section:

~~Do not heat Type III crack sealant to greater than 295 °F (146 °C).~~

423.07

On page 236, **Replace** the first sentence of the fourth paragraph:

For Type II ~~and III~~ crack sealants, place the sealant such that it fills the cracks with a band of sealant within 2 to 4 inches (50 to 100 mm) wide.

423.10

On page 237, **Delete** the following:

~~423~~	~~Pound (Kilogram) or Square Yard (Square Meter)~~	~~Crack Sealing, Type III~~
~~423~~	~~Pound (Kilogram) or Square Yard (Square Meter)~~	~~Crack Sealing, Type II or III~~

424

On page 237 **Replace** the entire section with the following:

ITEM 424 FINE GRADED POLYMER ASPHALT CONCRETE

424.01 Description
424.02 Composition
424.03 Mixing
424.04 Acceptance
424.05 Method of Measurement
424.06 Basis of Payment

424.01 Description. This work consists of constructing a surface course of aggregate and polymer modified asphalt binder mixed in a central plant and spread and compacted on a prepared surface. The requirements of Items 401, 402, 403, and 440 apply with the additional requirements of this specification.

424.02 Composition.

A. Type A. Use 8.5 percent modified asphalt binder by total mix weight. The requirements of 440.04 and 440.06 do not apply for Type A mix designs.

B. Type B. Submit a proposed JMF according to Item 440 to the Laboratory that meets the requirements of a Type 1 surface course, except as follows:

1. Minimum VMA, 15.0 percent

2. Minimum total binder content, 6.7 percent

3. Design air voids, 4.0 percent

4. For projects with less than 1500 trucks use 50 blows, for projects with greater than or equal to 1500 trucks use 75 blows. If multiple sections with differing traffic counts occur on a project use 75 blows for the project.

$$\text{Trucks} = \text{Current ADT} \times T_{24}$$

Where:
Current ADT =current average daily traffic count from the plans
T_{24} = percent trucks per day from the plans

C. Asphalt Binder. Use a PG 76-22M asphalt binder; or a PG 64-22 asphalt binder modified by adding 5.0 ±0.3 percent by weight Styrene Butadiene Rubber (SBR) solids and meeting the requirements of PG 76-22. Provide SBR conforming to 702.14. Provide mineral filler conforming to 703.07.

D. RAP and RAS. Do not use RAS. Ten percent RAP may be used in a Type B mix if all requirements of footnote [3] in Table 424.02-1 are met by the RAP. Do not use RAP in a Type A mix.

E. Aggregate. Furnish clean, uncoated aggregate conforming to the applicable requirements of Table 424.02-1 and quality requirements of 703.05.

TABLE 424.02-1 - MIX GRADATION

Sieve Size		Total Percent Passing	
		Type A [1][2]	Type B [1][3][4]
1/2 inch	(12.5 mm)		100
3/8 inch	(9.5 mm)	100	95 to 100
No. 4	(4.75 mm)	95 to 100	85 to 95
No. 8	(2.36 mm)	90 to 100	53 to 63
No. 16	(1.18 mm)	80 to 100	37 to 47
No. 30	(600 µm)	60 to 90	25 to 35
No. 50	(300 µm)	30 to 65	9 to 19
No. 100	(150 µm)	10 to 30	--
No. 200	(75 µm)	3 to 10	3 to 8

[1] Gradation includes any mineral filler and is specified in percent passing.

[2] Use natural sand with at least 50 percent silicon dioxide by weight according to ASTM C 146. Include with a JMF submittal certified test data from an AASHTO accredited laboratory showing conformance to the 50 percent silicon dioxide requirement. Ensure data is no more than one year old at time of submittal.

[3] Fine Aggregate - Use natural sand with at least 50 percent silicon dioxide by weight according to ASTM C 146. Include with a JMF submittal certified test data from an AASHTO accredited laboratory showing conformance to the 50 percent silicon dioxide requirement. Ensure data is no more than one year old at time of submittal. For 50 blow mixes, use no more than 20 percent limestone sand, No. 10 limestone, or combination of both by weight of total aggregate. For 75 blow mixes, use 20 percent limestone sand, No. 10 limestone, air cooled slag sand or combination thereof by weight of total aggregate. If 10 percent RAP is used the silicon dioxide content of the total natural sand blend must be at least 50 percent. Contact OMM for guidance on submitting RAP aggregate silicon dioxide data.

[4] Coarse Aggregate - For 50 blow mixes, for the final blend of all coarse aggregate use a minimum 10 percent two or more fractured faces aggregate. For 75 blow mixes, use 100 percent two or more fractured faces aggregate. Meet the two or more fractured faces aggregate criteria of ASTM D5821-13.

424.03 Mixing. Discharge the mix from the plant at temperatures from 335 °F to 370 °F (168 °C to 188 °C) for hot mix asphalt or 300 °F to 340 °F (149 °C to 171 °C) for warm mix asphalt.

424.04 Acceptance. The Department will base acceptance of the asphalt concrete mix on the item specified in the Contract item description. (i.e., 448, 449). For Type A mixes comply with acceptance requirements of 449.

424.05 Method of Measurement. For Type A mixes use a unit weight conversion of 1.75 tons/cubic yard (2.08 metric tons/cubic meter).

424.06 Basis of Payment. Include the cost of asphalt material to coat vertical faces and seal joints and gutters in the contract unit price for Item 424.The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
424	Cubic Yard (Cubic Meter)	Fine Graded Polymer Asphalt Concrete, Type A, (449)
424	Cubic Yard (Cubic Meter)	Fine Graded Polymer Asphalt Concrete, Type B, (___)

440

On Page 239, After Item 424, **Add** the following NEW Item:

ITEM 440 ASPHALT CONCRETE MIX DESIGN — GENERAL

440.01 Description
440.02 Materials
440.03 JMF Submittal
440.04 Composition
440.05 Reclaimed Asphalt Concrete Pavement and Reclaimed Asphalt Shingles
440.06 Antistrip Additive
440.07 Tonnage Conversion

440.01 Description. This specification describes the general requirements for asphalt concrete pavement mix design for base, intermediate, and surface courses. Provide laboratory and personnel meeting the requirements of Supplement 1041 to perform mix designs.

Do not start mix production without a preliminary JMF approval and 48 hour notification of District Testing. Final approval of a JMF will be based on field verification. Obtain a new JMF for any desired change to an existing JMF in excess of those allowed in 403.07.

440.02 Materials. Furnish materials conforming to:

Asphalt binder 702.01
Aggregates (base courses)..... 703.04
Aggregates (intermediate and surface courses) ..... 703.01 and 703.05
Mineral filler 703.07

If 100 percent of coarse aggregate in an asphalt mix design is steel slag (703.01.E), the Contractor may include steel slag as a maximum of up to 50 percent of fine aggregate. If a steel slag source causes bulking (expansion resulting in flushing or material loss) in asphalt concrete courses, OMM will place limits on the amount of steel slag allowed in a mix design. Bulking may be shown through testing, such as ASTM D 4792, or through field failure such as, but not limited to, flushing on newer pavement or apparent over-asphalting in production. The Department may require the steel slag processor at any time to perform additional testing to verify steel slag properties. Potential mix problems due to poor control of steel slag aggregate include bulking, poor gradation and specific gravity control resulting in highly variable void properties, excess soft pieces resulting in pock marks, flushing, etc.

440.03 JMF Submittal. Submit no more than two JMFs for each asphalt concrete pay item per project. Additional submittals are at the discretion of OMM. Develop a JMF to comply with the mix design criteria and submit it to OMM on approved forms at least two weeks prior to the start of production for preliminary approval. OMM may require additional time prior to preliminary approval to perform tests on lab or plant produced mixtures to ensure adequate mix performance. OMM will notify the Contractor if additional time for testing is required. Based on the results of this testing, OMM may require the Contractor to design a new JMF.

Identify the PG Binder supplier, as well as the polymer type if applicable, on the JMF submittal. A change in polymer asphalt binder or polymer source will require a redesign. Provide on one page neatly summarized, dated test results for the requirements of Table 702.01-1. Ensure data is no more than two months old. If SBR polymer is added at the asphalt concrete mixing plant, provide in the JMF data from the SBR polymer supplier for total solids (percent) and ash (percent) according to the 702.14. As well, provide the target amount of SBR polymer greater than or equal to 3.5 percent to achieve the properties specified. Include a letter of certification from the polymer supplier verifying percent butadiene in the SBS or SBR polymer. Report in the JMF submittal results of temperature-viscosity testing for mixing and compaction temperatures. For polymer asphalt binders, supplier recommended temperatures may be used in lieu of the temperature-viscosity results, but the temperature-viscosity results must still be reported.

For Superpave mixes, include the standard Department cover and summary page, all printouts from the gyratory compactor (all gyratory points not necessary), and analysis covering the required mix properties in the JMF submittal.

Ensure the JMF submittal includes the percentages of RAP, RAS, virgin aggregates, and virgin asphalt binder required for the mix item. Report all RAP and RAS test results, including binder blend analysis, in the JMF submittal. Identify the RAP in the JMF submittal as to project origin and mix type(s). Identify the approved manufactured shingle waste manufacturer source or the approved tear-off RAS processor in the JMF submittal.

Provide the required certification forms in the JMF submittal documenting that the RAS meets AASHTO MP 23-15 (2020), Section 4 and that RAS from roofing tear-offs conforms to the EPA's NESHAP, 40 CFR 61 Subpart M, and other applicable agency requirements for asbestos.

Note on the JMF submittal RAP page which of Method 1 or Method 2 methods described below apply to the RAP.

For mixes using Method 1 that will contain up to 10 percent RAP and no RAS, the JMF submittal is not required to include the RAP except when a virgin polymer asphalt binder is used in a surface course. In addition, for surface course JMF submittals having polymer asphalt binder and RAP, including 424 mixes, do not submit any blends having 1 through 9 percent RAP.

For mixes using Method 2 that will contain up to 15 percent RAP and no RAS, the JMF submittal is not required to include the RAP unless a virgin polymer asphalt binder is used in a surface course. In addition, for surface course JMF submittals having polymer asphalt binder and RAP do not submit any blends having 1 through 9 percent RAP.

Include RAS in a JMF submittal according to the Standard RAP/RAS Limits Table 440.05-1 or Extended RAP/RAS Limits Table 440.05-2 unless specified differently in the applicable mix specification.

Include any required antistrip additive in the mix design. Submit the following to OMM with the proposed JMF:

A. All TSR data (before and after the addition of the antistrip additive).

B. Rate of addition of the liquid antistrip material, if used.

C. If using liquid antistrip material submit product information, information on use by other State DOTs using the liquid antistrip material, and a letter of certification. If using hydrated lime submit certified test data showing the hydrated lime conforms to AASHTO M 303, Type 1.

D. Results of the washed gradation test of the individual components of the mix used in determining the combined gradation.

E. Results of the adherent fines testing for each component.

OMM may perform additional tests on lab or plant produced mix according to Supplements 1004, 1051, and 1052. If a change in the aggregate production is suspected, the Laboratory may require the Contractor to perform washed gradations on components and calculate adherent fines to determine the need for additional TSR review.

440.04 Composition. Perform the mix design and supply all required data in a manner taught in Level 2 Asphalt Technician School, Level 3 Asphalt Mix Design School and in the most recent Asphalt Institute Manual Series No. 2 (MS-2). OMM may visit the Level 3 mix design lab for review. Provide a mix design with at least four asphalt binder content points, including a minimum of two points above and two points below the JMF asphalt binder content. Design using HMA temperatures and do not use WMA additives during design. Use a 2 hour cure for volumetric mix samples and ensure the cure temperature and specimen compaction temperature are the same. Select the JMF asphalt binder content using the design air voids of the mix type and ensure the JMF meets the other requirements of the specified mix. Determine air voids from specimens prepared and tested according to Supplement 1036. Unless otherwise directed, submit an uncompacted sample for MSG representing the JMF meeting the minimum sample size in Supplement 1036 and three Marshall or two gyratory compacted specimens at design air voids. Submit additional samples as requested by OMM.

Do not apply the gradation requirements of 703.05 for fine aggregate.

If the F/A ratio using total asphalt binder content is greater than 1.0 recalculate it using the effective asphalt binder content. Calculate the effective asphalt binder content according to the MS-2. The value (calculated to the nearest percentage point) of the Fifty to Thirty (F-T) value, is the percent of total aggregate retained between the No. 50 (300 µm) and No. 30 (600 µm) sieves, minus the percent of total aggregate retained between the No. 30 (600 µm) and No. 16 (1.18 mm) sieves.

The Contractor may use the Marshall flow test in Superpave design as an indicator of potential for excess tenderness.

440.05 Reclaimed Asphalt Concrete Pavement and Reclaimed Asphalt Shingles. Provide reclaimed asphalt concrete pavement (RAP) and reclaimed asphalt shingles (RAS) according to the following requirements when choosing to use one or both in a mix. Failure to follow these requirements will result in a rejection of the Contractor QCP (403.03); restriction of the use of any RAP, RAS, or both at the facility; a change to Restricted Acceptance at the facility; or any combination thereof.

Provide RAP obtained from verifiable Department or Ohio Turnpike Commission projects and RAS obtained from un-used manufactured shingle waste or used roofing tear-off shingles as listed in Tables 440.05-1 and 440.05-2 and as follows. If the RAP is not from the above sources or the source is unknown, process and blend the RAP into a single uniform stockpile, test according to Level 3 Asphalt Mix Design requirements and obtain OMM approval for use. Obtain written approval from OMM for use of unusually large, old RAP stockpiles of unknown content, age, or both. Include approved methods in the QCP for ongoing processing and testing of these piles. Ensure no foreign or deleterious material is present in RAP. Use approved RAS suppliers meeting the requirements of Supplement 1116.

Ensure that the percentages of RAP and RAS fall within the specified limits of the required mix item.

Determine the final RAP gradation and asphalt binder content on a minimum of four separate stockpile (or roadway for concurrent grinding) samples. A RAP pile will be considered established if all samples agree within a range of 0.4 percent for asphalt binder content and 5 percent passing the No. 4 (4.75 mm) sieve. If fractionated RAP is used, use a suitable sieve for determining gradation uniformity. Determine RAP binder content from a centrifuge extraction test. Do not use reflux extraction or oven burnoff. Do not add RAP or other materials to established RAP piles. Once an established RAP pile is added to or used up, the RAP pile is no longer established and all JMF's associated with the pile are no longer approved. Notify OMM of JMF's impacted and JMF approval will be withdrawn.

Use no more than 3.0 percent RAS by dry weight of mix. For design assume 12.0 percent available RAS binder. Determine gradation and specific gravity according to AASHTO PP 78-17 (2020), Section 5 or subsequent AASHTO applicable standard.

If the uniform stockpile will be processed into the asphalt plant using plant cold feed in line processing determine the processed RAP properties for use in the mix design. Record in the JMF submittal both the uniform stockpile and in line processed RAP properties.

Submit a new JMF for each existing mix type on the project (or each milling pass of two types) desired for use as concurrent project RAP.

A. RAP and RAS Usage Limits and Requirements. Follow Method 1 or Method 2 when using RAP, RAS , or both. When using RAS without RAP apply the virgin binder requirements of Table 440.05-2 Method 2. Use PG 64-28 virgin binder in all 442 intermediate courses regardless of the percentage of RAP used. If greater than 25 percent RAP is used in a JMF submittal use PG 58-28 or PG 64-28 virgin binder. If 26-30 percent RAP is used in the JMF submittal, the Contractor may submit a 3000 gram RAP sample along with a blend chart, according to Level 3 Mix Design procedures, to determine the grade of virgin asphalt binder to use. When using both 15 percent or greater RAP and 3 percent RAS in in the JMF submittal for intermediate and base courses, use PG 58-28 or PG 64-28. ODOT may request RAP samples, RAS samples, binder properties, or any combination at any time.

B. Method 1 Standard RAP. Limit RAP and RAS according to the Standard RAP/RAS Limits Table 440.05-1 unless specified differently in the applicable mix specification.

TABLE 440.05-1 METHOD 1 – STANDARD RAP/RAS LIMITS

Asphalt Mix Application	Percent RAP by Dry Weight of Mix, Max.[1]	RAS Usage [2]	Total Virgin Asphalt Binder Content, Min.	Comments
442 Polymer Surface Course	10%[3]	None	5.2	Polymerized binder is virgin. (For non-polymer virgin binder allow 20% max RAP)
424 Fine Graded Polymer	10% [3][4]	None	[5]	
441 Surface Course	20%	None	5.0	Polymer or non-polymer virgin.
441, 442 Intermediate Course	35%	Manufacturing waste and tear-offs	3.0	Any mix type used as an intermediate course.
301 Base Course	50%	Manufacturing waste and tear-offs	2.7	OMM will establish the asphalt binder content.
302 Base Course	40% (30%)	Manufacturing waste and tear-offs	2.0	OMM may limit RAP to 30 percent, eliminate RAS, or both if poor production mixing or coating is evident.[6]

[1] When using RAP and RAS in combination, use no more than 25 percent RAP.
[2] No more than 3.0 percent RAS by dry weight of mix.
[3] Use zero or 10 percent. Do not submit blends with 1 to 9 percent RAP.
[4] Type B mixes only. Do not use RAP in Type A mixes.
[5] The requirements of 424 apply.
[6] OMM will adjust the virgin binder content if the lower limits apply.

C. Method 2 Extended RAP. Limit RAP and RAS according to the Extended RAP/RAS Limits Table 440.05-2 unless specified differently in the applicable mix specification. Use Method 2 only with counter flow drum plants or mini-drum batch plant configurations meeting 402.

TABLE 440.05-2 METHOD 2-EXTENDED RAP/RAS LIMITS

Asphalt Mix Application	Percent RAP by Dry Weight of Mix, Max.[1]	RAS Usage[2]	Total Virgin Asphalt Binder Content, Min.	Comments
442 Polymer Surface Course	15%[3]	None	5.0	Polymerized binder is virgin. (For non-polymer virgin binder allow 25% max RAP)
424 Fine Graded Polymer	10% [3][4]	None	[5]	
441 Surface Course	25%	None	5.0	Polymer or non-polymer virgin.
441, 442 Intermediate Course	40%	Manufacturing waste and tear-offs	3.0	Any mix type used as an intermediate course.
301 Base Course	55%	Manufacturing waste and tear-offs	2.5	OMM will establish the asphalt binder content.
302 Base Course	45% (35%)	Manufacturing waste and tear-offs	1.8	OMM may limit RAP to 35 percent, eliminate RAS, or both if poor coating is evident.[6]

[1] When using RAP and RAS in combination, use no more than 25 percent RAP.
[2] No more than 3.0 percent RAS by dry weight of mix.
[3] Use zero or 10 percent. Do not submit blends with 1 to 9 percent RAP.
[4] Type B mixes only. Do not use RAP in Type A mixes.
[5] The requirements of 424 apply.
[6] OMM will adjust the virgin binder content if the lower limits apply.

440.06 Antistrip Additive. If the proposed JMF contains any gravel coarse aggregate, or contains more than 25 percent natural sand, or contains more than 20 percent RAP containing gravel coarse aggregate, or is designed according to Item 442 conduct the following tests:

TABLE 440.06-1 ANTISTRIP TESTS

Test Description	Specification
Moisture damage potential test	Supplement 1051
Washed gradation	AASHTO T 11 as modified by Supplement 1004
Adherent fines test for each component	ASTM D 5711

Modify the mix with liquid antistrip material or hydrated lime if the results of the moisture damage potential test show the Tensile Strength Ratio (TSR) of the asphalt concrete mix to be less than 0.80 for 442 mixes or 0.70 for all other mix types.

A. Liquid Antistrip Material. Include liquid antistrip material at a rate of 0.5 to 1.0 percent by weight of the asphalt binder. However, if 442 is specified, include liquid antistrip material at a rate of 0.50 to 1.25 percent by weight of the asphalt binder. Ensure the TSR of the asphalt concrete mix is greater than or equal to 0.80 after the addition of the liquid antistrip material.

B. Hydrated Lime. Include hydrated lime in the dry form at a rate of 1.0 percent by the dry weight of aggregate for asphalt concrete except use 0.75 percent for 302 mixes. Conform to AASHTO M 303, Type 1 for hydrated lime. Ensure the TSR of the asphalt concrete mix is greater than or equal to 0.80 after the addition of the hydrated lime.

440.07 Tonnage Conversion. If an OMM established mix design conversion factor from the approved JMF is not available, OMM will use the factors in Table 440.07-1.

TABLE 440.07-1 CONVERSION FACTORS

Aggregate	lb/yd³	(kg/m³)
Gravel and stone	4000	(2370)
Slag less than 90 lb/yd³ (less than 1450 kg/m³) [1]	3600	(2135)
Slag 90 to 100 lb/yd³ (1450 to 1600 kg/m³) [1]	4000	(2370)
Slag more than 100 lb/yd³ (more than 1600 kg/m³) [1]	4300	(2550)
[1]Based on average dry rodded weight at the Laboratory.		

441

On page 239 **Replace** the entire section with the following:

ITEM 441 MARSHALL ASPHALT CONCRETE

441.01 Description
441.02 Composition
441.03 Acceptance
441.04 Basis of Payment

441.01 Description. This work consists of design, production, placement, compaction and testing of one or more courses of Marshall asphalt concrete, on a prepared foundation. The Marshall asphalt concrete consists of a mixture of graded aggregate and specified type and grade of asphalt binder that is designed using Marshall mix design procedures and a Marshall hammer. The aggregate and asphalt binder are mixed in a central plant then spread and compacted on the prepared surface. The requirements of Items 401, 402, 403, and 440 apply with the additional requirements of this specification.

441.02 Composition. Use a PG 64-22 asphalt binder for a Type 1 Intermediate course unless RAP, RAS, or both used according to 440.03 require a virgin binder grade change. Use a PG 64-22 asphalt binder for a Type 2 intermediate course unless RAP and/or RAS used according to 440.03 require a virgin binder grade change. Use a PG 64-22 asphalt binder and Type 1 surface gradation for asphalt concrete for driveways and under guardrails.

TABLE 441.02-1

Asphalt Mixture Composition			
Property	**Type 1 Surface**	**Type 1 Intermediate**	**Type 2 Intermediate**
1 1/2 inch (37.5 mm)[1]			100
1 inch (25.0 mm)[1]			95-100
3/4 inch (19.0 mm)[1]			85-100
1/2 inch (12.5 mm)[1]	100	100	65-85
3/8 inch (9.5 mm)[1]	90-100	90 to 100	
No. 4 (4.75 mm)[1]	45-57	50-72	35-60
No. 8 (2.36 mm)[1]	30-45	30 to 55	25-48
No. 16 (1.18 mm)[1]	17-35	17 to 40	16-36
No. 30 (600 μm)[1]	12-25	12 to 30	12-30
No. 50 (300 μm)[1]	5-18	5 to 20	5 to 18
No. 100 (150 μm)[1]	2-10	2 to 12	2 to 10
No. 200 (75 μm)[1]			
Asphalt Binder[2]	5.8-10.0	5.8 to 10.0	4.6 to 9.0
F/A Ratio, max.[3]	1.2	1.2	1.2
F-T Value[4]	+2	+2	
Blows[5]	50	50	50
Stability, min., pounds[5] (N)	1200 (5338)	1200 (5338)	1200 (5338)
Flow, 0.25 mm[5]	8 to 16	8 to 16	8 to 16
Design Air Voids[6]	3.5	3.5	4.0
VMA, min.[7]	16.0	16.0	13.0
CTIndex, min.[8]	Report	Report	Report

[1] Sieve, percent passing
[2] Percent of total mix
[3] Using effective asphalt binder content
[4] Percentage points maximum
[5] AASHTO T 245
[6] Percent, Supplement 1036
[7] Percent, Supplement 1037
[8] Perform the IDEAL-CT and report results according to Supplement 1033

441.03 Acceptance. The Department will base acceptance of the asphalt concrete mix on the item specified in the Contract item description. (i.e., 446, 447, 448, 449).

441.04 Basis of Payment. Include the cost of asphalt material to coat vertical faces and seal joints and gutters in the contract unit price for Item 441. The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
441	Cubic Yard (Cubic Meter)	Asphalt Concrete Surface Course, Type ___, (__), PG64-22
441	Cubic Yard (Cubic Meter)	Asphalt Concrete Surface Course, Type ___, (___), PG70-22M
441	Cubic Yard	Asphalt Concrete Intermediate Course,

	(Cubic Meter)	Type 1, (___)
441	Cubic Yard (Cubic Meter)	Asphalt Concrete Intermediate Course, Type 2, (___)
441	Cubic Yard (Cubic Meter)	Anti-Segregation Equipment

442

On page 249 **Replace** the entire section with the following:

ITEM 442 SUPERPAVE ASPHALT CONCRETE

442.01 Description
442.02 Type A Mix Design
442.03 Type B Mix Design
442.04 Asphalt Binder
442.05 Acceptance.
442.06 Basis of Payment

442.01 Description. This work consists of design, production, placement, compaction and testing of one or more courses of Superpave asphalt concrete, on a prepared foundation. The Superpave asphalt concrete consists of a mixture of graded aggregate and specified type and grade of asphalt binder that is designed using Superpave mix design procedures and a gyratory compactor. The aggregate and asphalt binder are mixed in a central plant then spread and compacted on the prepared surface. The requirements of Items 401, 402, 403, and 440 apply with the additional requirements of this specification.

442.02 Type A Mix Design.

Supply aggregate according to the lane current average daily truck traffic (Lane ADTT) as follows unless otherwise shown on the plans:

$$\text{Lane ADTT} = \text{Current ADT} \times T_{24} \times 0.45$$

Where:
Current ADT =current average daily traffic count from the plans
T_{24} = percent trucks per day from the plans

TABLE 442.02-1 GYRATION LEVEL AND MATERIAL REQUIREMENTS

Lane ADTT	Nini	Ndes	Nmax	Coarse Aggregate Angularity	Fine Aggregate Angularity	Flat and Elongated Particles	Sand Equivalent
<4000	7	65	105	95 [1] /90 [2]	44	10	45
≥4000	7	65	105	100 [1] /100 [2]	44	10	50
[1] Percent fractured (one or more faces) according to ASTM D5821 [2] Percent fractured (two or more faces) according to ASTM D5821							

Submit aggregate to be used to OMM for approval a minimum of 3 weeks before submitting a JMF for approval.

If fine aggregate is from crushed carbonate stone or air-cooled blast furnace slag, the Department will not require the fine aggregate angularity (FAA) test. The Department will allow a blend of a material not meeting the FAA with a material that meets the FAA, but calculate the FAA result based on the individual Department FAA results and actual blend percentages. Obtain OMM approval of any blends.

The restricted zone does not apply. Use control points according to MS-2, except as specified in Table 442.02-2.

TABLE 442.02-2 AGGREGATE GRADATION REQUIREMENTS

Sieve Size		9.5 mm mix	12.5 mm Surface Course mix	12.5 mm Intermediate Course mix	19.0 mm mix
		Total Percent Passing			
1 1/2 inch	(37.5 mm)	–	–	100	100
3/4 inch	(19 mm)	–	100	95 to 100	85 to 100
1/2 inch	(12.5 mm)	100	95 to 100	90 to 100	90 max
3/8 inch	(9.5 mm)	90 to 100	96 max	89 max	–
No. 4	(4.75 mm)	70 max	52 to 60[1]	60 max	–
No. 8	(2.36 mm)	34 to 52	34 to 45	34 to 45	28 to 45
No. 200	(75 µm)	2 to 8	2 to 8	2 to 8	2 to 6
[1] For the No. 4 sieve do not exceed 63 in production.					

Ensure that the F/A ratio is a maximum of 1.2. Use a 2-hour cure for the mix design.

If more than 15 percent fine aggregate not meeting FAA is used, perform testing using the asphalt pavement analyzer (APA) according to Supplement 1057. To estimate an APA sample mix volume, use the bulk density from gyratory specimens at N_{des}. Deformation less than 0.20 inch (5.0 mm) at 120 °F (49 °C) are considered passing for PG 58-28 and PG 64-22 mixes. Deformation less than 0.12 inch (3.0 mm) at 120 °F (49 °C) are considered passing for all other mixes.

Test design volumetric properties at N_{des}. Test N_{max} for the required criteria. Ensure that the VMA is not less than the minimum values of Table 442.02-3.

TABLE 442.02-3 VMA CRITERIA

Mix	VMA (percent minimum)
9.5 mm	15.0
12.5 mm Surface	14.0
12.5 mm Intermediate	14.0
19.0 mm	13.0

Perform the IDEAL-CT on all mixes and report results according to Supplement 1033.

442.03 Type B Mix Design. Apply the mix design specified in 442.02 for a Type A mix except as modified by this subsection:

Modify the Coarse Aggregate Angularity of Table 442.02-1 according to Table 442.03-1.

TABLE 442.03-1 COARSE AGGREGATE ANGULARITY

Lane ADTT	Coarse Aggregate Angularity
<4000	65 [1] /65 [2]
≥4000	75 [1] /70 [2]
[1] Percent fractured (one or more faces) according to ASTM D5821 [2] Percent fractured (two or more faces) according to ASTM D5821	

Ensure that at least 50 percent by weight of virgin fine aggregate is aggregate meeting FAA or is crushed carbonate stone or air-cooled blast furnace slag. Modify the No. 8 (2.36 mm) sieve requirement for a 12.5 mm surface course mix in Table 442.02-2 to 34 to 40 percent. Apply an F-T value of +2 according to 440.04 and 403.06.

442.04 Asphalt Binder. Use a PG 70-22M asphalt binder for surface courses and a PG 64-28 asphalt binder for 19.0 mm intermediate courses. For 12.5 mm intermediate courses use a PG 64-22 asphalt binder for 25 percent or less RAP, and a PG 64-28 asphalt binder for more than 25 percent RAP or if RAS is used with or without RAP.

The minimum total asphalt binder content for a surface course is 5.8 percent. For 12.5 mm intermediate courses, the minimum total asphalt binder content is 5.4 percent and the minimum total virgin asphalt binder content is 3.5 percent. The minimum total asphalt binder content for a 19.0 mm is 4.6 percent.

442.05 Acceptance. The Department will base acceptance of the asphalt concrete mix on the method specified in the Contract line item description (i.e., 446, 447, 448, 449).

442.06 Basis of Payment. Include the cost of asphalt material to coat vertical faces and seal joints and gutters in the contract unit price for Item 442. The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
442	Cubic Yard (Cubic Meter)	Asphalt Concrete Surface Course, (____mm), Type _____(___)
442	Cubic Yard (Cubic Meter)	Asphalt Concrete Intermediate Course, (_____mm), Type ____(___)
442	Cubic Yard (Cubic Meter)	Anti-Segregation Equipment

443

On page 252 **Replace** the entire section with the following:

ITEM 443 STONE MATRIX ASPHALT CONCRETE

443.01 Description
443.02 Quality Control Program
443.03 Composition
443.04 Mixing
443.05 Storage
443.06 Quality Control
443.07 Construction
443.08 Acceptance
443.09 Basis of Payment

443.01 Description. This work consists of design, production, placement, compaction and testing of one or more courses of stone matrix asphalt concrete (SMA), on a prepared foundation. The aggregate and asphalt binder are mixed in a central plant then spread and compacted on the prepared surface. The requirements of 401, 402, 403, 440, 442; and 446 or 447 apply with the additional requirements of this specification.

Do not use the warm mix asphalt method (402.05) for this item.

443.02 Quality Control Program. With the submission of a SMA mix design to be approved, submit to OMM a revised Quality Control Program, if necessary, to include a section to satisfy 403.03.P.

443.03 Composition. Discuss the mix design approach with OMM during the mix design process and prior to submittal.

A. Design Limits. Submit a JMF to the Laboratory which meets the requirements of Table 443.03.1.

TABLE 443.03-1 MIX COMPOSITION

Property Description	Specification
3/4 inch (19.0 mm) [1]	100
1/2 inch (12.5 mm) [1]	85 to 100
3/8 inch (9.5 mm) [1]	50 to 75
No. 4 (4.75 µm0 [1]	20 to 28
No. 8 (2.36 µm) [1]	15 to 24
No. 50 (300 µm) [1]	10 to 20
No. 200 (75 µm) [1]	8 to 12
Binder, % [2]	5.8 to 7.5
VMA, % [3]	16.0 to 19.0
Draindown Test, % [4]	0.3
Design Air Voids, %	3.5
Design Gyrations [5]	65
VCA MIX / VCA DRC [6]	< 1.0
TSR [7]	0.80
F/A	NA

[1] Sieve, percent passing
[2] By total mix
[3] Based on bulk gravity
[4] AASHTO T305 conducted at mix production temperature (not compaction temperature)
[5] N_{ini} and N_{max} do not apply
[6] VCA = Volume of Coarse Aggregate (Calculated for mix and dry rodded conditions according to AASHTO R 46.)
[7] Unconditioned specimens will have a minimum 65 psi (450 kPa) retained strength.

Compact specimens at 300 °F (149 °C) for PG 70-22M and 310 °F (154 °C) for PG 76-22M.

B. Coarse Aggregate. Use approved coarse aggregates. Ensure coarse aggregates meet 703.05 and Table 443.03-2.

TABLE 443.03-2 AGGREGATE REQUIREMENTS

Tests	Description	Specification
ASTM D 4791	% Flat and Elongated Ratio at 3:1, (max. to min.) 5:1, (max. to min.)	 20 max 5 max
ASTM D 5821	% Crushed, one / two faces	100 / 90 min
AASHTO T 96	LA Abrasion (stone or gravel)	35 max

C. Mineral Filler. Conform to 703.07. Use mineral filler in the JMF with a plasticity index (AASHTO T 90) not greater than 4 (does not apply to hydrated lime). Reclaimed asphalt concrete pavement passing the 5/8 inch (16 mm) sieve may be used as filler only. Do not account for reclaimed asphalt concrete pavement binder content. Do not use quicklime (CaO). Do not premix filler with another aggregate. Cover mineral filler piles to protect from rain.

Blend the mineral filler, asphalt binder and fiber stabilizer into a homogenous mixture and test the mortar for the following properties of Table 443.03-3.

TABLE 443.03-3 MORTAR TEST REQUIREMENTS

Tests	Description	Specification
AASHTO T 315	Unaged DSR, G*/ sin δ (kPa)	5 minimum
AASHTO T 315 & T 240	RTFO Aged DSR, G*/ sin δ (kPa)	11 minimum
AASHTO R 28 & T 313	PAV Aged BBR, Stiffness (MPa)	1500 maximum

D. Reclaimed Asphalt Concrete Pavement and Shingles. Do not use reclaimed asphalt concrete pavement except as described in 443.03.C. Do not use reclaimed asphalt shingles.

E. Fiber Stabilizer. Choose and meet the requirements of one of the following fiber stabilizers. Submit with the JMF submittal the fiber manufacturer's most recent actual test data and a certification of compliance for the fiber type to be used. Protect the fiber stabilizer from moisture or other contamination.

1. Cellulose Fibers. Add the fiber at a dosage rate of 0.3 to 0.4 percent by weight of the total mix as directed by District Testing to control draindown in production.

TABLE 443.03-4 CELLULOSE FIBER REQUIREMENTS

Property	Limits
Fiber Length (max)	0.25 inches (6.35 mm)
No. 100 (150 µm) [1]	60 to 80
No. 20 (850 µm) [2]	80 to 95
No. 40 (425 µm) [2]	45 to 85
No 100 (150 µm) [2]	5 to 40
Ash Content	18% non-volatiles (±5%)
pH	7.5 (±1.0)
Oil Absorption (times fiber weight)	5.0 (±1.0)
Moisture Content (max)	5.0%
[1] Sieve analysis – Alpine Sieve Method, percent passing [2] Sieve analysis – Ro-Tap Sieve Method, percent passing	

2. Cellulose Pellets. Cellulose pellets consist of cellulose fiber and may be blended with 0 to 20 percent asphalt binder. Meet the cellulose fiber requirements above. If no asphalt binder is used, add the pellet at a dosage rate of 0.3 to 0.4 percent by weight of the total mix as directed by District Testing to control draindown in production. Adjust the fiber dosage to maintain the desired fiber amount when fiber is pre-blended with binder.

TABLE 443.03-5 CELLULOSE PELLET REQUIREMENTS

Maximum Pellet size	1/4 cubic inch (4000 mm^3)
Binder	25 to 80 pen.

3. Mineral Fiber. Use mineral fibers made from virgin basalt, diabase, or slag treated with a cationic sizing agent to enhance disbursement of the fiber as well as increase adhesion of the binder to the fiber

surface. Add the fiber at a dosage rate of 0.3 to 0.4 percent by weight of the total mix as directed by District Testing to control draindown in production.

TABLE 443.03-6 MINERAL FIBER REQUIREMENTS

Average Fiber length (max)	0.25 in (6.35 mm)
Average Fiber thickness (max)	0.0002 in (0.005 mm)
Shot content (ASTM C612) Percent Passing No. 60 (250 µm) sieve Percent Passing No. 230 (63 µm) sieve	 90 to 100 65 to 100
Degradation (max)[1]	30 percent
[1] (GeorgiaDOT-124/McNett) - copy available from OMM .	

443.04 Mixing. Conform to the following additional requirements.

A. Fiber Stabilizer. Furnish feeder equipment specifically manufactured to uniformly feed fiber into the plant and that is automated through connection with plant controls. Include a low level and no-flow indicator, print out the feed rate of the feeder supply system, and include a transparent pipe section for observing flow consistency. District Testing will approve the fiber feed system prior to the start of production by a trial load of SMA and inspection of the bag house collected material. Conduct and document a weekly quick check of the fiber feed calibration according to the Quality Control Plan. Conduct a daily check of fiber usage by calculating and documenting on the TE 199 that fiber usage is within 10 percent of the intended usage.

In drum plants, add the fibers in loose form, by an automated calibrated feed system, such that the fibers are coated by asphalt binder before being caught in the drum air flow.

In batch plants, distribute the fiber uniformly before injecting asphalt binder and increase mixing time a minimum of 5 seconds.

B. Mineral Filler. Filler may be fed through a hopper if consistency of flow is achieved. If a problem in feeding consistency occurs a pneumatic system will be required. Feed filler into the weigh hopper or pug mill of a batch plant, or at a point away from the flame on a drum plant.

443.05 Storage. Do not store the SMA at the plant for more than 2 hours. Do not exceed a mix temperature of 350 °F (180 °C). If draindown occurs shorten the storage time and increase the fiber dosage.

443.06 Quality Control. Ensure an employee of the Contractor with a Level 3 rating is at the plant or construction site during production of the SMA for any test strips and through at least one full production day satisfactory to the District.

Perform quality control tests every 3 hours of production. The increased frequency of quality control testing may require additional quality control personnel at the plant. Determine the asphalt binder content, gradation, moisture content, air voids, VMA, and MSG of the SMA. For each test series calculate the VCAMIX / VCADRC. If the limit of 1.0 is exceeded stop production until resolved. Perform a draindown test once each day of production and raise fiber dosage 0.1 percent if the test limit is exceeded. Do not exceed the No. 200 (75 µm) sieve design bands by the moving average of three tests. Compact specimens at 300 °F (149 °C) for PG 70-22M and 310 °F (154 °C) for PG 76-22M. Due to sample variability with SMA, a larger than usual sample size from which material is obtained for the various tests is required.

443.07 Construction. At least 24 hours prior to beginning a test strip meet with the Engineer and District Testing and provide a written summary of steps taken to assure mix quality and construction practices account for the special needs of SMA production and placement. Send a copy of the written summary to OMM.

A. Test Strips and JMF Adjustment. Do not begin full production of the SMA until receiving authorization from District Testing. This authorization will be based on the successful construction of one or more test strips. Test strips consist of 50 to 100 tons of SMA produced and placed in accordance with these specifications. Cease SMA production that day unless another test strip is needed. Place test strips in one continuous mat. The test strip will be included in the first lot for determining density for payment.

During the construction of a test strip, perform one set of quality control tests as described above and obtain and test 3 random cores of the compacted pavement. Within 1 working day after a test strip is completed, the Laboratory and the Contractor's Level 3 employee will determine if any changes in the SMA JMF, production, or placement procedures are needed. A redesign of the JMF or another test strip may be required. OMM will notify District Testing of any JMF adjustments. Do not start production until notified by District Testing.

B. Hauling. Provide SMA at a minimum of 300 °F (148 °C) when it arrives at the paver, unless otherwise approved by OMM. If draindown is evident when discharging into the paver, shorten the storage time and increase the fiber dosage.

C. Compaction. Start compaction immediately after the SMA has been placed. Use only steel wheel rollers. Vibratory rollers in vibratory mode, set at a high frequency and low amplitude, can be used as the breakdown roller only. Always operate the breakdown roller immediately behind the paver. If isolated, small fat spots develop, apply sand immediately during compaction. If continuous or large fat spots develop, cease production until resolved. Do not compact SMA that is below 230 °F (110 °C).

443.08 Acceptance. After accepting the test strips, the Department will base acceptance of the asphalt concrete mix on the method specified in the Contract line item description (i.e., 446 or 447).

443.09 Basis of Payment. Include the cost of asphalt material to coat vertical faces and seal joints and gutters in the contract unit price for Item 443.The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
443	Cubic Yard (Cubic Meter)	Stone matrix asphalt concrete, 12.5mm, PG70-22M, (_____)
443	Cubic Yard (Cubic Meter)	Stone matrix asphalt concrete, 12.5mm, PG76-22M, (_____)

446

On page 257 **Replace** the entire section with the following:

ITEM 446 ASPHALT CONCRETE CORE DENSITY ACCEPTANCE

446.01 Description
446.02 Joint Construction
446.03 Core Procedures
446.04 Density Acceptance

446.01 Description. This specification describes the acceptance criteria for asphalt concrete surface and intermediate courses using mat and joint cores from each day's production. The Department will base acceptance of the compacted mixture in place on the level of density attained as sampled by the Contractor and analyzed by the Department.

446.02 Joint Construction. Make a hot longitudinal joint between the mainline pavement lane and the adjoining shoulder and all ramps and the adjoining shoulders. If a hot longitudinal joint is specified between the mainline pavement lanes, the Contractor may construct a cold longitudinal joint between the mainline pavement lanes and the adjoining shoulders.

446.03 Core Procedures. Obtain core samples only in the presence of the Engineer and immediately surrender each core sample to the Engineer for testing. If taken, locate cores obtained for Contractor quality control (QC comparison core) longitudinally from and within 4 inches (100 mm) of the Department core. In addition to the QC comparison cores, three extra cores may be taken from the first lot of a JMF for testing to correlate density gauges. Do not take additional cores beyond what is noted above unless clearly identified in the Contractor's QCP.

Clearly label all cores with mat locations so that they may be readily identified. Any unlabeled cores may be destroyed by the Department. Notify the Department if any questions arise. Do not store additional cores anywhere (project, in vehicles or at the plant) beyond those required to be taken for testing.

Test all Contractor cores and maintain records of all tests (core tests and correlated gauge tests) according to the QCP. Destroy all Contractor cores immediately after testing is complete.

Fill core holes by the next workday with asphalt concrete. Before filling, ensure the holes are dry and tack them with asphalt material conforming to 407.02. Properly compact the asphalt concrete used for filling the hole and leave it flush with the pavement.

446.04 Density Acceptance. Obtain ten, 4-inch (100 mm) cores for the Department to test to determine the in-place density of the compacted mixture as a percentage of the average QC Maximum Specific Gravity (MSG) for the production day the material was placed. If Department MSG VA tests show poor comparison to the average QC MSG according to 403.10 use Department determined MSG VA results in the density calculation for each production day.

Payment for compaction of the completed mainline pavement and ramps is by Lot, based upon the degree to which density is attained. Compact shoulders using the same equipment and procedures as used on the mainline pavement. Payment for shoulders depends on the degree to which the density is obtained on the adjacent mainline pavement lane or ramp. However, when a cold longitudinal joint is made between a mainline pavement lane and an adjoining shoulder, payment for the shoulder will be based on the degree to which the density is obtained on the shoulder.

A Lot consists of an area of pavement placed during a production day, including the shoulders. If less than 400 tons (400 metric tons) is produced in a production day, then that production day is combined with the next production day into a single Lot. If greater than 250 tons (250 metric tons) and less than 400 tons (400 metric tons) are produced on the last day of production for the project, then the day's production is a separate Lot. If less than 250 tons (250 metric tons) is produced on the last production day for the project, it is part of the previous Lot for acceptance, provided the previous Lot was placed within 3 days; otherwise, it is a separate Lot.

Within 48 hours after the pavement is placed, obtain ten cores for each Lot at random locations the Engineer determines. The Engineer will divide a Lot into five equal sublots and calculate two random core locations in each sublot as described below using ODOT TE-217 procedure. Both mainline pavement and ramps will be included in Lot determinations. The Engineer will not give the Contractor random core locations early in the Lot placement. The Engineer will tell the Contractor the method used to determine random locations as noted below before project start and will use the same method for all Lots.

Take three cores from cold longitudinal joints (joint cores) and seven cores from the mat (mat cores). If locations not according to this specification are given, immediately inform the Engineer. Do not take joint cores from ramp joints. Take joint cores from the first, last and randomly from one of the three remaining sublots. Determine by random number the longitudinal location of the joint core, and which pavement edge to be cored when the mat placed has both confined and unconfined edges. Take joint cores such that the core's closest edge is 4 inches (100 mm) from the edge of the mat. Obtain the mat cores from at least 12 inches (300 mm) away from the longitudinal joint.

The Department will determine the pay factor for each Lot cored by the pay schedule in Table 446.04-1 for Lots with three cold longitudinal joint cores and Table 446.04-2 for Lots with less than three cold longitudinal joint cores. If less than 10 cores are available for determining the mean, OMM will determine disposition of the Lot.

TABLE 446.04-1 FOR LOTS WITH 3 COLD JOINT CORES

Mean of Cores [1]	Pay Factor	
	Surface Course	**Intermediate Course**
98.0% or greater	[2]	[2]
97.0 to 97.9%	0.94	[2]
96.0 to 96.9%	1.00	0.94
93.4 to 95.9%	1.04 [4]	1.00
92.4 to 93.3%	1.00	1.00
91.4 to 92.3%	0.98	1.00
90.4 to 91.3%	0.90	0.94
89.4 to 90.3%	0.80	0.88
88.4 to 89.3%	[3]	[3]
Less than 88.4%	[2]	[2]

[1] Mean of cores as percent of average MSG for the production day.

[2] For surface courses, remove and replace. For other courses, the District will determine whether the material may remain in place. If the material may not remain in place, remove and replace this course and all courses paved on this course. The pay factor for material allowed to remain in place is 0.60.

[3] The District will determine whether the material may remain in place. If the material may not remain in place, remove and replace this course and all courses paved on this course. The pay factor for material allowed to remain in place is 0.70.

[4] No incentive will be paid if any single cold joint core is less than 91.0%.

TABLE 446.04-2 FOR LOTS WITH LESS THAN 3 COLD JOINT CORES

Mean of Cores [1]	Pay Factor	
	Surface Course	**Intermediate Course**
98.0% or greater	[2]	[2]
97.0 to 97.9%	0.94	[2]
96.0 to 96.9%	1.00	0.94
94.0 to 95.9%	1.04 [4]	1.00
93.0 to 93.9%	1.00	1.00
92.0 to 92.9%	0.98	1.00
91.0 to 91.9%	0.90	0.94
90.0 to 90.9%	0.80	0.88
89.0 to 89.9%	[3]	[3]
Less than 89.0%	[2]	[2]

[1] Mean of cores as percent of average MSG for the production day.

[2] For surface courses, remove and replace. For other courses, the District will determine whether the material may remain in place. If the material may not remain in place, remove and replace this course and all courses paved on this course. The pay factor for material allowed to remain in place is 0.60.

[3] The District will determine whether the material may remain in place. If the material may not remain in place, remove and replace this course and all courses paved on this course. The pay factor for such material allowed to remain in place is 0.70.

[4] No incentive will be paid for lots where 3 joint cores are required to be taken but less than 3 cores are taken.

447

On page 260 **Replace** the entire section with the following:

ITEM 447 ASPHALT CONCRETE MAT AND JOINT CORE DENSITY ACCEPTANCE

447.01 Description
447.02 Joint Construction
447.03 Core Procedures
447.04 Mat Density Acceptance
447.05 Joint Density Acceptance
447.06 Application of Multiple Pay Factors

447.01 Description. This specification describes the acceptance criteria for asphalt concrete surface courses using mat cores from each day's production and joint cores from the completed cold longitudinal paving joints. The Department will base acceptance of the compacted mixture in place on the level of density attained separately in the mat and at the cold longitudinal joints as sampled by the Contractor and analyzed by the Department.

447.02 Joint Construction. Make a hot longitudinal joint between the mainline pavement lane and the adjoining shoulder and all ramps and the adjoining shoulders. If a hot longitudinal joint is specified between the mainline pavement lanes, the Contractor may construct a cold longitudinal joint between the mainline pavement lanes and the adjoining shoulders. Cold longitudinal joints will be tested according to 447.05.

The Contractor may construct a notched wedge joint for course thicknesses of 1.25 inches (32 mm) or greater. Provide a 0.5 to 0.7 inch (12 to 18 mm) vertical face notch at the upper portion of the wedge after compaction. Allow a notch at the lower wedge toe of height equal to the nominal maximum aggregate size of the asphalt concrete mixture. Provide a sloped wedge with a width of no more than 6.0 inches (152 mm) and an angle of no more than 10 degrees from horizontal for surface courses up to 1.75 inches (45 mm) lift thickness. Provide a sloped wedge with a width of no more than 10.0 inches (250 mm) and an angle of no more than 15 degrees from horizontal for courses over 1.75 inches (45 mm) lift thickness. The lane width is determined from the upper notch of the wedge. When constructing the wedge joint maintain the asphalt material head the same as or greater than the head of asphalt material in front of the spreading equipment screed. Remove any loose asphalt material at the lower wedge toe or any material that is not part of the wedge slope face before overlaying. When the adjacent lane top portion of the wedge joint is placed over the bottom portion of the first lane wedge joint use the same equipment required for constructing wedge joints at 0 degrees wedge taper to achieve pre-compaction of the top portion of the wedge joint.

Do not place a wedge joint at ramps and other tight areas of slow production as designated by the Engineer. Provide a vertical face joint when not constructing a notched wedge joint.

Attach the wedge joint device to the spreading equipment in all wedge joint operations. Ensure the wedge joint device pre-compacts, rather than strikes-off, the asphalt concrete by means of a longitudinal, uniformly decreasing material height of the asphalt concrete forced under the device as the spreading equipment moves forward. Ensure the angle of pre-compaction through the device is 25 to 35 degrees. Ensure the length of travel of material under the device is a minimum of 10 inches (250 mm). Provide additional compaction on the wedge and after the wedge joint device as desired but do not distort the wedge and notch configuration. Ensure the wedge joint device has a variable angle adjustment from 0 degrees (horizontal) to the taper angle necessary to complete the wedge height required as well as creating the required notch. Ensure the wedge joint device is constructed to allow at least the same head of asphalt material in front of the device as is in front of the spreading equipment screed. Ensure the wedge joint device does not allow any asphalt material to bypass wedge joint pre-compaction. Do not use wedge joint equipment unless it has been approved by the Laboratory and meets the above requirements.

Seal all cold longitudinal construction joints by coating the cold joint with certified 702.09 Hot Applied Asphaltic Joint Adhesive to provide 100 percent coverage of the joint face, or wedge and notch, and extend at least 1/2 inch (13 mm) on both surfaces.

447.03 Core Procedures. Obtain core samples only in the presence of the Engineer and immediately surrender each core sample to the Engineer for testing. Do not take additional cores beyond what is required in 447.04 and 447.05 unless clearly identified in the approved Contractor's QCP. If taken, locate cores for the Contractor's quality control (QC comparison core) longitudinally from and within 4 inches (100 mm) of the random core. In addition to the QC comparison cores, three extra cores may be taken from the first lot of a JMF for testing to correlate density gauges.

Clearly label all cores with mat or joint locations, as applicable, so that they may be readily identified. Any unlabeled cores may be destroyed by the Department. Notify the Laboratory if any questions arise. Do not store additional cores anywhere (project, in vehicles, or at the plant) beyond what is required to be taken for testing.

Test all Contractor cores and maintain records of all tests (core tests and correlated gauge tests) according to the QCP. Destroy all cores immediately after testing is complete.

Fill core holes by the next workday with asphalt concrete. Before filling, ensure the holes are dry and tack them with asphalt material conforming to 407.02. Properly compact the asphalt concrete used for filling the hole and leave it flush with the pavement.

447.04 Mat Density Acceptance. Obtain ten, 4 inch (100 mm) cores for the Department to test to determine the in-place density of the compacted mixture as a percentage of the average QC Maximum Specific Gravity (MSG) for the production day the material was placed. If Department MSG VA tests show poor comparison to the average QC MSG according to 403.10 use Department determined MSG results in the density calculation for each production day.

Payment for compaction of the completed mainline pavement and ramps is by Lot, based upon the degree to which density is attained. Compact shoulders using the same equipment and procedures as used on the mainline pavement. Payment for shoulders depends on the degree to which the density is obtained on the adjacent mainline pavement lane or ramp. However, when a cold longitudinal joint is made between a mainline pavement lane and an adjoining shoulder, payment for the shoulder will be based on the degree to which the density is obtained on the shoulder.

A Mat Density Lot consists of an area of pavement placed during a production day, including the shoulders. If less than 400 tons (400 metric tons) is produced in a production day, then that production day is combined with the next production day into a single lot. If greater than 250 tons (250 metric tons) and less than 400 tons (400 metric tons) are produced on the last day of production for the project, then the day's production is a separate lot. If less than 250 tons (250 metric tons) is produced on the last production day for the project, it is part of the previous lot for acceptance, provided the previous lot was placed within 3 days; otherwise, it is a separate lot.

Within 48 hours after the pavement is placed, obtain ten cores for each Mat Density Lot at random locations the Engineer determines. The Engineer will divide a Lot into five equal sublots and calculate two random core locations in each sublot using an acceptable random number selection method. Both mainline pavement and ramps will be included in Lot determinations. The Engineer will not give the Contractor random core locations early in the Lot placement. The Engineer will tell the Contractor the method used to determine random locations before project start and will use the same method for all Lots. If locations not according to this specification are provided, immediately inform the Engineer.

Take the ten random mat cores such that the core's closest edge is at least twelve inches (300 mm) from the cold longitudinal joint, wedge joint upper notch, or vertical face edge.

The Department will determine the pay factor for each Mat Density Lot cored by the pay schedule in Table 447.04-1. The Department will verify the MTD if the MSG determination has a deviation from the MTD of less than or equal to 0.020. If the MTD is not verified, establish a new MTD according to the procedures established in 403.06. If less than 10 cores are available for determining the mean, the Laboratory will determine disposition of the Lot.

TABLE 447.04-1 MAT DENSITY LOTS

Mean of Cores [1]	Pay Factor Surface Course
98.0% or greater	[2]
97.0 to 97.9%	0.94
96.0 to 96.9%	1.00
94.0 to 95.9%	1.04
93.0 to 93.9%	1.00
92.0 to 92.9%	0.98
91.0 to 91.9%	0.90
90.0 to 90.9%	0.80
89.0 to 89.9%	[3]
Less than 89.0%	[2]

[1] Mean of cores as percent of average MSG for the production day.

[2] Remove and replace.

[3] The District will determine whether the material may remain in place. If the material may not remain in place, remove and replace this course. The pay factor for material allowed to remain in place is 0.70.

447.05 Joint Density Acceptance. A Joint Density Lot will consist of the entire length of eligible cold longitudinal joint on the project. Divide each lot into 2500 foot (760 m) sublots, if the remaining sublot is less than 500 feet (152 m) in length, include that length of longitudinal joint in the previous sublot.

A. Excluded Joints. Do not obtain joint cores from the following excluded joints to determine lot incentive/disincentive payment.

1. Joints where one side of the joint is formed by existing pavement not constructed on the project.

2. Joints within 15 feet longitudinally of an obstruction during construction of the wearing course (manholes, inlet grates, utilities, bridge structures, etc.)

3. Joints where plan material type, thickness, or acceptance method varies from one side of the joint to the other.

4. Joints on ramps.

5. Joints in intersections, gore areas or transitions, or anywhere the Engineer determines paving and phasing methods do not allow for consistent longitudinal joint construction. Prior to paving, submit requests in writing to the Engineer for consideration of any joints to be excluded on this basis. The Engineer will make the final determination.

B. Sampling. Obtain one 6 inch (150 mm) joint density core for each sublot, at the random longitudinal locations as determined by the Engineer. For vertical joints, center joint density cores on the line where the two adjacent mats abut at the surface. For notched wedge joints, center joint density cores one half the joint taper width, away from the joint line in the direction of the wedge. Obtain joint density cores within 48 hours after the longitudinal joint for each sublot is closed. Clearly label all cores so that locations may be readily identified. Identify the samples by Joint Density Lot and Sublot number.

Vertical Joint	Notched Wedge Joint
Figure not to scale	**Figure not to scale**

C. Percent Within Tolerance (PWT). The Department will average the verified daily MSG average for the mix on each side of the longitudinal joint at each joint density core location according to 447.05. The average of the two values will be used for the density calculation of each sublot sample according to Supplement 1036. Once all test results for the Joint Density Lot have been received, the Department will compute the PWT and average in place density for each lot according to Supplement 1044.

The Department will determine the pay factor for each Joint Density Lot cored by the pay schedule in Table 447.05-1. Lots with all joint cores having a density greater than or equal to 92.0 percent will receive the two percent maximum Joint Density Lot incentive regardless of PWT.

TABLE 447.05-1 JOINT DENSITY LOTS

LOT PWT	Pay Factor Surface Course
PWT ≥ 90	$\left[\frac{(PWT-90)}{10}\times 0.02\right]+1$
PWT = 61 to 89	1.00
PWT = 50 to 60	$1-\left[\frac{(60-PWT)}{10}\times 0.05\right]$
PWT ≤ 49	0.95

The Department will calculate a joint density lot pay factor for each item specified with 447 acceptance. The calculated pay factor adjustment will be applied to all material placed under the corresponding line item specifying 447 acceptance.

447.06 Application of Multiple Pay Factors. The Department will apply a mat density pay factor to each Mat Density Lot as defined in 447.04. The Department will apply one joint core density pay factor to all material placed under the corresponding line item of work specifying 447 acceptance as defined in 447.05. The Department will apply mat and joint core density factor to the contract unit bid price for the corresponding line item of work specifying 447 acceptance.

448

On page 266 **Replace** the entire section with the following:

ITEM 448 ASPHALT CONCRETE GAUGE DENSITY ACCEPTANCE

448.01 Description
448.02 Density
448.03 Reports
448.04 Acceptance

448.01 Description. This specification describes the acceptance criteria for asphalt concrete surface and intermediate courses using density gauge and laboratory testing. The Department will determine acceptance of the mixture by Lot, based on the field density and mix composition of random samples taken and tested by the Contractor and verified by the Department.

448.02 Density. Conduct density gauge quality control testing on the asphalt mat according to Supplement 1055. Do NOT enter a density gauge offset of any kind into the gauge. If an offset is already in the gauge remove it. Verify to the Engineer daily that no offset is present in the gauge. All values used in controlling mat density according to Supplement 1055 will be as calculated and written on forms supplied in Supplement 1055.

448.03 Reports. Report density gauge QC testing results according to Supplement 1055.

448.04 Acceptance. Acceptance is by Lot as defined in 403. A Lot is considered acceptable for gradation and asphalt binder content if the deviation of the average from the JMF and the Range is no more than the tolerances shown in Table 448.04-1.

TABLE 448.04-1 DEVIATION FROM THE JMF AND RANGE TOLERANCES [1]

Mix Property	Deviation from JMF (Percent)	Range (Percent)
Asphalt Binder Content	0.3	1.0
1/2 inch (12.5 mm) sieve	6	15
No. 4 (4.75 mm) sieve	5	15
No. 8 (2.36 mm) sieve	4	15
[1] Based on average of four Lot Acceptance tests.		

If the average of the Lot acceptance tests for a particular sieve or sieves, or for asphalt binder content deviates from the JMF by more than the tolerances shown in Table 448.04-1 but falls within the tolerances shown in Table 448.04-2, then the Lot is considered reasonably acceptable and may remain in place with payment at a reduced pay factor as show in Table 448.04-2.

If the Range of the Lot acceptance tests for asphalt binder content or for any particular sieve, or sieves, exceeds the tolerance shown in Table 448.04-1, the Department will apply a pay factor of 0.95.

TABLE 448.04-2 448 ACCEPTANCE SCHEDULE [1]

Mix Property	Pay Factor	2 Tests	3 Tests	4 Tests
Asphalt Binder Content	1.00	0 to 0.47	0 to 0.36	0 to 0.30
	0.98	0.48 to 0.54	0.37 to 0.42	0.31 to 0.35
	0.90	0.55 to 0.61	0.43 to 0.48	0.36 to 0.40
	0.80	0.62 to 0.68	0.49 to 0.54	0.41 to 0.45
	0.60	0.69 to 0.75	0.55 to 0.59	0.46 to 0.50
	[2]	> 0.75	> 0.59	> 0.50
1/2 inch (12.5 mm) sieve	1.00	0 to 8.5	0 to 6.9	0 to 6.0
	0.99	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.97	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	0.94	11.4 to 12.7	9.3 to 10.4	8.1 to 9.0
	0.90	12.8 to 14.1	10.5 to 11.5	9.1 to 10.0
	[3]	> 14.1	> 11.5	> 10.0
No. 4 (4.75 mm) sieve	1.00	0 to 7.1	0 to 5.8	0 to 5.0
	0.99	7.2 to 8.5	5.9 to 6.9	5.1 to 6.0
	0.97	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.94	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	0.90	11.4 to 12.7	9.3 to 10.4	8.1 to 9.0
	[3]	> 12.7	> 10.4	> 9.0
No. 8 (2.36 mm) sieve	1.00	0 to 5.7	0 to 4.6	0 to 4.0
	0.99	5.8 to 7.1	4.7 to 5.8	4.1 to 5.0
	0.97	7.2 to 8.5	5.9 to 6.9	5.1 to 6.0
	0.94	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.90	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	[3]	> 11.3	> 9.2	> 8.0

[1] Based on average of Lot Acceptance tests from the JMF.
[2] Remove and replace material
[3] Engineer will determine if the material may remain in place. Pay factor for material allowed to remain in place is 0.70.

The Department will determine payment for the Lot by multiplying the contract unit price by the pay factor. When any pay factors for a specific Lot are less than 1.00, use the lowest pay factor to calculate the payment.

The Department will base acceptance of partial Lots on the average and the Range of the results of tests on the number of samples obtained

Payment for compaction of the completed pavement is based on quality assurance (QA) testing according to Supplement 1055. Each QA density test represents one half (1/2) day's production. The Department will use Table 448.04-3 to determine the percent deduction pay adjustment due to density for each one half (1/2) day's production represented by the QA test.

TABLE 448.04-3 DENSITY PAY DEDUCTIONS

Density (%)	Payment Deduction	
	One Test Below 91.0%	Both Tests Below 92.0%
91.0 to 91.9	n/a	5%
90.0 to 90.9	5%	10%
89.0 to 89.9	15%	15%
88.0 to 88.9	30%	30%
Less than 88.0	Remove and replace	

449

On Page 266, After Item 448, **Add** the following NEW Item:

ITEM 449 ASPHALT CONCRETE NON-DENSITY ACCEPTANCE

449.01 Description
449.02 Rollers
449.03 Compaction
449.04 Acceptance

449.01 Description. This specification describes the non-density acceptance criteria for asphalt concrete surface, intermediate, and base courses. The Department will determine acceptance of the mixture based on the required roller coverage.

449.02 Rollers. Use only steel wheel and pneumatic tire types of rollers meeting the minimum requirements of the following tables. Conform to manufacturer's specifications for all ballasting.

TABLE 449.02-1 ROLLER CAPACITY

Roller Type	Maximum Capacity square yards per hour (m^2/hr)
Tandem	700 (600)
Three-Wheel	700 (600)
Trench	15 per inch width (13 per 25 mm width)
Pneumatic Tire, Type I	1000 (850)
Pneumatic Tire, Type II	700 (600)
Vibratory, Vibrating Roll	15 per inch width (13 per 25 mm width)
Vibratory, Static Roll (not vibrating)	3 per inch width (3 per 25 mm width)

TABLE 449.02-2 STEEL WHEEL ROLLERS

Roller Type	Three-Wheel	Tandem	Vibratory Static	Trench
Total weight, tons (metric tons)	10 (9)	8 to 12 (7 to 11)	8 to 12 (7 to 11)	
Compression rolls, pounds per inch width (kN/m), minimum	300 (53)	200 (35)	120 (21)	300 (53)

TABLE 449.02-3 PNEUMATIC TIRE ROLLERS

Type I	
Tire size, minimum	9.00 × 20 in (229 × 508 mm)
Wheel load, minimum	5000 lb. (2250 kg)
Average tire contact pressure, minimum	85 psi (590 kPa)
Type II	
Tire size, minimum	7.50 × 15 in (191 × 381 mm)
Wheel load, minimum	2000 lb. (900 kg)
Average tire contact pressure, minimum	55 psi (380 kPa)

For pneumatic tire rollers, use self-propelled, reversible units with vertical oscillation on all wheels on at least one axle. Determine the tire inflation pressure necessary to meet the specified minimum contact area and contact pressure requirements. Furnish the tire manufacturer's charts or tabulations to the Engineer for verification of the required inflation pressure. Check tire inflation pressure as the Engineer directs and maintain it within 5 pounds per square inch (35 kPa) of the required pressure.

449.03 Compaction. Immediately after spreading the asphalt concrete and adjusting any surface irregularities, compact the mixture uniformly using rollers conforming to 449.02. Do not use a spreading rate that exceeds the total of the specified capacities of the rollers in use. However, if compacting a mixture spread 1 inch (25 mm) thick or less, do not use a spreading rate that exceeds twice the total capacity of the rollers in use.

Coordinate the spreading of the mixture with the required roller coverage, considering the rate of cooling of the mixture as affected by lift thickness and environmental conditions. Complete the required roller coverage during the time in which the temperature of the mixture is sufficient for the roller coverage to be effective in compacting the mixture.

Compact base mixtures using a combination of both steel wheel and Type I pneumatic tire rollers; however, in small areas, compact these mixtures as the Engineer approves using any of the rollers specified in 449.02.

Use a minimum of two rollers when compacting surface mixtures placed 1 inch (25 mm) thick or less.

Compact variable depth courses using a combination of both steel wheel and pneumatic tire rollers; however, in small areas, compact these mixtures as the Engineer approves using any of the roller types specified in 449.02.

For surface courses using a polymer modified asphalt binder give a copy of the JMF approval letter containing the design compaction temperature to the Engineer before any mix is placed. Unless otherwise specified ensure that the mix temperature immediately before rolling is not less than 290 °F (145 °C) if placing hot mix asphalt, and not less than 250 °F (121 °C) if placing warm mix asphalt according to 402.05. Do not compact polymer asphalt concrete surface courses with pneumatic tire rollers.

Use steel wheel rollers to remove any surface deviations and deformations caused by pneumatic tire rollers. Do not use pneumatic tire rollers if any resultant surface deformations cannot be removed.

Do not use vibratory rollers on courses with a thickness under 1 1/4 inches (32 mm).

449.04 Acceptance. Mixes will be accepted as follows:

A. Acceptance of 301, 302, and 424 Type A Mixes. Acceptance is based on Table 449.04-1.

TABLE 449.04-1 MIX ACCEPTANCE

	Deviation from JMF[1]	Range
Asphalt Binder Content	±0.5%	1.0
No. 4 (4.75mm) sieve	±6%	12
[1] Based on the average of the day or night QC Tests		

B. Acceptance of All Other Mixes. Acceptance is by Lot as defined in 403. A Lot is considered acceptable for gradation and asphalt binder content if the deviation of the average from the JMF and the Range is no more than the tolerances shown in Table 449.04-2.

TABLE 449.04-2 DEVIATION FROM THE JMF AND RANGE TOLERANCES [1]

Mix Property	**Deviation from** JMF **(Percent)** [1]	**Range (Percent)**
Asphalt Binder Content	0.3	1.0
1/2 inch (12.5 mm) sieve	6	15
No. 4 (4.75 mm) sieve	5	15
No. 8 (2.36 mm) sieve	4	15
[1] Based on average of four Lot Acceptance tests.		

If the average of the Lot acceptance tests for a particular sieve or sieves, or for asphalt binder content deviates from the JMF by more than the tolerances shown in Table 449.04-2, but falls within the tolerances shown in Table 449.04-2, then the Lot is considered reasonably acceptable and may remain in place with payment at a reduced pay factor as show in Table 449.04-3.

If the Range of the Lot acceptance tests for asphalt binder content or for any particular sieve, or sieves, exceeds the tolerance shown in Table 449.04-2, the Department will apply a pay factor of 0.95.

TABLE 449.04-3 ACCEPTANCE SCHEDULE [1]

Mix Property	Pay Factor	2 Tests	3 Tests	4 Tests
Asphalt Binder Content	1.00	0 to 0.47	0 to 0.36	0 to 0.30
	0.98	0.48 to 0.54	0.37 to 0.42	0.31 to 0.35
	0.90	0.55 to 0.61	0.43 to 0.48	0.36 to 0.40
	0.80	0.62 to 0.68	0.49 to 0.54	0.41 to 0.45
	0.60	0.69 to 0.75	0.55 to 0.59	0.46 to 0.50
	[2]	> 0.75	> 0.59	> 0.50
1/2 inch (12.5 mm) sieve	1.00	0 to 8.5	0 to 6.9	0 to 6.0
	0.99	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.97	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	0.94	11.4 to 12.7	9.3 to 10.4	8.1 to 9.0
	0.90	12.8 to 14.1	10.5 to 11.5	9.1 to 10.0
	[3]	> 14.1	> 11.5	> 10.0
No. 4 (4.75 mm) sieve	1.00	0 to 7.1	0 to 5.8	0 to 5.0
	0.99	7.2 to 8.5	5.9 to 6.9	5.1 to 6.0
	0.97	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.94	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	0.90	11.4 to 12.7	9.3 to 10.4	8.1 to 9.0
	[3]	> 12.7	> 10.4	> 9.0
No. 8 (2.36 mm) sieve	1.00	0 to 5.7	0 to 4.6	0 to 4.0
	0.99	5.8 to 7.1	4.7 to 5.8	4.1 to 5.0
	0.97	7.2 to 8.5	5.9 to 6.9	5.1 to 6.0
	0.94	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.90	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	[3]	> 11.3	> 9.2	> 8.0

[1] Based on average of Lot Acceptance tests from the JMF.
[2] Remove and replace material
[3] Engineer will determine if the material may remain in place. Pay factor for material allowed to remain in place is 0.70.

The Department will determine payment for the Lot by multiplying the contract unit price by the pay factor. When any pay factors for a specific Lot are less than 1.00, use the lowest pay factor to calculate the payment.

The Department will base acceptance of partial Lots on the average and the Range of the results of tests on the number of samples obtained.

451.04

On Page 268, **Replace** the entire section with the following:

451.04 Equipment. Furnish self-propelled spreading and finishing machines capable of consolidating and finishing the concrete and producing a finished surface meeting the requirements specified. Ensure that all paving equipment is operated in a manner that does not result in segregation of the mixture or loss of air entrainment in the mixture.

Construct mainline pavement using slip form paving in accordance with 451.04 A.

Construct small, short sections, or irregular pavement areas, as determined by the Engineer, in accordance with 451.04 B.

Construct ramps and secondary roads in accordance with 451.04 C.

A. Slip Form Construction. Place concrete using an industry-standard slip form paver designed to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine and with a minimum of hand finishing providing a dense and homogeneous pavement.

Consolidate the full width and depth of concrete pavement placed by a single pass of approved internal vibrators. Operate the vibrators at a frequency range of 7000 to 11,000 impulses per minute. Attach vibrators to either the spreading or finishing equipment in such a manner that they do not come in contact with preset dowel basket assemblies, the subgrade, reinforcing mesh, or side forms. Do not operate vibrators in a manner to cause a separation of the mix ingredients (segregation); i.e., either a downward displacement of large aggregate particles or an accumulation of laitance on the surface of the concrete. Avoidance of segregation may require reduction in the vibration frequency within the range specified when forward motion of the paver is reduced. Connect the power to all vibrators so they stop when the machine motion is stopped. Stop paving operations if any vibrator fails to operate within the above specified range.

Provide an electronic monitoring device that displays the operating frequency of each internal vibrator when paving mainline, ramps, acceleration/deceleration lanes, and collector distributor lanes. Ensure the monitoring device has a readout display near the paver operator's controls visible to the operator and the Engineer. Operate the monitoring device continuously while paving and display all vibrator frequencies with manual or automatic sequencing among individual vibrators. Using the monitoring system, record the following minimum information: time of day, station location, paver track speed, and the frequency of each individual vibrator. Make recordings after each 25 feet (8 m) of paving or after 5-minute intervals of time. If not using a monitoring system with a recorder, make and record readings every 30 minutes. Provide vibration data, in electronic format, to the Engineer prior to the next concrete placement.

Electronic vibration monitoring devices are not required for paving machines used to construct gores. When electronic monitoring devices are not required, use a tachometer or similar device to demonstrate to the Engineer the paving equipment vibration meets specification.

Operate the slip form paver with as nearly a continuous forward movement as possible. Coordinate all operations of mixing, delivering, and spreading concrete to provide uniform progress with minimal stopping and starting of the paver. If for any reason it is necessary to stop the forward movement of the paver, immediately stop the consolidation devices. Unless controlled from the machine, do not apply any other tractive force to the machine.

Accurately control the finish grade of the pavement from a pre-set grade line parallel to the finish grade. Use equipment with controls that will trace the grade line and automatically adjust the grade of the screed.

In areas where adjoining concrete pavement is to be constructed, ensure that the surface at the edge of the pavement on either side of the longitudinal joint does not vary more than 1/4 inch (6 mm) below the typical section. Ensure that the outside edges of the pavement do not vary more than 1/2 inch (13 mm) below the typical section. Ensure that all pavement edges are nearly vertical with no projections or keyways exceeding 1/2 inch (13 mm).

In the area of construction joints placed at the end of the days run, the Engineer will allow a reduction of approximately 2 inches (50 mm) in overall width.

B. Fixed Form Construction. Spread, screed, and consolidate concrete using one or more machines between previously set side forms. Furnish an adequate number and capacity of machines to perform the

work at a rate equal to the concrete delivery rate. Furnish machines capable of uniformly distributing and consolidating the concrete without segregation. Do not use vibrating truss screeds or roller screeds.

Provide machines capable of operating on two side forms, on adjacent lanes of pavement and one side form, or on two adjacent lanes as necessary. When placing concrete adjacent to an existing pavement lane, take measures to protect the adjacent pavement from damage. Remove from the work any machine that causes displacement of the side forms from the line or grade or causes undue delay, as determined by the Engineer, due to mechanical difficulties.

Finish small areas, irregular areas, and areas that are inaccessible to finishing equipment using other methods as approved by the Engineer. Accomplish vibration of these areas using handheld or machine mounted internal vibrators. Continue vibration to achieve adequate consolidation, without segregation, for the full depth and width of the area placed.

Use straight edge side forms made of steel and of a depth equal to the specified pavement thickness. Use modified steel forms if a safety edge is required. Do not use bent or damaged side forms or forms with damaged joint locks or pin pockets. Provide forms in sections of not less than 10 feet (3 m) in length without horizontal joints in the height of the form. Utilize forms with a nominal base width of at least 3 inches (75 mm). Ensure forms can support the paving equipment without shifting or deforming during paving. Clean and oil all forms each time they are used. If the radius of the circular pavement edge is 100 feet (30 m) or less, use flexible or curved forms of a design acceptable to the Engineer. Provide adequate devices to securely set forms and withstand operation of the paving equipment. Do not use built-up forms except to construct pavement of a specified thickness whose total area for the project is less than 2000 square yards (1650 m^2). Provide forms with adequate joint locks to tightly join ends of abutting form sections together.

C. Ramps and Secondary Roads. Place concrete lanes with a minimum length of 400 LF and constant width using an industry-standard slip form paver or fixed form paver designed to spread, consolidate, screed, and finish the freshly placed concrete in accordance with 451.04 A. or 451.04 B. A minimum pavement length does not include variable widths or widened sections.

Place concrete pavement lengths with less than 400 LF using alternate methods.

For areas determined to be inaccessible to industry-standard slip form pavers or fixed form pavers provide a detailed layout of the areas with sufficient information detailing the paving equipment inaccessibility along with the specifications of the proposed alternative finishing equipment for approval by the Engineer.

Accomplish vibration of any areas that are placed using alternative finishing equipment using handheld or machine mounted internal vibrators. Continue vibration to achieve adequate consolidation without segregation for the full depth and width of the area placed.

451.07

On Page 271, **Replace** the fifth paragraph with the following:

Do not place concrete on any surface that is frozen or has frost. At all times, ensure that the concrete maintains a minimum temperature of 35 °F (2 °C) and a maximum temperature of 95 °F (35 °C) until the concrete reaches a minimum modulus of rupture of 600 psi.

451.09

On Page 271, **Replace** the first eight paragraphs with the following:

451.09 Joints. Unless otherwise directed, construct all transverse contraction and construction joints normal to the centerline of the pavement lane and of the type, dimensions, and at locations specified. Construct contraction joints by saw cutting. Saw contraction joints across the full pavement width for a continuous joint and match previously placed lanes.

Construct longitudinal joints between simultaneously placed lanes by sawing.

Accurately mark the pavement with the correct locations of all joints to be saw cut. Ensure the method of marking remains clearly visible after the paver passes and until the joint saw cut is completed. Reapply curing compound according to 451.11 at saw cut joints.

Use either a standard water-cooled, diamond-bladed concrete saw or an early-entry, dry cut, light-weight concrete saw. Provide saws with adequate guides, blade guards, and a method of controlling the depth of cut. After wet sawing, clean the joint using a jet of water. After dry sawing clean the joint using air under pressure. Maintain a standby saw in working condition and an adequate supply of blades.

When using standard concrete saws, and for pavement less than or equal to 10 inches (255 mm), saw joints to a minimum depth of one-fourth the specified pavement thickness. For pavements greater than 10 inches (255 mm) thick, saw joints to a minimum depth of one-third the specified pavement thickness. Saw joints 1/4 ± 1/16 inch (6 ± 1.6 mm) wide measured at the time of sawing.

When using early-entry saws use saw blades and skid plates as recommended by the saw manufacturer for the coarse aggregate type being used in the concrete. Saw joints 1/8 inch (3 mm) wide and 2 1/4 to 2 1/2 inches (56 to 63 mm) deep.

Repair all cracking or spalling according to 451.17.

451.09.A.

On Page 272, **Replace** the entire section with the following:

A. Longitudinal Joint. Place deformed epoxy coated steel tiebars, epoxy coated hook bolt with epoxy coated coupling, or epoxy coated hook bolt alternate (wiggle bolt) with epoxy coated coupling, in longitudinal joints during consolidation of the concrete. Install them at mid-depth in the slab using approved mechanical equipment. As an alternate procedure, rigidly secure them on chairs or other approved supports to prevent displacement. Provide tie bars, hook bolts, or wiggle bolts of the size and spaced as shown on the standard construction drawings. If used, securely fasten hook bolts or wiggle bolts with couplings to the form at the longitudinal construction joint as shown on the standard construction drawings.

451.09.B.

On Page 273, **Delete** the first sentence of the section:

~~Unless otherwise directed, construct all transverse joints normal to the centerline of the pavement lane and of the type, dimensions, and at locations specified.~~

451.09.B.1.

On Page 273, **Replace** the third paragraph of the section with the following:

Immediately before paving check that the assemblies are held firmly in place and check that the dowels are parallel to the grade and parallel to centerline of pavement.

451.09.C.

On page 280, **Replace** the first sentence of the first paragraph with the following:

Where a pressure relief joint is not provided adjacent to a bridge structure, construct expansion joints at the first two regularly spaced transverse contraction joint locations adjacent to the bridge approach slab on each side of the bridge.

451.09.C.

On Page 280, **Replace** the first sentence of the third paragraph with the following:

Use round, straight, smooth, steel dowels, and within 2 hours prior to placing concrete, coat the dowels with a thin uniform coat of new light form oil as a bond-breaking material to provide free movement.

451.09.C.

On Page 280, **Replace** the fourth paragraph with the following:

Punch or drill proper size dowel holes into the preformed expansion joint filler to ensure a tight fit around each dowel.

451.09.D.

On Page 280, **Delete** the entire section.

D. ~~**Contraction Joints.** For pavement less than or equal to 10 inches (225 mm) thick, saw contraction joints with a standard (water cooled diamond bladed) concrete saw to a minimum depth of one-fourth of the specified pavement thickness. For pavement greater than 10 inches (255 mm) thick, saw contraction joints to a minimum depth of one-third the specified pavement thickness. When cutting joints using a standard (water cooled diamond blade) saw ensure the joint is 1/4 ± 1/16 inch (6 ± 1.6 mm) wide when measured at the time of sawing.~~

~~When using the option of early-entry (dry cut, light weight) saws, only use saw blades and skid plates as recommended by the saw manufacturer for the coarse aggregate type being used in the concrete. Perform the early entry contraction joint sawing after initial set and before final set. Saw the contraction joint 2-1/4 to 2-1/2 inches (56 to 63 mm) deep. Ensure any early entry saw joints are approximately 1/8 inch (3 mm) wide at the time of sawing.~~

~~If the pavement is constructed in two or more separately placed lanes, install the joints continuous for the full width of the pavement. Saw the pavement with sawing equipment approved by the Engineer as soon as the saw can be operated without damaging the concrete. Provide saws with adequate guides, blade guards, and a method of controlling the depth of cut. After wet sawing, clean the joint using a jet of water. After dry sawing clean the joint using air under pressure. During sawing of contraction joints, maintain a standby saw in working condition with an adequate supply of blades.~~

451.09.E.

On Page 281, **Replace** the **E. Construction Joints** with **D. Construction Joints**.

455.04.F.

On Page 295, **Delete** item 6.

~~6. Define who will perform the HIPERPAV analysis required in 451.09 and the proposed timeframe the Engineer will have to review the report.~~

455.05.A.3.

On Page 298 **Replace** the first full paragraph with the following:

After the initial curing at the project site and within 72 hours, deliver three (3) QA cylinders to District Testing and three (3) QA cylinders to the AASHTO accredited laboratory for standard curing and testing. Failure to comply with these requirements will be grounds for removal of the AASHTO accredited laboratory from the project at the discretion of the District Testing Engineer and OMM. The AASHTO accredited laboratory will test the QA sample and the QC sample and report the test results on the form accepted by the QCP. Distinguish the QA from the QC results for the sublot.

499.02

On Page 300, **Replace** the materials listing for “Fly ash” with “Fly ash or natural pozzolan”.

499.02

On Page 300, **Replace** Portland Cement with the following:

Portland cement.....701.01, 701.02, 701.04, 701.05, 701.09, 701.15 or blended cement[1]

499.03

On Page 301, in Table 499.03-1, **Replace** notes [5] and [7] with the following:

[5] The maximum fly ash, natural pozzolan, or slag cement content may be increased up to 50%.

[7] Cement or a combination of cement and up to 15% fly ash or natural pozzolan; or up to 30% slag cement.

499.03

On Page 301 in Table 499.03-1, **Replace** the *QC SCC* row with the following:

QC SCC [8]	4500 (31.0) at 28 days	1,500 or as per plan	520 (236)	Well-Graded, 1 inch or 3/8-inch nominal size or as per plan

499.03

On Page 301 **Replace** footnote [8] in Table 499.03-1 with the following:

[8] For QC 5 and QC SCC mixes with 3/8-inch nominal size, provide an air content of 8±2%.

499.03

On Page 302, in Table 499.03-2, **Add** the following row after "Fly Ash":

Natural pozzolan	25

499.03.A.

On Page 302, **Add** the following sentence after the second sentence in the first full paragraph:

Water-reducing admixtures conforming to the requirements of 705.12 may also be used or adjusted to meet slump requirements.

499.04.F.

On Page 303, **Replace** the last sentence of the paragraph with the following:

Adjust the absolute volume of the aggregates if the cementitious content is increased.

499.04.H.

On Page 304, **Replace** the entire paragraph with the following:

H. If slump loss occurs before or during placement of the concrete, the concrete slump may be field adjusted to restore plasticity with a Type F or G chemical admixture conforming to 705.12, additional water, or both, only if the maximum water-cementitious ratio of the accepted JMF is not exceeded. Mix for a minimum of 30 revolutions at mixing speed after addition of admixture, water, or both. Inform the Inspector, record all adjustments, and confirm compliance with 499.03A. The Engineer will recheck the slump and air content to ensure conformance to the specification. If after any adjustment the components of the load are segregated, the Department will reject the load.

499.05

On Page 305 **Add** the following subsection **D.** as follows:

D. Volumetric Truck Mixers. Volumetric Truck Mixers. Provide mixers conforming to ASTM C685, Sections 7, 8, 9, 10, 11, 13, and 14. Mixers must have rating plates indicating that the

performance of the mixer is in accordance with the Volumetric Mixer Manufacturer Bureau or equivalent. Mix concrete in accordance with the manufacturer's recommended procedures. The volumetric mixer must be capable of carrying sufficient unmixed dry bulk cement, supplementary cementitious materials, coarse and fine aggregate, admixtures and water, in separate compartments and accurately proportion the approved JMF. Each volumetric mixer shall be equipped with an onboard ticketing system that will electronically produce a record of all material used and their respective weights and the total volume of concrete placed. Place no more than 30 cubic yards (23 m^3) per unit per day. Limit the use of volumetric truck mixers to QC Misc., QC MS, QC FS, and Item 613.

Provide a process control plan, product quality control plan, and manufacturer's recommended procedures to the OMM Cement and Concrete Engineer. Calibrate the proportioning devices before the start of a project and at intervals recommended by the manufacturer. Perform calibrations in the presence of the Engineer. Calibrate the cement and aggregate proportioning devices by weighing (determining the mass of) each component. Calibrate the admixture and water proportioning device(s) by weight (mass) or volume. Batch each material to ensure weights are within the tolerances listed in Table 499.06-2, based on the amount specified in the accepted JMF. Furnish batch tickets in accordance with Item 499.07. Verify yield daily based on the cement meter count (number of revolutions per 94 pounds (42.5 kg) of cement), for each volumetric truck mixer.

499.06

On Page 306 **Add** the following table after Table 499.06-1:

Table 499.06-2 VOLUMETRIC TRUCK BATCHING TOLERANCES

Material	Batching Tolerance (%)
Cement	0.0 to +4.0
Pozzolan	0.0 to +4.0
Carbonate Micro-fines	0.0 to +4.0
Aggregates	±2.0
Water	±1.0
Chemical Admixtures	±3.0

499.07-1

On Page 307 **Add** the following row after "Batch plant location":

Producer/Supplier Code	

499.07

On Page 307, in Table 499.07-1, **Add** the following row after "Fly ash":

Natural pozzolan	lb (kg)

499.07

On Page 308, in Table 499.07-2, **Add** the following row after "Fly ash":

Natural pozzolan		

499.08

On Page 308 **Delete** the 4th and 5th paragraphs of the section.

~~When concrete is delivered in transit mixers and before discharging any of a batch, the Engineer may allow adding water within the specified water-cement ratio limits. Perform sufficient~~

~~mixing, a minimum of 30 revolutions at mixing speed, to adjust the slump and to regenerate the specified air content throughout the batch.~~

~~When approved by the Engineer, the Contractor may use approved admixtures (705.12, Type F or G) for retempering the load to adjust the slump after the start of discharge. Mix for a minimum of 30 revolutions at mixing speed after addition of the admixture.~~

501.03

On Page 310 **Replace** the section with the following:

501.03 Notification of Fabricator. When furnishing materials under Items 513, 515, 516, 517, and 518, select a fabricator from the pre-qualified fabricators list in effect the date of the Contract letting. Before or at the preconstruction conference, provide a written notification to the DCE~~A~~, DET and OMM of the selected steel fabricators and precast concrete fabricators. Payment per 109.10 will not be made until 30 days after OMM is notified and proper documentation is received.

501.04.B

On Page 311, **Add** the following sentence to the end of the first paragraph;

Shop Drawings are not required for elastomeric bearings.

501.05.A.

On Page 312, **Add** the following sentence after the first sentence *(Submit Engineered Drawings to all involved railway companies at least 50 days before planned construction begins. Obtain acceptance from all involved railroad companies.)* of the third paragraph:

Do not include calculations unless requested by the railroad or the Engineer.

501.05.B.

On Page 313, **Add** the following sentence after the second sentence (*Submit Engineered Drawings to the Engineer at least 7 days prior to the meeting*.) of the third paragraph:

Do not include calculations unless requested by the Engineer.

501.05.B.1.d.

On Page 314, **Replace** the last paragraph with the following:

d. Design Cofferdams and Excavation Bracing to support the sides and bottom of an excavation for all phases of work in accordance with the latest edition of the ODOT Bridge Design Manual and either the latest AASHTO Guide Design Specifications for Bridge Temporary Works, Section 4 or the latest edition of the AASHTO LRFD Bridge Design Specifications.

501.05.B.2.

On page 315, **Replace** first paragraph with the following:

2. Demolition of Bridges or portions of Bridges in which the work endangers property or the welfare, life, or health of any individual. Perform all Work as specified below:

501.06.A

On page 318, **Add** the following sentence after the last sentence of the first paragraph:

Mill certifications for Fracture Critical Materials shall include FCM statement.

506.03

On Page 327, After the last sentence **Add** the following graphic:

507.06

On Page 330, **Replace** the section with the following:

507.06 Cast-in-Place Reinforced Concrete Piles. Provide cast-in-place reinforced concrete piles with a plain cylindrical casing conforming to 711.03. Measure the pile diameter to the outside diameter of the casing.

Ensure that the pile casings are watertight after being driven. If furnished, shoes or points shall not project more than 1/4 inch (6 mm) outside the vertical surface of the casing.

The nominal pile wall thickness~~, t,~~ is the greater of either 0.250 inches (6.66 mm) or the minimum thickness specified in the project plans. thickness determined using the following formula:

$$\cancel{t\ (\text{inches}) = \frac{R\ (\text{lb})}{900{,}000}} \qquad \cancel{t\ (\text{mm}) = \frac{R\ (\text{N})}{157{,}606}}$$

~~Where:~~

~~R = Ultimate bearing value in pounds (newtons)~~

For cast-in-place piles containing reinforcing steel, place reinforcing steel as stated in the second and third paragraph of 524.09 and place concrete according to 524.11.

After installation, cover the tops of driven casings until the concrete is placed. Before placing concrete, remove accumulated water or other foreign matter in a driven casing. Place concrete for cast-in-place piles using methods that prevent voids, however, do not vibrate the concrete.

508.02

On Page 334, **Add** the following sentence after the second sentence of the last paragraph:

For phased construction of slab superstructures, do not place concrete for a closure pour until falsework on each side of the closure has been removed.

508.02

On Page 335, **Add** the following sentence to the end of the last paragraph:

Galvanize all deck hangers not encased in concrete per 711.02.

508.05

On Page 336, **Replace** the last paragraph with the following**:**

Include the cost for load testing required as per 508.02 in the item for which the falsework support is used.

509

On Page 336, **Replace** the section with the following**:**

ITEM 509 CONCRETE REINFORCEMENT

509.01 Description
509.02 Materials
509.03 Care of Material
509.04 Method of Placing
509.05 Bending
509.06 Approval of Placing
509.07 Splicing
509.08 Supports
509.09 Reinforcement Ties
509.10 Epoxy Coated Steel Reinforcement
509.11 GFRP Reinforcement
509.12 Galvanized Steel Reinforcement
509.13 Chromium Steel Reinforcement
509.14 Stainless Steel Reinforcement
509.15 Method of Measurement
509.16 Basis of Payment

509.01 Description. This work consists of furnishing and placing supports, mechanical splice systems, tie wires, and uncoated (black), epoxy coated, galvanized, chromium, stainless steel and GFRP concrete reinforcement of the quality, type, size, and quantity designated, including steel dowels.

509.02 Materials. Furnish materials conforming to:

Epoxy coated reinforcing steel 709.00
Reinforcing steel, deformed bars..... 709.01, 709.03, 709.05
Spiral reinforcing steel ..... 709.01 or 709.08
Bar mats and wire fabric 709.09, 709.10, 709.12
Plastic supports 709.15
GFRP deformed bars..... 705.28
Mechanical Splice Systems 709.19
Galvanized reinforcement 709.16
Chromium reinforcement 709.17
Stainless steel reinforcement 709.18

Do not substitute one type of reinforcement (uncoated, epoxy coated, galvanized, chromium, stainless steel or GFRP) for another except as noted in 709.16.

The Department will randomly sample concrete reinforcement and mechanical splices for QA testing according to their respective material specifications. Provide sufficient additional concrete reinforcement to replace that removed by the Department for sampling. Replace random samples in the structures with additional reinforcement, spliced according to 509.07.

509.03 Care of Material. Upon delivery to the project and before use, place concrete reinforcement on canvas tarps supported off the ground. Within 24 hours of delivery, cover reinforcement with canvas tarps or opaque polyethylene sheeting or other suitable opaque protective material to protect reinforcement from ultraviolet light. Keep the reinforcement covered and free from dirt, oil, grease, and avoidable rust.

When handling reinforcement, use equipment that avoids damaging or abrading the reinforcement. Lift bundles of reinforcement with synthetic straps at multiple pickup points. Do not drop or drag reinforcement. Prevent exposure of GFRP reinforcement to temperature above 120°F during storage. Before placing in the concrete, ensure the reinforcement is clean and free of dirt, oil, grease, and rust. Perform necessary repairs according to 509.09 for epoxy coated reinforcement, 711.02 for galvanized reinforcement and 509.10 for GFRP reinforcement.

509.04 Method of Placing. Place concrete reinforcement in the positions shown on the Plans, and firmly secure the reinforcement during the placing and setting of concrete. Tie bars in the superstructure at all intersections, except tie bars at alternate intersections where bar spacing is less than 1 foot (0.3 m) in any direction. The Contractor may place up to 25 percent of the upper longitudinal bars in a bridge deck slab beneath the upper transverse bars to support the top mat. Do not drive or force concrete reinforcement into concrete after its initial set.

Welding on reinforcing is prohibited, except as permitted by 709.10 and 709.12. The Engineer will allow the Contractor to fabricate reinforcing bar cages for prestressed beams if fabrication is done in a manner satisfactory to the Director.

Install concrete reinforcement with the following clearances from the concrete surface:

A. 2.5 inches [-0 inch, +0.5 inch] the top of sidewalks.

B. 3.0 inches [± 0 inch] at the faces of footings placed against rock or earth.

C. 1.5 inches [-0 inch, +0.25 inch] to the bottom of a cast-in-place deck slab.

D. 2.5 inches [-0.25 inch, +0.75 inch] to the top surfaces of cast-in-place concrete deck slabs.

E. 2.0 inches [-0 inch, +0.5 inch] at all other surfaces.

509.05 Bending. Bend concrete reinforcement to the dimensions shown on the Plans or as shown in Table 509.05-1. Reject concrete reinforcement showing transverse cracks.

TABLE 509.05-1 STANDARD BENDS

	Bar								
	Nominal Dimensions			180° Bend		90° Bend		135° Bend	
Bar	Diameter	Area	Weight	D	A	D	A	D	A
Size	in	in²	lb/ft	in	in	in	in	in	in
3	0.375	0.11	0.376	2 1/4	5	2 1/4	5	1 1/2	4
4	0.500	0.20	0.668	3	6	3	7	2	4 1/2
5	0.625	0.31	1.043	3 3/4	7	3 3/4	8 1/2	2 1/2	5 1/2
6	0.750	0.44	1.502	41/2	8	4 1/2	10		
7	0.875	0.60	2.044	5 1/4	10	5 1/4	12		
8	1.000	0.79	2.670	6	11	6	131/2		
9	1.128	1.00	3.400	9 1/2	15	9 1/2	15 1/2		
10	1.270	1.27	4.303	10 3/4	17	10 3/4	18		
11	1.410	1.56	5.313	12	19	12	20		
14	1.693	2.25	7.65	18 1/4	27	18 1/4	25		
18	2.257	4.00	13.60	24	36	24	33		
Tolerances: For diameter of bends, "D", the tolerance may be plus or minus the diameter of the bar. Standard fabricating tolerances shall be in accordance with the CRSI Manual of Standard Practice. No weight allowances will be made for tolerances.									

509.06 Approval of Placing. Before placing concrete, obtain the Engineer's acceptance of concrete reinforcement in place.

509.07 Splicing. Splice reinforcement as specified in the Plans or determined by the Engineer. Splice spiral reinforcement by lapping 1 1/2 turns.

Splice Nos. 14 and larger reinforcing bars with mechanical splice systems. The Department will not permit lap splices for these size bars.

Splice additional reinforcement used to replace random samples as follows:

TABLE 509.07-1 – SPLICE LENGTHS FOR RANDOM SAMPLES

Bar Size	Weight (lb/ft)		Lap Length (inches)			
	Uncoated/ Galvanized/ Epoxy coated	Stainless Steel	Uncoated/ Galvanized/ Stainless	Epoxy Coated	Chromium	GFRP
3	0.376	0.374	15	17	24	26
4	0.668	0.679	19	23	32	43
5	1.043	1.048	24	29	39	46
6	1.502	1.495	29	43	47	58
7	2.044	2.038	33	50	55	65
8	2.670	2.685	38	57	63	76
9	3.400	3.396	47	70	78	97
10	4.303	4.321	58	86	96	91
11	5.313	5.296	69	104	115	n/a
14	7.650	7.640	n/a	n/a	n/a	n/a
18	.600	13.590	n/a	n/a	n/a	n/a
20	.690	n/a	n/a	n/a	n/a	n/a

The Department will not permit mechanical splices for GFRP reinforcement.

509.08 Supports. Use precast mortar blocks, epoxy coated, galvanized, stainless steel, or plastic supports of adequate strength, of the proper depth, and in sufficient number to support concrete reinforcement. Use Table 509.08-1 to determine allowable support material for concrete reinforcement. Space supports for concrete reinforcement no more than 4 feet apart transversely and longitudinally. Supports shall have a shape that is easily enveloped by the concrete.

TABLE 509.08-1 – ALLOWABLE SUPPORT MATERIAL

Reinforcement Material	Support Material				
	Precast mortar	Epoxy coated	Galvanized	Plastic	Stainless steel
Uncoated	X	X		X	
Epoxy coated	X	X	X	X	X
Galvanized	X	X	X	X	
Chromium	X			X	X
Stainless	X			X	X
GFRP	X			X	X

X = Allowable Support Material

Mortar blocks may only be used to support the lower mat of reinforcing steel in concrete that is cast directly against bedrock or soil.

509.09 Reinforcement Ties. Use Table 509.09-1 to determine allowable reinforcement tie material for concrete reinforcement.

TABLE 509.09-1 ALLOWABLE REINFORCEMENT TIE MATERIAL

Reinforcement Material	Reinforcement Tie Material				
	Epoxy/PVC coated wire	Galvanized wire	Plastic/ Nylon Zip Ties	Stainless steel wire	Thermo-plastic clips
Uncoated	X				X
Epoxy coated	X	X		X	X
Galvanized	X	X			X
Chromium				X	X
Stainless				X	X
GFRP			X	X	X

X = Allowable Reinforcement Tie Material

509.10 Epoxy Coated Steel Reinforcement. Use bar supports and reinforcement ties that prevent electrical coupling between mats. Carefully handle and install bars to avoid coating damage that will require field repair. Repair all damaged coating areas where underlying steel surface is exposed. Surface rust is visual evidence of exposed steel surface. Where coating is damaged, use a wire brush or mechanical means to remove rust and loose epoxy. Repair using patching material of the same composition used or provided by the epoxy coating applicator meeting ASTM A775 except the Department will not allow aerosol spray applications.

If repair is required, clean and repair the damaged areas and allow adequate cure time before placing concrete. The Engineer will approve the installation once patching has been done as outlined above.

509.11 GFRP Reinforcement. The maximum total unrepaired visible damage on each linear foot of each GFRP bar shall not exceed 2% of the surface area in that linear foot of bar. The depth of the permissible damage shall not exceed 0.04 in. Replace the damaged bar or lap splice a new GFRP bar adjacent to the damaged portion with the appropriate lap length on either side of the damage. Do not field bend or straighten GFRP bars. Do not field cut GFRP reinforcement.

509.12 Galvanized Steel Reinforcement. Use bar supports and reinforcement ties that prevent electrical coupling between mats. Carefully handle and install bars to avoid coating damage that will require field repair. Repair all damaged coating areas where underlying steel surface is exposed. Except for damage to due field fabrication, the maximum amount of repaired damaged coating shall not exceed one percent of the total surface area in each 1-ft of bar length. Surface rust is visual evidence of exposed steel surface. Where coating is damaged, repair according to 711.02.

509.13 Chromium Steel Reinforcement. Use bar supports and reinforcement ties that prevent electrical coupling between mats.

509.14 Stainless Steel Reinforcement. Use bar supports and reinforcement ties that prevent electrical coupling between mats.

509.15 Method of Measurement. The Department will measure Epoxy Coated Steel Reinforcement, Galvanized Steel Reinforcement, Chromium Steel Reinforcement and Stainless Steel Reinforcement, by the number of pounds shown on the Plans. The Department will measure GFRP Reinforcement by the total length in feet for each bar size specified on the Plans. Additional measurements or calculations are not required.

If the Contractor believes the pay weights or lengths, as shown on the Plans, are in error, the Contractor is responsible to prove this discrepancy by recalculating the total weight or length for the reference number involved. The Contractor shall submit its figures to the Engineer for review and approval. The number of pounds of respective steel reinforcement types shall be the actual number of pounds of the various sizes incorporated in the concrete as shown on the Plans, completed and accepted. The total length in feet for GFRP reinforcement shall be the actual number of feet of the various sizes incorporated in the concrete as shown on the Plans, completed and accepted.

If the weight of respective steel reinforcement types is recalculated, determine the number of pounds from the number, length, and weight of the bars as shown on the concrete reinforcement list of the Plans, based on the weight per foot shown in the Table 509.07-1 with deductions for bars not used, and additions for extra bars used as directed by the Engineer**.** If the length of GFRP reinforcement is recalculated, determine the total length in feet from the number and length for each bar size as shown on the concrete reinforcement list of the Plans with deductions for bars not used, and additions for extra bars used as directed by the Engineer**.**

509.16 Basis of Payment. The Department will not include the supports, mechanical connectors, and tie wires in the calculated weights or lengths but will consider them incidental to the price bid.

The Department will pay for accepted quantities at the contract price as follows:

Item	Unit	Description
509	Pounds	Epoxy Coated Steel Reinforcement
509	Pounds	Uncoated Steel Reinforcement
509	Feet	No. Deformed GFRP Reinforcement
509	Pounds	Galvanized Steel Reinforcement
509	Pounds	Chromium Steel Reinforcement, Type
509	Pounds	Stainless Steel Reinforcement

511.03

On page 343**, Revise** the first paragraph to the following:

511.03 Concrete. Provide concrete for structures according to 499.03, using Class QC 1, QC 2, QC 3, or QC 4 or QC 5 as specified in the Contract.

511.04

On page 343**, Delete** the third paragraph and table and **Replace** with the following:

When the concrete bid item does not require QC/QA, the Engineer will make at least one set of acceptance test cylinders for each 50 cubic yards (40 m^3) of concrete.

511.07

On page 345**, Revise** the following definitions:

f'ci = Compressive strength of prestressed concrete at release; ksi. Use the fabricator's reported strength if beams have been cast, otherwise use strength provided in the Plans.

$$k_{td} = \frac{t}{12\left(\frac{100-4f'_{ci}}{f'_{ci}+20}\right)+t}$$

511.07

On page 345, **Replace** the fourth paragraph with the following:

Provide the Engineer with revised plan sheets and Design Camber calculations or measured camber data signed, sealed and dated by an Ohio Registered Professional Engineer at least 7 days prior to constructing the beam seats. The revised plan sheets shall include the measured camber data (if available), Design Camber (D_t) and beam age (t) assumed for establishing the revised elevations. Provide haunch reinforcement for prestressed I-beam members according to the ODOT Bridge Design Manual, Figure 308-7 as necessary to extend the beam's composite reinforcement at least two inches into the deck thickness. All revisions resulting from adjusted beam seat elevations shall be clearly marked as revised. Do not begin work until the Engineer approves the revised plan.

511.09

On page 350**, Replace** the section with the following:

511.09 Construction Joints. A construction joint is a plane separating concrete placements that reach initial set at different times**.** Place construction joints in the locations shown in the plans. Construction joints shall have a non-finished surface, a formed finish surface or a roughened finish surface. Provide a non-finished surface on horizontal joints and a formed finished on vertical joints unless otherwise specified. A non-finished surface shall have uniformly exposed aggregate, no loose aggregate and all laitance removed. When placing concrete against an existing surface, placed in a previous project, the Department will consider the construction joint created to be a formed finish surface unless otherwise specified in the plans. All construction joint form work and bulkheads shall be in accordance with Item 508. Do not use an edger on construction joint edges. Cure the construction joints according to 511.14.

A roughened construction joint surface, when specified in the plans, shall be as follows:

A. For bonding surfaces that can be finished, finish the surface by producing groves at right angles and penetrating the finished surface approximately 1/4 ± 1/8 inch (6 ±3 mm) at a maximum spacing of 1 -1/4 ±1/4 inch (32 ± 6 mm). Grooves shall terminate approximately 1½-inches from

the edge of finishing surface. If the first strike-off does not produce the required roughness, repeat the process before the concrete reaches initial set.

B. For bonding surfaces that cannot be finished according to Part A, use mechanical scarifying equipment to thoroughly roughen the existing surface to a uniformly distributed 1/4 ± 1/8 inch (6 ±3 mm) at a spacing of 1 -1/4 ±1/4 inch (32 ± 6 mm). Do not use chipping hammers heavier than the nominal 15 lb (7 kg) class and operate at an angle of less than 45 degrees with respect to the surface. Remove concrete in a manner that prevents cutting, elongating or damaging reinforcing steel.

Before placing fresh concrete against any hardened concrete surface, thoroughly clean and saturate the existing surface. Remove all loose particles, dust, dirt, laitance, oil, curing compound, concrete lip or edging, and any film of any sort. Flush construction joint surfaces with water and allow the surfaces to dry to a surface-dry condition immediately before placing concrete.

Requests to add, delete or relocate construction joints shall be in accordance with the ODOT Bridge Design Manual and shall be in writing, accompanied by revised plan sheets signed, sealed, and dated by an Ohio Registered Professional Engineer. Obtain the Engineer's acceptance prior to placing a construction joint not shown on the plans. The Department will not pay for added costs that result from such changes.

511.10

On page 350**, Replace** the section with the following:

511.10 Work Stoppage. If the work is unexpectedly interrupted by breakdowns, storms, delays or other causes which will result in an initial set of the placed concrete, rearrange the freshly deposited concrete to provide a straight and non-wavy construction joint per 511.09. If the Engineer determines that this construction joint adversely affects the structure capacity, the Engineer will require a corrective action plan per 501.05.C.

511.15

On page 355, **Replace** the first two paragraphs with the following:

511.15 Surface Finish. For concrete that is to be sealed with Epoxy-Urethane according to 512.03, perform surface profiling and surface finish according to 512.03.F.

For all others, finish the concrete surface as detailed below:

511.15.A.

On page 355, **Replace** the paragraph with the following:

A. Standard Finish. On all surfaces, remove fins and irregular projections with a stone or power grinder, taking care to avoid contrasting surface textures. Repair all cavities produced by form ties and, on visible surfaces, repair all defects using a mortar consisting of one part of hydraulic cement conforming to Item 499 and 1-1/2 parts sand conforming to 703.03, by volume and water conforming to 499.02 with a maximum water/cementitious ratio of 0.4. A defect is an imperfection in the concrete measuring at least 3/4" (19mm) in diameter or at least 1/2" (13 mm) deep but not exceeding a total volume of 1 cubic inch (16.387 mL). Finish all repaired surfaces on the structure in a similar manner and to the extent required to produce a uniform appearance.

511.19.E.

On page 358, **Replace** E. with the following:

E. Portable barrier anchor locations.

511.19.F.

On page 358, **Add** the following after E.:

F. Cracks discovered in the deck of the top and bottom surfaces before opening the deck to traffic, that are 10 mils or 0.010 inches or less in width. For deck cracking on the top and bottom surface area, on more than 20% of the surface area, or that is 10 mils or 0.010 inches or more in width, or deck scaling that is greater than 0.250 inches deep, or on more than 20% of the deck surface area, or deck spalling on more than one area, or an area greater than 32 square yards, an investigation will be performed by OMM and proceed according to 108.02 to resolve the issue.

512.03.F.

On page 364, **Replace** the entire section with the following:

F. rface Preparation and Profiling.

1. Non-Epoxy Sealer

Remove dust, dirt, oil, wax, curing compounds, efflorescence, laitance, coatings and other foreign materials from surfaces to be sealed.

Ensure that all wastes generated by the surface preparation operation are managed in accordance with 107.19.

If the concrete surface had curing compound applied, acid test the surface after blasting to see if the curing compound was removed. Perform the acid test for every 500 square feet (47 square meters). Use a 30%, by weight, solution of hydrochloric acid. Apply 4 to 5 drops to the concrete surface. If foaming/fizzing occurs the curing compound is removed. Rinse the tested location with an ammonia solution to neutralize the concrete area tested (1 cup ammonia to 5 gallons water).

(NOTE: Muriatic acid and ammonia can be bought in a hardware store. Muriatic acid is used to clean masonry. Only dilute by pouring the acid into the water. DO NOT pour the water into the acid.)

When surfaces show intermittent or no foaming, use chemicals or other cleaning compounds to remove the curing compounds. Only use products approved by the sealer manufacturer. Furnish the Engineer documentation of the sealer manufacturer's approval and method to test if materials are removed.

2. Epoxy-Urethane Sealer

Remove dust, dirt, oil, wax, curing compounds, efflorescence, laitance, coatings and other foreign materials from surfaces to be sealed.

Ensure that all wastes generated by the surface preparation operation are managed in accordance with 107.19.

If the concrete surface had curing compound applied, acid test the surface after blasting to see if the curing compound was removed. Perform the acid test for every 500 square feet (47 square meters). Use a 30%, by weight, solution of hydrochloric acid. Apply 4 to 5 drops to the concrete surface. If foaming/fizzing occurs the curing compound is removed. Rinse the tested location with an ammonia solution to neutralize the concrete area tested (1 cup ammonia to 5 gallons water).

(NOTE: Muriatic acid and ammonia can be bought in a hardware store. Muriatic acid is used to clean masonry. Only dilute by pouring the acid into the water. DO NOT pour the water into the acid.)

When surfaces show intermittent or no foaming, use chemicals or other cleaning compounds to remove the curing compounds. Only use products approved by the sealer manufacturer. Furnish the Engineer documentation of the sealer manufacturer's approval and method to test if materials are removed.

After concrete has cured and forms are removed, use one or both of the following methods to produce a surface profile that feels and looks like 100 grit sandpaper or coarser. Provide the Engineer sandpaper for comparison. Perform the ASTM D7682-12, Method B, Standard Test Method for Replication and Measurement of Concrete Surface Profile Using Replica Putty to obtain a replica coupon of the prepared concrete surface on a flat, test section, on the first day of production, and as requested by the Engineer. With a micrometer, measure the surface profile obtained on the coupon, and provide the coupon to the Engineer.

a. Water blast at 7000 psi (48Mpa) minimum, or

b. Abrasive blast, followed by air brooming or power sweeping, to remove dust and sand from the surface and opened pores, or

c. Use a combination of water blast and abrasive blast.

Install suitable traps, filters, drip pans and other separation devices in the cleaning equipment so oil and other foreign material are not deposited on the surface.

Fill all cavities produced by form ties and other single defects or defected areas with a prequalified trowelable mortar in accordance with Supplemental Specification 843.02 and 843.06. Provide a broom/brush finish to all trowelable mortar patches. Cure the trowelable mortar according to Supplemental Specification 843.07.

A defect is an imperfection in the concrete measuring at least 3/4" (19mm) in diameter or at least 1/2" (13mm) deep but not exceeding a total volume of 1 cubic inch (16.387 mL). A defected area is an area with a density of imperfections between 1/4" (6 mm) and 3/4" (19 mm) in diameter or between 1/4" (6mm) and 1/2" (13 mm) deep numbering 10 or more per 1 square foot (0.09 square meters) area.

Air dry for at least 10 days after completion of the manufacturer's recommended cure time for trowelable mortar. Brush abrasive blast, followed by air brooming or power sweeping, to remove dust and sand from the surface and opened pores.

512.03.G.

On page 365, **Replace** the first paragraph of the subsection with the following:

G. plication and Coverage. Do not apply sealer to surfaces with moisture. Apply the sealer between 12 and 48 hours after surface preparation by water blasting methods. Apply the sealer within 48 hours after abrasive blasting methods. Do not apply sealer if rain is anticipated within six (6) hours after application. Wait at least 12 hours after last rain event to apply sealer. Clearly mark where the sealer application stops if not continuous.

512.04.B.

On page 368**, Replace** the section with the following:

B. Surface Preparation. Remove roadway dirt and debris from the area of the deck to be treated. Sweep, abrasive blast, then with the use of a manual or power broom sweep and blow with compressed air so that the surfaces to which the sealer is to be applied is dry and free of dust and dirt. Use high pressure compressed air to blow all loose material from visible cracks. Fit the cleaning equipment with suitable traps, filters, drip pans, driers and other devices to prevent oil and other foreign material from being deposited on the surface. Do not allow traffic on the clean surface prior to application of the sealer. Remove existing pavement markings using a method as specified in 614.11.G.1.a. ~~The cost of removal is incidental to the Work.~~ Remove all traces of asphalt or petroleum products and concrete curing seals by abrasive blasting prior to air sweeping.

512.06.B.

On page 371**, Replace** the section with the following:

B. Surface Preparation. First remove roadway dirt and debris from the area to be treated. Sweep abrasive blasted surfaces to which the sealer is to be applied, then manual or power broom swept and blown with compressed air so that they are dry and free of dust and dirt. Use high pressure compressed air to blow all loose material from visible cracks. Use a high pressure water blast followed by an air blast if particles are highly embedded in the cracks, to clean cracks. Fit the cleaning equipment with suitable traps, filters, drip pans, dryers and other devices to prevent oil and other foreign material from being deposited on the surface. Do not allow traffic on the clean surfaces prior to application of the sealer. Remove existing pavement markings using a method as specified in 614.11.G.1.a. ~~The cost of removal is incidental to the Work.~~ Remove all traces of asphalt or petroleum products and concrete curing by the abrasive blasting prior to air sweeping.

512.09

On page 376**, Add** the following paragraph after the last paragraph:

The Department will measure the removal of pavement markings using the same method of measurement as completed markings in the units designated per Item 641.

512.10

On page 376 **Replace** the last paragraph with the following:

The Department will consider the removal of dust, dirt, oil, wax, curing compounds, efflorescence, laitance, and other foreign materials as incidental to the surface preparation of the concrete surfaces to be sealed. When the surface to be sealed contains an existing coating, the Department will consider all materials, equipment and labor to remove the existing coating as incidental to the pay item Removal of Existing Coatings from Concrete. When the surface to be sealed contains pavement markings, the Department will consider all materials, equipment and labor to remove the existing pavement markings as incidental to the pay item Removal of Existing Pavement Marking.

512.10

On page 377, **Add** the following after the last item:

512	Linear Feet or Square Foot (Meter of Square Meter) or Each	Removal of Existing Pavement Marking

513.13

On page 383, **Replace** the last sentence of the first paragraph with the following:

Weld stiffeners connected to cross frames and/or diaphragms to the top and bottom flange.

513.15

On page 384, **Replace** the entire section with the following:

513.15 Horizontally Curved Beams and Girders. If members are to be heat curved, submit the detailed procedure, including ~~necessary~~ calculations ~~for geometric limitation criteria, camber adjustment and applied loading,~~ to the Office of Materials Management. Obtain the Office of Materials Management's acceptance of the procedure before starting this work.

Curve beams and girders using heat according to ~~*AASHTO Standard Specifications for Highway Bridges*, except that the fabricator may cut flanges for girders to obtain the required alignment.~~ the *AASHTO-LRFD Bridge Construction Specification*.

513.19

On page 385, **Replace** the ninth paragraph with the following:

The Fabricator shall drill holes full sized in unassembled pieces or connections, including templates for use with matching sub-sized and reamed holes, using suitable numerically controlled (N/C) drilling equipment. If using N/C drilling equipment, demonstrate the accuracy of the drilling procedure to the inspector according to 513.24.

513.20.C.

On Page 387, **Replace** the fourth paragraph with the following:

Install bolts in the remaining open holes and tighten the bolts to a snug tight fit, after which all bolts shall be tightened completely by the turn-of-nut method or according to Supplement 1082.

513.20.D

On Page 388, **Replace** Table 513.20-2 with the following:

TABLE 513.20-2

Bolt Size (inches)	Bolt Tension[1] (kips), minimum A 325
1/2	12
5/8	19
3/4	28
7/8	39
1	51
1 1/8	64
1 1/4	81
1 3/8	97
1 1/2	118

[1] Equal to 70 percent of specified minimum tensile strengths of bolts, rounded off to the nearest kip.

513.20.D

On Page 388, **Delete** Table 514.2-2M

~~**TABLE 513.20-2M**~~

~~**Bolt Size (mm)**~~	~~Bolt Tension[1] (kN), minimum A 325M~~
~~M16~~	~~91~~
~~M20~~	~~142~~
~~M22~~	~~176~~
~~M24~~	~~206~~
~~M27~~	~~267~~
~~M30~~	~~327~~
~~M36~~	~~475~~

~~[1]Equal to 70 percent of specified minimum tensile strengths of bolts, rounded off to the nearest kN.~~

513.24

On page 391, **Add** the following sentence after the last sentence of the fifth paragraph:

The maximum sweep at any point along all members of an expansion joint shall not exceed ¼" in 50'.

513.28

On page 395, **Replace** the second paragraph with the following.

Shop blast unpainted Grade 50W material and main members requiring galvanized coating to SSPC-SP 6, commercial blast. QCP #3 shall apply according to Item 514.

514.04.A.

On page 397, **Replace** the first three paragraphs with the following:

A. Quality Control Specialist. Identify the individuals dedicated to performing duties as the painting quality control specialists before starting work in the field. Provide a quality control specialist for each structure, but one quality control specialist must be provided for every three structures for which work is progressing concurrently on this contract.

Each quality control specialist must have a current certification from one of the following:

1. NACE (National Association of Corrosion Engineers) coating inspector Level 1
2. SSPC (The Society for Protective Coatings) protective coating specialist
3. SSPC protective coating inspector Level 1, SSPC bridge coating inspector Level 1
4. AMPP (Association for Materials Protection and Performance) Coating Inspector Level 1
5. AMPP Bridge Coating Inspector Level 1
6. Individuals trained prior to 7-15-22 by NACE or SSPC certified coating or inspector Level 1 or higher will be accepted for 5 years from the date on their certificate after their training per the old specification.

The quality control specialist must successfully complete a Bridge Painting prequalification course offered by the Department. The training course must have been completed within the past four years and an individual course transcript must have been received by the quality control specialist.

Provide the following to the Office of Construction Administration to be placed on the approved Quality Control Specialist List.

1. Copy of your current AMPP, NACE or SSPC certification. Applications for individuals trained prior to 7-15-22 by a NACE or SSPC certified individual will be accepted until 5 years after their training.
2. Transcript from your Bridge Painting Prequalification Course (Work Type 26 Course).
3. Application with photo included from the Office of Construction Administration Website.

514.04.B

On page 400, **Replace** the 10th quality point with the following:

10. Finish Coat Application	Check surface cleanliness, apply ~~intermediate~~ finish coat, check coating thickness	Yes	Yes

514.06

On Page 402, **Replace** 514.06 with the following:

514.06 Work Limitations. Apply the prime coat to new structural steel inside permanent buildings at the fabricator's facility. If inside permanent buildings, the fabricator may perform year-round abrasive blasting and painting. Perform abrasive blasting and painting in the field from April 1 to October 31 unless otherwise approved by the Engineer. The Department will not issue a time extension due to adverse weather during the month of April. The plans or other Contract Documents may require additional work limitations for specific bridges or projects.

514.10

On page 403, **Replace** the first paragraph with the following:

514.10 Inspection Access and Lighting. In addition to the requirements of 105.10, furnish, erect, and move scaffolding and other appropriate equipment to allow the inspector and the Engineer the opportunity to closely observe all affected surfaces during all phases of the work and for at least 10 workdays after completely painting each structure to allow for the Final Inspection according to 514.21. Provide artificial lighting as necessary to supplement natural light with a minimum of 30 foot candles (325 LUX) at the surface of the steel for inspection, cleaning, and painting. Prevent glare that interferes with traffic, workers and inspection. Submit fully detailed Engineered Drawings of the scaffolding or work platforms used for inspection access to the Engineer at least 14 days before installation. All details of the inspection access shall comply with the applicable safety requirements of The Ohio Industrial Commission and OSHA. Provide details and locations of all connections, to the permanent structure, used for painting and inspection of the structure with the Engineered Drawings. Damage to the permanent structure shall be avoided. Do not drill into the bottom of the deck or under bearing locations or similar areas of concern for the structure. The details shall be reviewed, signed, stamped and dated by an Ohio registered Professional Engineer certifying that they meet these requirements. The Engineer will provide a written response to the submittal in accordance with 105.02. Do not begin work until the Engineers acceptance has been received. Perform all work in accordance with the accepted Engineering Drawings. Immediately cease all operations that deviate from the accepted Engineered Drawings. If a deviation is necessary, prepare revised Engineering Drawings as noted above and furnish the Engineer a copy of revised Engineering Drawings. Do not begin work until the revised drawings are accepted by the Engineer. Maintain the in-place inspection access equipment employed during original painting activities or provide alternate inspection equipment such as platform lifts, bucket trucks, snooper trucks, or equivalent as approved by the Engineer. If scaffolding, or any hanger attached to the scaffolding, is supported by horizontal wire

ropes, or if scaffolding is directly under the surface to be painted, comply with the following requirements:

514.13.C

On page 406, **Replace** the second FULL paragraph with the following:

For field blasting use a recyclable steel grit, recyclable amorphous metal oxides or a recyclable natural mineral, low dusting abrasive. Recycled glass abrasives with no beryllium and no more than 0.5 percent free silica will be allowed on small areas with less than 1000 square feet of field blasting on a structure. Do not use silica sands, mineral slags, and other types of non-metallic abrasives that contain more than 0.5 percent free silica, by weight, have a chlorides salts content more than 25 ppm, and contain any organic material. For shop blasting use an abrasive that produces an angular profile. All abrasives shall provide a profile from 1.5 to 3.5 ~~(40 to 90 µm)~~ mils as determined by replica tape according to ASTM D 4417, Method C. Adjust the abrasive size, blast hose nozzle pressure or other means in order to provide the 1.5 to 3.5 mil profile. Clean the abrasive of paint chips, rust, mill scale, and other foreign material after each use and before each reuse. Use equipment specifically designed for cleaning the abrasive.

514.17.C

On page 411, **Replace** the first paragraph of section with the following.

C. Additional Information Pertaining to Shop Applied Paint. Apply a prime coat to all structural steel surfaces by brush or spray methods, including insides of holes, behind stiffener clips, areas that are to be embedded in concrete and contact surfaces of connection, and splice material that is to be fastened with bolts in the shop or field. For ASTM A709 Grade 50W and 70W steel embedded in concrete diaphragms, apply a prime coat to the entire surface area encased within the diaphragm and extending at least 12-in outside the diaphragm. Apply a mist coating from 0.5 to 1.5 mils (12.5 to 37.5 µm) on surfaces within 2 inches (50 mm) of field welds other than those attaching intermediate or end cross frames to beams or girders. Apply one coat of primer to pins, pin holes, and contact surfaces of bearing assemblies, except do not paint those containing self-lubricating bronze inserts. Once the prime coat is dry, apply erection marks, using a thinned paint of a type and color that is completely concealed by, and compatible, with the second coat.

514.17.E.

On page 414, **Replace** the entire section with the following:

E. Brush Application. Apply the paint to produce a smooth coat. To ensure coverage, apply wet stripe coats using brushes, daubers, small diameter rollers or sheepskins to all edges, outside corners, crevices, welds, rivets, bolts, nuts and washers in addition to the spray application of each individual coating. Apply stripe coat of organic zinc primer and intermediate coat either before or after spray application of respective coats ~~primer~~. Tint intermediate stripe coats another color that is applied after spray application. Apply stripe coats of ~~intermediate and~~ the finish coats before spray application of the finish ~~respective~~ coats. Apply additional paint as necessary to produce the required coating thickness.

514.17.G.

On page 415, **Replace** the second paragraph of section G with the following:

Ensure that the paint manufacturer's printed instructions for the minimum times to handle, recoat and cure the individual coats for specified conditions and thicknesses are followed for each coat of paint before applying the next coat. Comply with the manufacturer's written instructions for the time interval between coats and apply the next coat when an additional coat will not cause detrimental film irregularities, such as lifting, wrinkling, or loss of adhesion of the undercoat. Do not exceed the following time intervals. If the prime coat is organic zinc, the maximum time between the prime and intermediate coats is 30 days. There is no maximum time between the prime and intermediate coats

for an inorganic zinc primer. The maximum time interval between intermediate and finish coats is 13 days. These maximum recoat times include adverse weather days and the Engineer will not extend the times. The recoat windows begin with the initial application of each coating type inclusive of stripe coats. Additional applications of the same coat do not reset the recoat windows. The time interval ends with the application of the next full coat. The stripe coat does not end the time interval. If the next type of coating is not applied within the times stated above, remove the coatings and re-blast the steel according to SSPC-SP 10.

514.20

On page 418, **Replace** the last sentence of the last paragraph with the following:

The removal and replacement of the coating shall be done as specified in ~~514.19~~ 514.22.

514.21.A

On page 418, **Replace** the section with the following:

A. The Engineer will select locations for coating removal for inspection of surface preparation and dry film thickness. For all structures in which the supporting members are rolled beams or girders, remove a minimum of one location per ~~150~~ 300 linear feet ~~(46 m)~~ of beam line for webs and flanges and ~~5~~ 2.5 percent of all cross frame assemblies and other secondary structural members shall be selected for destructive testing. For all other bridge types with structural steel, remove one location for every ~~1200~~ 2400 square feet ~~(108 m²)~~ of steel surface for destructive testing. Do not perform destructive testing on areas that have been painted with an inorganic zinc prime coat.

514.21.B

On page 418, **Replace** the section with the following:

B. At the selected areas, the Engineer will perform total dry film thickness testing using a type 2 magnetic gage. If the dry film thickness for that spot does not meet the requirements of ~~514.18~~ 514.20, additional measurements will be taken to determine the extent of the deficient coatings.

515.06

On page 423 **Replace** the section with the following:

515.06 Shop Drawings. Provide shop drawings conforming to 501.04 and the following requirements.

Include all details, dimensions, dimensional tolerances, and size of materials, lifting devices, inserts, reinforcing steel supports, fabricator incorporated reinforcing, contractor supplied items, piece mark diagrams for field connection and erection of any steel and all prestress members, and all other information necessary for the complete fabrication and erection of the prestressed members. Show all items that will be incorporated into each prestressed member, including Contractor supplied hardware. All steel hardware to be incorporated into the prestressed member and added after Contract Sale shall be galvanized according to 711.02; and meet clearances specified in 509.04.

Provide mill certs to the fabricator, prior to the prefabrication meeting.

Provide the detensioning procedure and pattern conforming to 515.16.

515.10

On page 424, **Add** the following sentence after the last sentence in the section:

Verify casting bed losses annually and provide the data as an update to the Fabricator's Quality Control Plan.

515.15

On page 426, **Replace** the section with the following:

515.15 Concrete. The fabricator shall provide concrete mix designs to Office of Materials Management. The submittal will include:

A. Test data showing the mix achieves the required 28-day strength when cured by methods used for member fabrication. The strength of the concrete for the mix design approval and during production is determined using a set of ~~two, 6 × 12-inch cylinders or~~ three, 4 × 8-inch cylinders.

B. w/c ratio (maximum =0.40)

C. A design and maximum slump. For SCC concrete, provide a slump flow range in accordance with ASTM C1611, provide the following:

a. Visual Stability Index (VSI) – Provide a VSI of 0 or 1 as listed in ASTM C 1611 for acceptance of the mix design

b. J-Ring- Test J-ring passing ability in accordance with ASTM C 1621. The measured difference between the slump flow and J-ring flow must be two inches or less to be acceptable.

c. Static Segregation- Test for static segregation according to ASTM C 1712. The measured penetration must be one-half inch or less to be acceptable.

d. Column Segregation- Test for column segregation according to ASTM C 1610. Provide a static segregation ≤15.0%.

D. Test data showing the mix design achieves 2000 coulombs or less at 90 days when tested according to AASHTO T277. Use samples for the test that were mixed without corrosion inhibitors and that were cured with the same methods that will be used to produce the prestressed concrete bridge members. Do not apply additional cure to samples that have reached the required design strength.

Changes in proportioning, cement, pozzolans or aggregate will require retesting and resubmittal. Office of Materials Management may waive the retests. Provide the waiver request in writing and include all information for the new mix design and a comparison to the previously tested and approved mix design(s).

Deliver concrete according to Item 499 except that 499.03 and 499.04 does not apply. The plastic air content of the concrete before placement shall be 6 ± 2 percent. If the Department questions the concrete's placed air content, obtain cores from the prestressed member and have hardened air testing performed by an independent testing lab acceptable to the Department. Beams with hardened air contents below 4 percent will be rejected. Add an approved corrosion inhibiting admixture at the approved dosage and document the dosage that has been incorporated into each batch of concrete.

Maintain the mix design slump during production. Segregation of the mix is not acceptable. Do not exceed the maximum water-cement ratio during concrete production. When using admixtures to increase the slump, use Type F or G as described in 705.12. Do not use calcium chloride or admixtures containing calcium chloride.

Sample and test the conventional or SCC concrete for prestressed concrete members as specified in Table 515.15-1. For SCC mixes, perform slump flow in accordance with ASTM C 1611 and provide a VSI of 0 or 1. Fabricate test specimens in accordance with ASTM C 1758 per Table 515.15-1. Perform ASTM C 1621 and C 1712 at least once per bed line, per day, during concrete production, and within the tolerances listed in 515.15.C.

TABLE 515.15-1, TEST SPECIMEN REQUIREMENTS[1]

Cubic Yards per Bed	Sampling Frequency	Number of Cylinders Required
Less than or equal to 30 cubic yards	First and last load per bed	Minimum of 4
30 to 60 cubic yards	First and last load per bed plus one random sample.	Minimum of 6
Greater than 60 cubic yards	First and last load per bed plus 2 random samples.	Minimum of 8

Determine strength, for both strand release and final shipping, by testing a group of cylinders, which consists of one cylinder from every sample location. Each group of cylinders shall have an average strength of what is specified in the shop drawings, and no individual cylinder shall have less than 95 percent of the specified strength.

The inspector may require additional cylinders from locations were the concrete does not conform to mix design or placement requirements. Include these additional cylinders in the group of cylinders for determining release and final strength.

The fabricator may place concrete in the bottom flange of a box beam before placing the interior forms and reinforcement for the upper portion of the member, provided continuous concrete placement is not interrupted for more than 45 minutes.

Screed the top surfaces of non-composite members and finish the surface with a burlap drag or other means to provide a uniform surface with a gritty texture suitable for waterproofing.

Screed the top surface of composite members and finish the surface with a wire broom, in a transverse direction and penetrating the finished surface approximately 1/4 inch (6 mm) + 1/16 inch (1.5 mm) – 1/8 inch (3 mm) at a maximum spacing of 1 -1/2 inches (38 mm).

Immediately after final concrete placement and surface finishing, protect the concrete surface with a suitable enclosure until application of live steam or radiant heat. Assure the enclosure's ambient temperature is at least 50 °F (10 °C). Assure the plastic concrete's temperature before initial set doesn't rise more than 10 °F (5 °C) per hour. Limit the total rise before initial set to less than 40 °F (22 °C) and the maximum temperature to 100 °F (38 °C). Record the times and concrete temperatures before initial set.

For curing with low-pressure steam, do not apply live steam directly onto the concrete forms if it causes localized high temperatures.

For accelerated curing with radiant heat, apply radiant heat using pipes circulating steam, hot oil, or hot water, or using electric heating elements. Minimize moisture loss by covering all exposed concrete surfaces with plastic sheeting, 705.06, or by applying a liquid membrane curing compound, 705.07, to all exposed concrete surfaces. Before bonding field-cast concrete or other materials in the finished structure, remove the curing compound from the shear faces of composite members and other surfaces.

Start initial application of the steam or heat 2 to 4 hours after final concrete placement. If using retarders, start applying the steam or heat 4 to 6 hours after final concrete placement. If determining the time of initial set according to ASTM C 403, these time limits do not apply. Record and report the actual time of concrete placement of the last load, placement of enclosure and initial set time.

Apply live steam or radiant heat so the ambient temperature within the curing enclosure does not gain more than 40 °F (22 °C) per hour until reaching the curing temperature. Do not exceed 160 °F (71 °C). Only use a maximum temperature of 180 °F (82 °C) if the fabricator documents to the

Department that delayed ettringite or alkali silica reaction is not at issue. Maintain the maximum curing temperature until the concrete has reached the required release strength. De-tension the strands immediately upon completing the accelerated curing. Keep a record of the time the application of heat began and curing temperatures throughout the entire curing process.

Provide a final surface finish free of bug holes, honeycombing, and other defects. Neatly fill cavities in the exposed surface of beams with mortar of the same cement and fine aggregate mixed in the same proportions as used in the concrete being finished.

Clean the concrete and apply and cure the grout according to the manufacturer's published recommendations. Reject beams with honeycombing that impairs the member's performance. Follow the requirements of Item 512.03 for beams to be sealed with epoxy urethane.

515.17

On page 430, **Replace** the Table 515.16-5 with the following:

TABLE 515.16-5, BEAM SWEEP AND CAMBER TOLERANCES

Description	Box Beam	I Beam
Horizontal Sweep	±1/8" per 10 ft ~~(1 mm/m)~~ max ±3/4" ~~(19 mm)~~	±1/8" per 10 ft ~~(1 mm/m)~~ max ±1" ~~(25 mm)~~
Max Gap between beam	1" ~~(25 mm)~~	N/A
Deviation from Design camber (Dt) [1]	+ Sacrificial Haunch [2] or 1/8" per 10 ft ~~(1 mm/m)~~ max +1/2" or -1/2" ~~(13 mm)~~	+ Sacrificial Haunch [2] or – 1"
Variation in camber between beams in same span	max 1/2" ~~(13 mm)~~	N/A

[1] Design camber (Dt) calculated in accordance with 511.07

[2] Unless otherwise noted, Sacrificial Haunch thickness is 2"

515.18

On page 430, **Replace** the first paragraph with the following:

515.18 Prestressed Member Acceptance and repair. Throughout the fabrication process reject all prestressed members not meeting specification requirements except as noted below for camber.

515.18

On page 431, **Replace** the second paragraph with the following:

The Department will not accept for shipping, prestressed members with measured camber exceeding the Design Camber (Dt), used to establish the seat elevations, according to 511.07, by more than the Sacrificial Haunch thickness nor camber more than one inch less than Design Camber, until a corrective work plan has been approved by the Engineer. The plan shall be signed, sealed and dated by an Ohio Registered Engineer and shall include all revised plan information necessary to place the deck to the plan thickness. If the prestressed members are acceptable, exclusive of the deviation from Design Camber, the Department will pay for all costs incurred resulting from measured camber exceeding or more than 1 inch under Design Camber calculated for the actual beam age at the time of deck placement, as Extra Work, 109.05.

516.03

On Page 433, **Replace** the first paragraph with the following:

516.03 Coating. Coat exposed steel bearings attached to structural steel to match the coating of the adjoining structural steel. Metallize bearings with 100 percent zinc wire or galvanize bearings according to 711.02 that are to be attached to concrete beams. Repair damage to metallized or galvanized coatings according to 711.02.

516.03

On Page 433, **Replace** the second paragraph with the following:

Coat metal parts of expansion joints not part of extensions to existing steel expansion joints with metalized 100 percent zinc wire or galvanize according to 711.02. Prepare the surface to be coated and apply coating as required by The Society of Protective Coatings SSPC-CS-23.00(1). Apply coating to a minimum thickness of 6 mils. The vertical extensions to existing steel expansion joints are not to have any protection and the horizontal extensions to existing steel expansion joints are to match the existing protection.

516.08

On page 436, **Replace** the section with the following:

516.08 Method of Measurement. The Department will measure the specified items by the number of each, square feet (square meters), pounds (kilograms), or feet (meters).

For all Structural Steel Expansion joints, elastomeric compression seals and joint sealer, the Department will measure the length in feet horizontally along the joint centerline and between the outer limits of the joint.

For the Semi-Integral Abutment Expansion Joint Seal, the Department will measure, in feet, the total length of the joint between the diaphragm and the abutment.

For deck resurfacing, the Department will measure Structural Steel Expansion Joints extending vertically by the actual horizontal length of joint.

516.09

On page 436, **Delete** the following pay item:

~~516 Foot (Meter) Folder Copper Strip~~ _____

517.07

On page 438, **Replace** the entire section with the following:

517.07 Method of Measurement. The Department will measure Railing by the number of feet (meters) of railing including end posts. If deep beam guardrail is used, the Department will measure the length of railing between the first posts off the bridge excluding the first posts off the bridge. If hand rails or tubular backup rails are used, the Department will not measure any portions extending beyond the first posts off the bridge. If twin steel tube bridge railing is used, the Department will measure the length of the railing between the second post off the bridge including the second post. If Three Steel Tube Bridge Railing is used, the Department will determine the number of feet of railing as the total length of the middle tube railing as measured along the traffic face on each side of the bridge.

518

Beginning on page 438 **Replace** the section with the following:

ITEM 518 DRAINAGE OF STRUCTURES

518.01 Description
518.02 Fabrication
518.03 Materials
518.04 General
518.05 Porous Backfill
518.06 Prefabricated Geocomposite Drain (PGD)
518.07 Pipe
518.08 Scuppers
518.09 Excavation
518.10 Method of Measurement
518.11 Basis of Payment

518.01 Description. This work consists of constructing drainage systems.

518.02 Fabrication. Fabricate scuppers according to Item 513. Select a fabricator that is at least pre-qualified at level SF. The Department will base final acceptance of all fabricated members on the Engineer's approval that the fabricated items can be successfully incorporated into the structures. Submit mill test reports for structural steel, steel castings, bronze, and sheet lead certified according to 501.06.

518.03 Materials. Furnish materials conforming to:

Scuppers, structural steel and cast steel.....513
Metal pipe 707
Plastic pipe 707.33, 707.45
Other metals 711
Prefabricated Geocomposite Drain (PGD).....712.16
Geotextile fabric, Type A.....712.09
Reinforced thermosetting resin pipe… 707.80

Furnish pipe specials of a grade at least as high as the type of pipe specified.

Furnish porous backfill consisting of gravel, stone, or air-cooled blast furnace slag, with a No. 57 size gradation according to Table 703.01-1. The sodium sulfate soundness loss shall not exceed 15 percent.

Furnish ACBFS conforming to Supplement 1027.

518.04 General. As shown on the plans, connect all parts to new or existing sewers or other outlets.

When installing to superstructure, take into account the deflection of spans under full dead load.

518.05 Porous Backfill. Place porous backfill as shown on the plans. When not shown on the plans, place backfill at least 2 feet (0.6m) thick behind the full length of abutments, wing walls, and retaining walls. Measure the thickness of porous backfill normal to the abutment or wall face. The Contractor may leave undisturbed rock or shale within 18 inches (0.5 m) of the abutment or wall. Place 2 ft^3 (0.23 m^3) of bagged No. 3 aggregate at each weep hole to retain the porous backfill. Place the porous backfill for the full width of the trench and extend it to the bottom of the approach slab or base, as shown in the plans. Place porous backfill in loose lifts not to exceed 12 inches. Run a plate compactor or tamper over the top of each lift for consolidation of approximately 85% of original layer thickness. If placed in loose lifts greater than 12 inches, flood the porous backfill at the appropriate moisture content for consolidation of approximately 85% of original layer thickness.

518.06 Prefabricated Geocomposite Drain (PGD) Do not use PGD on Integral Abutments or above the beam seat elevation on Semi Integral Abutments.

A. Preparation. Prepare the surface of the wall or abutment, on which the PGD is to be placed, to be free of soil, debris, and excessive irregularities that prevent continuous contact between the wall surface and the PGD.

B. Placement. Place PGD strips to provide continuous coverage over the face of the wall. Unroll PGD directly onto the prepared surface. Do not drag the PGD across the ground. Tension the PGD to remove any creases or wrinkles. Do not expose PGD to weather or direct sunlight for longer than 5 days. Place the geotextile fabric side to face toward the backfill or retained soil.

Construct the PGD in horizontal or vertical courses. Place the PGD in direct contact with the wall and secure to the surface using either adhesives per manufactures recommendation or nails as follows. Secure with 2 inch (51 mm) or longer concrete nails along with washers or wood battens of not less than 9 square inches (5887 square mm). Space the concrete nails no more than 3 feet (0.9 m) apart, both horizontally and vertically. Use at least one horizontal row of nails in each horizontal course of PGD, or use at least one vertical column of nails in each vertical course of PGD. Do not affect the drainage area and the downward flow in the drain by the adhesive or fasteners.

C. Splicing and covering. Form horizontal or vertical seams between courses by utilizing the flap of geotextile extending from one course and lapping over the flap on that of the next course. Securely fasten the overlapped flaps with a continuous strip of 3 inch (76 mm) wide, waterproof, plastic tape.

Where splices are necessary without a geotextile flap, place and center a 12 inch (0.3 m) wide continuous strip of geotextile over the seam and fasten with continuous strips of 3 inch (76 mm) wide, waterproof, plastic tape.

As an alternative method of splicing, either horizontally or vertically, rolls of PGD may be joined together by turning back the geotextile flap at the roll edges and interlocking the drainage core approximately two inches. Fold the flap under and tape it beyond the seam with 3 inch (76 mm) wide, waterproof, plastic tape. Shingle lap the core and fabric in the direction of water flow.

To prevent soil intrusion, cover all exposed edges of the PGD core by tucking the geotextile flap over and behind the core edge. Alternatively, a 12 inch (0.3 m) wide strip of geotextile may be used to wrap the edge, taping it to the geotextile side 8 inches (203 mm) in from the edge with a continuous strip of 3 inch (76 mm) wide, waterproof, plastic tape and folding the remaining 4 inches (102 mm) over and behind the core edge. Caps (bottom, top, or end) provided by the manufactures can also be used according to manufacturer's instructions.

Construct all seams, splices, and caps to prevent the backfill material from entering the PGD.

D. Connecting to Weep Holes and Drainage System. Connect the PGD to the drainage system as shown on the plans or per manufacturer's recommendations if not shown in the plans. Maintain a positive outlet for the water in the PGD at all locations.

Do not seal, block or restrict weep holes with the PGD. If available, use weep hole fittings provided by the manufacturer and installed to the manufacturer's instructions. If the PGD core is not perforated at the weep hole location, make a hole in the PGD core matching the diameter of the weep hole or larger to accommodate the pipe or fitting. When making holes in the core, do not damage the geotextile fabric.

Use manufacturer provided outlet fittings that transition between the PGD and the outlet pipe, and prevent material from entering the outlet pipe. If manufacturer fittings are not available, provide smooth-lined or corrugated outlet fittings according to manufacturer's recommendations. Fasten and seal outlet fittings to the wall drains according to manufacturer's recommendations.

E. Repair. Patch or replace damaged PGD. Remove the damaged area and place a PGD patch and splice the edges according to 518.06.C. If the damaged portion is larger than 50 percent of the PGD roll width, cut across the entire width of the roll to remove the damaged portion and splice according to 518.06.C.

If damage is limited to tears in the geotextile fabric, place a geotextile patch extending 6 inches (152 mm) beyond the damaged area in all directions or to the edge of the roll, and seal the entire perimeter with 3-inch (76 mm) wide, waterproof, plastic tape.

Replace and repair damaged PGD at no additional expense to the Department.

F. Backfilling. Replace or repair any PGD component that is damaged during the backfilling operation. Use hand operated compaction equipment to compact the backfill within 1-foot (0.3m) of the PGD.

518.07 Pipe. For drain pipe leading down from the superstructure, use either galvanized steel pipe, 748.06, or plastic pipe, 707.45, or reinforced thermosetting resin pipe, 707.80. Provide specials, elbows, tees, wyes, and other fittings essential for a complete and satisfactory installation of the same material and quality as the pipe. Construct watertight joints of adequate strength. In steel pipe, weld joints or use clamp-type couplings having a ring gasket. In plastic pipe, make joints according to the applicable ASTM standard. In reinforced thermosetting resin pipe, make joints according to manufacturer guidelines and procedures. Securely fasten the pipe to the structure with hanger or clamp assemblies that are galvanized according to 711.02.

Place subsurface pipe as shown in the plans. If the plans require drainage pipe in the porous backfill, provide plastic pipe conforming to 707.33.

For corrugated metal pipe, perforated specials are not required and the Contractor may make bends with adjustable elbows conforming to the thickness requirements of the pipe specifications.

518.08 Scuppers. Construct secure and watertight connections, including the connections to adjacent concrete. Provide castings, true to form and dimension. Weld the joints of structural steel scuppers. Galvanize scuppers according to 711.02.

518.09 Excavation. Excavate all material encountered to the dimensions necessary to provide ample space at least to install pipe or other drainage facility behind abutments and for outlets.

518.10 Method of Measurement. The Department will measure Porous Backfill and Porous Backfill with Geotextile Fabric, by the number of Square Yards (Square Meters), Cubic Yards (Cubic Meters) or lump sum. The Department will measure Prefabricated Geocomposite Drain by the number of Square Yards (Square Meters) or lump sum. The Department will measure pipe specials by the same method as the pipe. If pipe is by the foot (meter), the Department will measure the pipe along its centerline.

The Department will measure all Square Yard (Square Meters) items as the area of the abutment or wall being covered for drainage.

518.11 Basis of Payment. The cost to backfill, if not separately itemized in the Contract, and excavation is incidental to the drainage facility that necessitates them.

The Department will include bagged aggregate with porous backfill for payment.

The Department considers all items to place the Prefabricated Geocomposite Drain including surface preparation, tape, fasteners, adhesives, outlet fittings or other support material, incidental to the Prefabricated Geocomposite Drain.

The Department will pay for perforated and non-perforated pipes for the Prefabricated Geocomposite Drain as separate pay items per 518.07.

The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
518	Cubic Yard (Cubic Meter) Square Yard (Square Meter) or Lump Sum	Porous Backfill
518	Cubic Yard (Cubic Meter) Square Yard (Square Meter) or Lump Sum	Porous Backfill with Geotextile Fabric
518	Square Yard (Square Meter) or Lump Sum	Prefabricated Geocomposite Drain
518	Foot (Meter)	____inch (____mm) ____Pipe, Including Specials
518	Each	Scuppers, Including Supports
518	Pound or Foot (Kilogram or Meter)	Trough Horizontal Conductors
518	Pound or Foot (Kilogram or Meter)	Pipe Horizontal Conductors
518	Foot (Meter)	____inch (____mm) Pipe Downspout Including Specials

519.04

On Page 441 **Replace** the second sentence of the last paragraph with the following:

Thoroughly clean the surface of the area to be patched and all exposed reinforcing steel of all dirt, dust, all loose rust or other foreign materials with water, air under pressure, or any other method that produces satisfactory results.

520

On Page 442 **Replace** the entire section with the following:

ITEM 520 PNEUMATICALLY PLACED CONCRETE- SHOTCRETE

520.01 Description
520.02 Materials
520.03 Shotcrete Mix Design.
520.04 Delivery of Materials.
520.05 Storage of Materials.
520.06 Equipment.
520.07 Submittal Requirements.
520.08 Removal of Concrete.
520.09 Reinforcement.
520.10 Blast Cleaning of Repair Area.
520.11 Preconstruction Testing.
520.12 Shotcrete Placing.
520.13 Curing.
520.14 Inspection and Testing

520.15 Method of Measurement
520.16 Basis of Payment

520.01 Description. This work consists of removing all loose and disintegrated concrete; surface preparation; furnishing and placing reinforcing steel, welded steel wire fabric, and dowels; furnishing and placing pneumatically applied concrete; and curing for new work, rehabilitation, or repair.

520.02 Materials. Furnish materials conforming to:

Reinforcing steel..... 509
Portland cement ..... 701.01 through 701.05, 701.09
Micro-silica..... 701.10
Fly ash 701.13
Slag Cement… 701.11
Fine aggregate 703.02, 703.03
Air-entraining admixture 705.10
Chemical admixture for concrete..... 705.12
Welded steel wire fabric.....709.10 or 709.12
Swedged anchor bolts 711.10

Use water for concrete mixing free from sewage, oil, acid, strong alkalis, vegetable matter, clay, and loam. Potable water is satisfactory for use in concrete. Non-potable water will meet the requirements of ASTM C 1602. Water from a reclaiming system will contain no more than 0.06% chlorides. Test the non-potable and reclaiming system water prior to the start of shotcrete production. Provide certified test data to the Engineer, at least 21 days prior to shotcrete production.

520.03 Shotcrete Mix Design. Only use mix designs accepted by the Department and the following requirements.

A. Provide a Shotcrete job mix conforming to the following:

1. Compressive strength. Provide a compressive strength, at a minimum, of 2000 psi at 3 days, and 4000 psi at 7 days, or as per plan requirements.

2. Migrating Corrosion Inhibitors. Each admixture shall be accompanied by manufacturer's written certification meeting ASTM C 1582. Dosage rate will follow manufacturer's recommendations.

3. ~~Corrosion Inhibitor grease. Use corrosion inhibitor (grease) conforming to the following:~~

~~3.1.1. Drop point 300 ºF (149 ºC) minimum by ASTM D 566.~~

~~3.1.2. Flash point 300 ºF (149 ºC) minimum by ASTM D 92.~~

~~3.1.3. Water content 0.1% maximum by ASTM D 95.~~

~~3.1.4. Rust test – Rust Grade 7 or better after 720 hours, aggressive conditions: Rust Grade 7 or better after 1000 hours by ASTM B 117 and ASTM D 610.~~

~~3.1.5. Water soluble ions.~~

~~Chlorides 10 ppm maximum by ASTM D 512~~

~~Nitrates 10 ppm maximum by ASTM D 3867~~

~~Sulfates 10 ppm maximum by APHA 427D (15th ED)~~

~~3.1.6. Oil separation – 0.5% by weight maximum at 160 ºF (71 ºC) by FIMS 719B, Method 321.2.~~

~~3.1.7. Soak test – 5% Salt Fog at 100 ºF (38 ºC), 5 mils (0.13 mm) (Q Panel Type S), immerse panels in 50% salt solution and expose to 5% Salt Fog – no emulsification after 720 hours by ASTM B 117 Modified.~~

B. Provide prepackaged shotcrete materials in accordance with ASTM C 1480 from a single manufacturer. The minimum compressive strength for shotcrete is 2000 psi at 3 days and minimum of 4000 psi at 28 days. Follow the manufacturer's recommendations for storing the material on site, do not allow the prepackaged materials to become wet prior to use. Submit certified test data to the Engineer for approval prior to use that and meets the requirement of Table 520.3.B-1.

Table 520.3.B-1, SHOTCRETE CONCRETE PROPERTIES

Hardened Properties	Test Method	Requirement
Slant Shear Bond Strength @ 28 days	ASTM C 882 Modified (1)	2000 psi (14 MPa), min.
Drying Shrinkage @ 28 days	ASTM C 157 Modified (2)	0.08%, max.
Rapid Chloride Permeability @ 28 days	ASTM C 1202 (3) / AASHTO T 277(3)	750 coulombs, max.
Volume of Permeable Voids @ 28 days	ASTM C 642(3)	10%, max.
Freeze-Thaw Resistance @ 300 cycles	ASTM C 666, Procedure A	95% RDM, min.
Flexural Strength @ 28 day	ASTM C 78	900 psi (6 MPa), min.
Compressive Strength @ 3 days	ASTM C 1604	2000 psi (14 MPa), min.
Compressive Strength @ 28 days	ASTM C 1604	4000 psi (28 MPa), min.

(1) No epoxy bonding agent used.
(2) ICRI Guideline No. 03733, "A Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces", 1"x1"x10" prism, air cured
(3) Either Rapid Chloride Permeability or Volume of Permeable Voids can be used.

Provide dry mix with migrating corrosion inhibitors. Each admixture shall be accompanied by manufacturer's written certification meeting ASTM C 1582. Dosage rate will follow manufacturer's recommendations.

520.04 Delivery of Materials. Deliver all materials in their original containers bearing the manufacturer's label, specifying date of manufacturing, batch number, trade name, and quantity. Each shipment will be accompanied by a Safety Data Sheet (SDS).

520.05 Storage of Materials. Stock and store any material necessary to perform the work to prevent damage by the elements. Keep the storage space clean and dry per Manufacturer's recommendations

520.06 Equipment. Provide shotcrete equipment capable of delivering the premixed material accurately, uniformly and continuously through the delivery hose.

A. Mixing: Provide dry-mix shotcrete using a rotary type or pressure vessel gun with a continuous-type predampener, capable of thoroughly mixing the shotcrete mixes in sufficient quantity to maintain shotcreting continuity and a moisture range of 3 to 5% prior to discharging into the gun. Operate all equipment in accordance with the manufacturer's recommendations.

Provide wet-mix shotcrete using a positive displacement pump (swing tube). Concrete for wet-mix shotcrete placement may be supplied by an approved concrete batch plant and delivered by truck concrete mixers. Supply plant batched concrete and delivery equipment meeting the requirements of ASTM C 94. Where the concrete mixture is prepared on-site, use mixing equipment with a calibrated water meter capable of mixing prepackaged shotcrete material. Supply concrete mixes used in shotcrete placement having a W/Cm ratio between 0.35-0.45. The maximum 90-minute limit will be implemented for wet-mix shotcrete after the addition of water to the mixture. Use of hydration control admixtures (HCA) may be used to extend the 90 minutes as approved in the job mix approval prior to use.

B. Air Pressure, Dry-Mix Process. Use a compressor ~~or blower~~ capable of delivering a sufficient volume of oil-free air at the pressure shown in Table 520.6.B-1. Maintain steady pressure throughout the placing process.

Use a water pump or a water booster pump with the size and capacity to deliver water to the nozzle with a pressure at least 15 psi more than the required air pressure.

The values shown in the Table 520.6.B-1 are based on a hose length of 150 feet with the nozzle less than 25 feet above the delivery equipment. Increase operating pressure approximately 5 psi for each additional 50 feet of hose and approximately 5 psi for each 25 feet the nozzle is raised.

TABLE 520.6.B-1, COMPRESSOR CAPACITIES

Compressor Capacity, CFM	**Hose Diameter, in.**	**Maximum Size of Nozzle Tip,** in.	**Operating Air Pressure Available, psi**
250	1	3/4	40
315	1-1/4	1	45
365	1-1/2	1-1/4	55
500	1-5/8	1-1/2	65
600	1-3/4	1-5/8	75
750	2	1-3/4	85

C. Air Pressure, Wet-Mix Process. Use a compressor ~~or blower~~ capable of delivering a sufficient volume of oil-free air to operate the pump at a line pressure between 100 psi and 300 psi. Use delivery hoses between 1-1/2 inches and 3 inches in diameter. Use mixing equipment capable of thoroughly mixing the materials in sufficient quantity to maintain continuous placement.

520.07 Submittal Requirements. Submit to the Engineer for review at least two weeks before beginning the work.

A. Evidence the contractor has successfully executed no less than five projects with similar size and scope over the last five years. The information provided is to include a statement of the type of work, and contact information for Engineer or Owner who have knowledge of the execution of the work and present condition of the work.

B. Documentation and owner references, verifying the qualifications of the nozzlemen. Personnel designated as nozzlemen on the job are required to document a minimum of one year of experience in the application of shotcrete on a comparable project and hold a current certificate for ACI Shotcrete Nozzleman, either dry-mix process or wet-mix process, as corresponds to the process indicated. Certifications for all nozzlemen to be utilized on the job.

C. Documentation the supervisor has experience supervising more than one comparable project including written documentation and owner references, verifying the qualifications.

D. JMF information and a list of materials and quantities. Include list of Admixture literature used. Indicate the admixture type and the manufacturer's recommendations for mixing the admixtures with JMF.

E. Methods and materials used for Depth control quality measures.

520.08 Removal of Concrete. In areas to be repaired, remove all loose, soft, honeycombed, and disintegrated concrete, plus a minimum of 1/4 inch (6 mm) to a maximum of 1 inch (25 mm) depth of sound concrete. Remove additional concrete as necessary to permit the placement of the minimum specified shotcrete thickness of not less than 1-1/2 inches (38 mm), except on top horizontal surfaces of not less than 3/4 inch (19 mm). Once initial removals are made, undercut all exposed reinforcing bars. Undercutting will expose the full circumference of the exposed reinforcing bar. Provide a clearance of 3/4 inch (19 mm) between the exposed reinforcing bar and the surrounding concrete.

Remove all heavy corrosion and scale from the reinforcing bars with wire brush or abrasive blasting. A minor amount or tightly adhered rust may be left in place.

Saw cut edge locations to a minimum of 1/2 inch (13 mm). Maintain an edge location depth of not less than the specified minimum depth for all repair areas.

Only use pneumatic, hand tools, or hydrodemolition equipment to obtain results satisfactory to the Engineer in the removal of concrete and in preparing and shaping the areas to be repaired.

If working around reinforcing steel, avoid loosening the steel, or shattering the concrete around it, beyond the repair area.

520.09 Reinforcement. For existing reinforcing bar that have been cut or having lost 20% or greater section loss, splice in supplement reinforcing bar of equal bar size. Use mechanical rebar slicing system for supplemental reinforcing bars.

Place deformed wire fabric in all vertical surface areas where the thickness of the shotcrete patch is greater than1 1/2 inches (38 mm) or bottom side of horizontal surfaces. Repairs areas on the top of horizontal surfaces do not require deformed wire fabric. Reinforce patches with deformed wire fabric meeting either 2 x 2 inches (50 x 50 mm) with wire size number D 0.9 (MD 6), or 3 x 3 inches (75 x 75 mm) with wire size number D 1.4 (MD 9). Cover the entire area of the repair with deformed wire fabric, place the wire fabric no closer than ½ inch (13mm) to the prepared surface and not less than 1 inch (25 mm) from the finished surface. Overlap adjacent sheets of deformed wire fabric by 6 inches (150 mm), and securely tie them together. Carefully pre-bend fabric before installation to fit around corners and into re-entrant angles. Rolled wire fabric is prohibited. Wire fabric held in place by elastic force (spring-loaded) or by friction is prohibited.

The deformed wire fabric can be tied to the existing reinforcing bars if there is a 3/4 inch (19 mm) clearance around the bar. The maximum anchor spacing for the deformed wire fabric is 18 inches (46 cm) on center, in all horizontal for vertical surfaces and 12 inches (30 cm) in all horizontal for bottom vertical surfaces, overhead. A minimum of 3 anchors are required for each repair area. Unless specified on plans use 3/8 inch (10 mm) swedged anchor bolts. Embed anchors to manufactures recommendation to develop full capacity of swedge bolt. Use swedge bolt and nut to secure wire fabric.

520.10 Blast Cleaning of Repair Area. After performing 520.08 and 520.09, blast clean all surfaces to which shotcrete is to bond between 24 and 72 hours prior to placing of the shotcrete. All surfaces to which the concrete is to bond include exposed reinforcing steel, existing concrete, and the work face of any previously placed material. Blast clean all surfaces using high-pressure water blasting with or without abrasives in the water, abrasive blasting with containment, or vacuum abrasive blasting. High-pressure water washing requirements can be defined as a minimum pressure of 4000 psi (28 MPa) and flow of 5.0 gal/min (79 L/min). Maintain a standoff distance (the distance between the nozzle and the surface being cleaned) to a maximum of 12 in.

Bring the prepared substrate to saturated surface dry (SSD) with water meeting 520.02, ensure that all prepared substrate maintain a SSD prior to and during the shotcrete placement. The Engineer will approve the preparation and condition of all surfaces immediately before the application of the shotcrete.

520.11 Preconstruction Testing. Before placing any shotcrete on the project, each nozzleman will need to perform mock-up panels to be accepted by the Engineer. The purpose of the mock-up panel is to demonstrate the nozzleman's ability to place and finish shotcrete around the reinforcement. A nozzleman shall not perform any work on the structure until the Engineer accepts every mock-up panel.

Fabricate mock-up panels using the same personnel, equipment, materials and procedures that will be used on the project. Finish mock-up panels as required by plan, if no finish is required by plan, texture exposed surfaces according to 520.12.

Construct mock-up panels no less than 3 ft (0.9 m) square and a minimum of 4 inches (100 mm) deep. Mock-up panel depth will be adjusted if greater than 4 inches (100mm) to match the depth of application shown in the plans. Install reinforcement in the mock-up panel that matches the largest size and tightest spacing found for the reinforcement in the bridge. Orient the mock-up panel for a vertical surface application. If an overhead application is specified in the plan, perform an additional mock-up panel oriented for overhead application. Apply the shotcrete until panel is full and finish exposed surfaces. Age mock-up panels for at least 24 hours before cutting. Cut every mock-up panel in half, transverse to the main reinforcements. There shall be no voids with a maximum dimension greater than 0.25-inches adjacent to the reinforcement bars. If 0.25-inches or greater voids are found, an additional cut is to be performed to prove the debonding does not extend greater than 3-inches along the length of the reinforcement bar. The shotcrete in the mock-up panel shall not sag nor decrease the bond of the preceding coat for multiple layer application of shotcrete.

520.12 Shotcrete Placing. Place the shotcrete when the ambient temperature is between 50 °F and 90 °F. Do not place concrete against a surface containing frost, ice, standing water, or when the surface temperature is less than 40 °F. Protect the work from environmental conditions until final curing has been applied.

Do not place shotcrete during a rainfall event. Immediately cover previously placed shotcrete, not yet cured. Resume concrete placement after the rainfall stops.

Discontinue placement of shotcrete or shield the nozzle stream if wind causes separation of ingredients from the nozzle stream.

Apply the concrete using pneumatic equipment that sprays the mix onto the prepared surface. Minimize rebound and produce a compacted dense homogenous mass.

Use shooting strips or guide wires to ensure square corners, straight lines, and a plane surface of shotcrete, except as otherwise permitted by the plans or approved by the Engineer. Place shooting strips to keep the trapping of rebound at a minimum. At the end of each day's work, or similar stopping periods requiring construction joints, cut the work on a 45° angle through the full depth of the section, roughen the surface by stiff broom, racking or scoring for good surface bond when placing subsequent shotcrete layers. In shooting all surfaces, ensure that the stream of flowing material from the nozzle impinges as nearly as possible at right angles to the surface being covered, and hold the nozzle 2 to 4 feet (0.6 to 1.2 m) from the working surface.

Finish shotcrete repairs flush with the original masonry or concrete surface, except as noted for areas of exposed reinforcing steel. Do not initiate cutting or finishing until the shotcrete is sufficiently set. If not specified on plan, use rubber/sponge float to finish all exposed surfaces. On vertical and overhead surfaces, the layer thickness is to be establish and demonstrated during the preconstruction testing phase of the project. If a successive coat is applied on shotcrete that has set for more than 2 hours, clean and dampen the shotcrete surface as required in 520.05 for the prepared surface.

After shotcrete has been placed to the desired thickness, cut off all high spots with a sharp trowel, or screed them to a true plane as determined by shooting strips or by the original masonry surface, or as directed. If using screeds, apply them lightly to all surfaces so as not to disturb the shotcrete for an appreciable depth, and work them in an upward direction when applied on vertical surfaces.

Shotcrete rebounded outside of the formwork is prohibited from being worked back into the surface and is not to be salvaged and included in later batches. Rebounded shotcrete is the responsibly of the Contractor for removal and disposal.

520.13 Curing. Cover the pneumatically placed shotcrete patches with burlap or cotton mats and keep them wet for 7 days after placing. If it is not practical to use mats, keep the surface wet by sprinkling for the same length of time. If the Engineer determines that the above curing procedures are impractical because of the inaccessibility of isolated repair areas, the Contractor may cure the final shotcrete surface according to 511.14, Method B, using twice the manufacturer's recommended coating rate for formed concrete surfaces (equal to a white sheet of typing paper) at the time of application. Protect all shotcrete against cold weather according to 511.12.

Do not use curing compounds on any surfaces against which additional shotcrete or other cementitious finishing materials are to be bonded unless positive measures, such as prepare surface per 520.10, are taken to completely remove curing compounds prior to application of such additional materials.

520.14 Inspection and Testing. At a minimum provide one test panel per nozzleman at the beginning of each day shotcreting occurs. The purpose of the test panel is to determine the compressive strength of all shotcrete placed after test panel per Table 520.3B-1. Fabricate test panel using the same personnel, equipment, materials and procedures that will be used on the project.

Construct a 24 inch x 24 inch x 3.5 inch (610mm x 610mm x 89mm) test panel with no reinforcement. Cure test panel in the same manner used for the structure. Follow ASTM C 1140 for panel size and coring, and compressive strength testing as per ASTM C 1604. Provide a minimum of six cores, test three cores per test age. Test the cores at an AASHTO Accredited laboratory for compressive strength**.**

After curing and before final acceptance, sound all patched areas. Remove and replace all unsound or cracked areas. In addition to sounding all patches, the Department will base acceptance of the shotcrete on compressive strength tests on cores taken from test panels.

Remove, replace, re-inspect, and re-test all defective patches, as determined by sounding, visible cracks, or unacceptable cores. Fill core holes according to 519.

Maintain the in-place inspection access equipment employed during the original work activities or provide alternate inspection equipment such as platform lifts, bucket trucks, snooper trucks, or equivalent as approved by the Engineer for testing.

520.15 Method of Measurement. The Department will measure Pneumatically Placed Shotcrete by the number of square feet (square meters). The Department will measure the area of exposed surfaces of all completed, tested, and approved patches, irrespective of depth or thickness of the patch. If a patch includes corners or edges of such members as beams, columns, or curbs, the Department will include all the exposed surfaces; if a patch extends completely through a member or a slab, the Department will include both exposed surfaces.

The Contractor is responsible for all test panels, coring repair of core holes, independent laboratory testing of the cores, replacement of rejected areas, and all previously mentioned work under Pneumatically Placed Shotcrete for payment.

520.16 Basis of Payment. The Department will not pay for additional reinforcement to replace that damaged by the Contractor's operations.

The Department will not pay for removing, replacing, and re-inspecting of defective patched shotcrete as determined by sounding, visible cracks, or unacceptable cores.

The Department will pay for accepted quantities at the contract price as follows:

TABLE 520.16-1 SHOTCRETE 28 DAY COMPRESSIVE STRENGTH PAY FACTOR

Compressive Strength (psi)	Pay Factor (%)
>4000	100
3999 –3700	90
3699 – 3520	75
<3520	Remove and Replace

Item	Unit	Description
520	Square Foot (Square Meter)	Pneumatically Placed Concrete Shotcrete

523.02

On page 451, **Replace** the first and second paragraphs with the following:

523.02 General. Perform dynamic tests on ~~a minimum of~~ two successfully tested piles. A successfully tested pile is one that provides adequate data to provide pile driving criteria as described

in 523.04. Test the first two piles driven for each pile size and UBV combination defined in the Plans; the two piles tested should be the two piles furthest apart within the same substructure unit and phase. Perform signal matching analysis of the dynamic test data on at least one of the two test piles. Perform the test according to ASTM D 4945 to determine driving requirements to achieve the required ultimate bearing values for the piles to be installed in the structure.

Perform restrike tests after piles have been driven and a minimum time specified in the plans has elapsed. When performing a restrike, warm the hammer before restriking the pile by applying at least 20 blows to another pile. Each restrike consists of performing dynamic testing on two piles and performing a signal matching analysis on one of the two piles tested. Test the same two piles as were tested for the dynamic load test item.

601.02

On page 464, **Replace** the first paragraph of the page with the following:

Ensure tied concrete block mats and articulating concrete block revetment systems are held together by galvanized steel wire, HDPE mesh, polypropylene mesh, or stainless steel wire.

601.12

On page 467, **Replace** the section with the following:

601.12 Tied Concrete Block Mat. When specified, use Tied Concrete Block Mat with Type ____ Underlayment conforming to 712.12 as shown on the plans. ~~Place directly on the Geotextile Fabric.~~ Install per the manufacturer's recommendation.

~~**601.15**~~

~~On page 468, **Replace** the Dumped Rock Fill, Type__pay item description with the following: Tied Concrete Block Mat with Type__Underlayment~~

601.15

On page 468, **Replace** the Tied Concrete Block Mat, Type__pay item description with the following: Tied Concrete Block Mat with Type___Underlayment

602.03.E.

On page 470, **Delete** the entire section.

605.01

On page 475, **Replace** the entire first paragraph with the following:

605.01 Description. This work consists of ~~constructing~~ excavating, installing, and backfilling unclassified pipe underdrains, shallow pipe underdrains, deep pipe underdrains, base pipe underdrains, or rock cut underdrains with or without a Geotextile Fabric, construction underdrains, prefabricated edge underdrains and aggregate drains.

605.02

On page 476, **Replace** the first paragraph of 605.02 with the following:

Backfill unclassified pipe underdrains, shallow pipe underdrains, deep pipe underdrains, base pipe underdrains, ~~or~~ rock cut underdrains, with or without a Geotextile Fabric, construction underdrains and aggregate drains with granular material consisting of ACBFS, limestone, or gravel. Furnish granular material meeting Size Nos. 8, 9, or 89. Gradations may be modified in accordance with Supplement 1069.11.C. Use granular material with a maximum sodium sulfate soundness loss of 15 percent.

605.07

On page 478, **Replace** the entire section with the following:

605.07 Aggregate Drains. Construct the aggregate drains after the completion of granular pavement courses.

A. Spacing. Space aggregate drains at 50 foot (15 m) intervals on each side of normal crowned sections, staggered so that each drain is 25 feet (7.5 m) from the adjacent drain on the opposite side, and at 25 foot (7.5 m) intervals on the low side only of superelevated sections. For rigid pavements, adjust the spacing to match the end of a transverse joint. Construct an aggregate drain on both sides of the low point of each sag vertical curve or the low side only in superelevated sections.

B. Excavation. Excavate trenches for aggregate drains to a minimum width of 12 inches (0.3 m) and to the depth shown on the plans. Slope the bottom of the trench to drain and keep it free from loose particles of soil. Excavate the trench to furnish a clean exposure of the granular pavement courses.

C. Placing and Backfilling. Use granular material for the drains. Place the aggregate to a minimum depth of 8 inches (200 mm) above the bottom of the trench. The remaining depth of the trench backfill with suitable embankment material according to Item 203.

606.02

On page 480, **Replace** the third paragraph with the following:

When using round wooden posts, construct type MGS using posts 69 in (1.75 m) in length.

606.06

On page 481, **Add** the following paragraph after the fourth paragraph:

Cover the face of the impact head with solid fluorescent yellow Type G reflective sheeting conforming to 730.19.

608.03.E.

On Page 486, **Delete** the last two sentences of paragraph E.

~~After the minimum curing period and a 30 day drying time apply an approved non-epoxy sealer (705.23.B) according to Item 512. Ensure any remaining curing compounds that are incompatible with the selected sealer and all foreign materials are removed prior to sealer treatment.~~

609.06.E.

On Page 491, **Delete** the last two sentences of paragraph E.

~~After the minimum curing period and a 30 day drying time apply an approved non-epoxy sealer (705.23.B) according to Item 512. Ensure any remaining curing compounds that are incompatible with the selected sealer and all foreign materials are removed prior to sealer treatment.~~

610

Starting on page 492, **Delete** the entire section.

611.02

On page 496, **Replace** the entire first paragraph with the following:

611.02 Materials. Furnish conduit material of the specified conduit type and conduit size or one size larger with the approval of the Engineer. Conduit shown in the plans is designed for hydraulic capacity and the Material Durability Design. Provide conduit materials with Bedding and Structural Backfill materials that meet the structural design requirements of Supplement 1086 for each conduit run. Provide drainage structure materials with Bedding and Structural Backfill materials that will

perform structurally for each location. Provide material descriptions and installation procedure details in the Installation Plans. Different conduit and drainage structure materials and the associated Bedding and Backfill may require varying installation procedures. If the conduit material is not specified in the plans, all material for that type of conduit will meet the Material Durability Design.

611.02.A.

On page 496, **Delete** the following material under section A. Type A Conduit – Culverts:

~~Vitrified clay pipe (extra strength only)~~.....~~706.08~~

611.02.A.

On page 497, Under section A. Type A Conduit – Culverts, Replace the material name "Polypropylene Corrugated Double Wall Pipe……707.65" with the following:

Corrugated Polypropylene Smooth Lined Pipe….....707.65

611.02.A.

On page 497, **Delete** the following material under section A. Type A Conduit – Culverts:

~~Polypropylene Corrugated Triple Wall Pipe…~~.....~~707.69~~

611.02.B

On page 497, **Delete** the following:

~~Corrugated steel spiral rib pipe…~~ .....~~707.12~~

611.02.B

On page 497, **Add** the following after the fifth item on the list:

Polymer-precoated corrugated steel spiral rib pipe.....707.11

611.02.B.

On page 497, Under section B. Type B Conduit – Storm or sanitary sewers under pavement,

Replace the material name "Polypropylene Corrugated Double Wall Pipe… ... 707.65" with the following:

Corrugated Polypropylene Smooth Lined Pipe…..... 707.65

611.02.B.

On page 497, **Delete** the following material

~~Polypropylene Corrugated Triple Wall Pipe…~~..... ~~707.69~~

611.02.C

On page 498, **Delete** the following:

~~Corrugated steel spiral rib pipe…~~ .....~~707.12~~

611.02.C

On page 498, **Add** the following after the fifth item on the list:

Polymer-precoated corrugated steel spiral rib pipe.....707.11

611.02.C.

On page 498, **Replace** the material name "Vitrified clay pipe… ... 706.08" with the following:

Vitrified clay pipe (extra strength only)..... 706.08

611.02.C.

On page 498, **Replace** the material name "Polypropylene Corrugated Double Wall Pipe……707.65" with the following:

Corrugated Polypropylene Smooth Lined Pipe….....707.65

611.02.C.

On page 498, **Delete** the following material:

~~Polypropylene Corrugated Triple Wall Pipe…~~.....~~707.69~~

611.02.D.

On page 498, **Delete** the following material:

~~Vitrified clay pipe (extra strength only)~~..... ~~706.08~~

611.02.D.

On page 499, **Delete** the following material:

~~Polypropylene corrugated single wall pipe…~~ ..... ~~707.62~~

611.02.E.

On page 499, **Replace** the material name "Vitrified clay pipe……706.08" with the following:

Vitrified clay pipe (extra strength only)..... 706.08

611.03

On page 501, **Add** the following to the seventh paragraph between the "707.07" and "707.12" material references:

, 707.11

611.03

On page 501, **Delete** the following definition:

~~**Design Service Life.** The average usable life of a conduit or structure.~~

611.03

On page 502, **Add** the following definition, after the definition "Lay Length":

Material Durability Design. Empirical design method used to ensure a 75-year average service life due to conduit material degradation caused by water chemistry and suspended material abrasion.

611.03

On page 502, **Delete** the second sentence in the sixth paragraph (Span):

~~Multiple cell openings are considered one span if the clear distance between the openings is less than half of the smaller contiguous opening.~~

611.04.A.

On pages 502, **Replace** the entire section with the following:

A. Shop Drawings. Prepare and submit shop drawings for C&MS items 706.05, 706.051, 706.052, 706.053, and "Special Design" 706.02 and as required below. Submit calculations for C&MS items 706.051, 706.052, 706.053 and all conduit materials as required below. Have competent individuals prepare and check the shop drawings and required calculations. Provide a cover sheet containing the preparer(s) and checker(s): First Name, Last Name, Initials and Content Responsibility. Preparer(s) and checker(s) shall initial each sheet for their content responsibility. The preparer(s) and checker(s) shall not

be the same individual. Have an Ohio Registered Engineer review, approve, sign, seal and date the shop drawing cover sheet or submittal letter and hydraulic calculations according to ORC 4733 and OAC 4733-35.

1. Submit load rating report in accordance to the most current version of ODOT's Bridge Design Manual along with one copy of the shop drawings and one copy of the calculations to the Office of Structural Engineering for all structures with a 10 foot or larger span. Submit an additional copy of the shop drawings and calculations to the Engineer.

2. If Reinforced Concrete Circular Pipe 706.02, requires a special structural design with a specified D-load requirement other than Tables 706.02-1 through 706.02-4, submit special structural design calculations. Design the pipe to meet the D-load requirements. Include the following information in the submittal: all structural design and loading information, all material specifications, all dimensions, and the installation plan.

3. Submittals for Precast reinforced concrete 3-sided flat topped culverts, precast reinforced concrete arch sections, or precast reinforced concrete round sections, (706.051, 706.052, or 706.053) shall include structural analysis methods, structural design criteria and calculations, structure details, and shop drawings. Include details for a precast slab bottom if required.

4. To substitute a precast reinforced concrete 3-sided flat topped culvert (706.051), a reinforced concrete arch section (706.052), or a precast reinforced concrete round section (706.053) for one another, the submittal shall include hydraulic calculations. The proposed culvert shall meet or exceed the same hydraulic requirements as the specified culvert and minimum cover requirements. If the specified culvert is on pedestal walls, include the shop drawings for the pedestal wall design in the submittal because 3-sided flat topped culverts, arch culverts, and round sections require different pedestal wall designs.

5. To substitute either a precast reinforced concrete 3-sided flat topped culvert, a precast reinforced concrete arch section, or a precast reinforced concrete round section (706.051, 706.052, or 706.053) placed on a precast or cast-in-place slab bottom for a precast reinforced concrete box culvert (706.05), the submittal shall include hydraulic calculations. The proposed culvert shall meet or exceed the same hydraulic requirements as the specified box culvert and minimum cover requirements. The Department may allow the bottom slab to be cast-in-place but will not issue a time extension for any delays resulting from the use of a cast-in-place bottom slab.

Department approval of shop drawings and calculations is not required.

611.04.B.

On pages 503, **Replace** the entire section with the following:

B. Installation Plan. Submit a written installation plan to the Engineer for installing all conduit and drainage structures for review and acceptance.

Submit the installation plan at least 15 days before any conduit or drainage structure work begins.

Do not perform work without an accepted installation plan.

Include the following required information for each conduit run:

1. Completed CA-P-1A Conduit Installation Plan Form dated 07-16-21.
2. Trench and excavation cross-sections with dimensions.
3. Bedding and Backfill material types with compaction density or compacted depth.
4. Plan and allowed buried height of cover.
5. Other installation details as necessary.
6. Provide written confirmation from the conduit manufacturer that the conduit material with the Bedding and Backfill types and compaction as described in the CA-P-1A Installation Plan Form will

perform structurally for the location. This confirmation by the conduit manufacturer will not relieve the Contractor of the responsibility for obtaining the required results.

Include the following required information for each drainage structure:

1. Completed CA-P-3A Drainage Structure Installation Plan Form dated 07-16-21.
2. Trench and excavation cross-sections with dimensions.
3. Bedding and Backfill material types with compaction density or compacted depth.
4. Other installation details as necessary.

Submit any deviations from the installation plan prior to commencing with the Work. Resubmit all installation plan revisions and applicable special structural design calculations to the Engineer within 14 days of the change with the conduit manufacturer's written confirmation as described above. Do not perform conduit or drainage structure Work without an updated, manufacturer signed and accepted installation plan.

For structural plate and metal pipe arch conduit with a span of 57 inches (1440 mm) or larger, ensure the manufacturer provides match-marked ends on the conduit. Include a layout drawing in the installation plan.

For metal conduit with two structural plate thicknesses specified, identify the location of the thicker plates. For precast concrete 3-sided flat and arch topped structures (706.051 and 706.052) provide a 3 inch (75 mm) deep keyway centered on the leg and at least 6 inches (150 mm) wider than the thickness of the leg at the bottom. For precast concrete round sections (706.053) provide an 8 inch (200 mm) deep keyway for spans up to 24 feet (7.3 m) and a 10 inch (254 mm) deep keyway for spans greater than 24 feet, (7.3 m). Center the keyway on the precast arch base. The width of the keyway must be 8 inches (200 mm) greater than the thickness of the precast arch base. For non-vertical leg arches set on pedestal walls, a one sided keyway is acceptable if the required pedestal wall design thickness is not sufficient for a full keyway.

611.04.C.

On pages 504, **Replace** the first sentence of the section with the following:

Perform work so that it can be verified by the Contractor's representative performing the inspection.

611.04.C.

On pages 504, **Add** the following sentence after the first sentence of the section:

Notify the Engineer in writing at least 14 days prior to beginning the work.

611.05

On page 505, **Replace** the third paragraph with the following:

Provide a firm bed for the full width and length of the trench for conduits and drainage structures. Remove any unsuitable material exposed in the bed for the width of the trench and a depth of at least 6 inches (150 mm). Replace the unsuitable material with structural backfill, Type 1 or 2. Remove any rock or shale exposed in the bed to a depth of at least 6 inches (150 mm). Replace the rock or shale with Structural Backfill, Type 1 or 2. The Department will pay for this work according to 109.05, unless otherwise noted in the Contract Documents. If the Engineer changes the flow line by more than one foot (0.3 m), the Department will pay according to 109.05, unless otherwise noted in the Contract Documents.

611.06

On page 506, **Replace** the third paragraph with the following:

Vibrate, tamp or compact each Bedding and Backfill lift. Perform compaction density testing of Bedding and Backfill according to Supplement 1015. If Structural Backfill Type 3 or open graded material is used, place the aggregate in lifts not to exceed 12-inches. Measure the Structural Backfill Type 3 compacted lift to ensure consolidation is 85 percent or more of the original lift thickness.

Final Backfill shall meet or exceed the requirements of 203.

611.08A.3.

On page 508, **Replace** the misspelled word "coorugated" with the following:

corrugated

611.08.B.3.a

On page 509, **Replace** the second sentence in the fifth paragraph with the following:

Next, cover all exterior joints with a 12 inch (300 mm) wide strip of joint wrap in accordance with the joint wrap manufacturer's recommendation.

611.11

On page 512, **Add** the following sentence to the beginning of the fourth paragraph of the section:

For all aluminum conduits, prior to placing concrete, coat the area to be paved with a zinc chromate primer or an epoxy paint formulated for applying to aluminum. Extend primer or epoxy 4 inches beyond the proposed paving limits.

611.11

On page 512, **Replace** the first sentence of the fifth paragraph with the following:

Construct paving so that it is 3 inches (75 mm) thick measured from the top of the corrugations of the conduit to a height equal to 1/3 of the Conduit Rise.

611.12 Performance Inspection

On page 515, **Add** the following to TABLE 611.12.B:

TABLE 611.12.B

Conduit Type	Measurement Equipment	Type of Measurement
Rigid conduit and 748.06, steel casing pipe	Crawler mounted camera according to SS902.01with crack measuring capabilities according to SS902.02 C	Joint gaps Crack widths
Plastic conduit, 707.12, corrugated steel spiral rib conduit, 707.24, corrugated aluminum spiral rib conduit, 748.01, ductile iron pipe, and Circular corrugated metal conduit not listed below	Crawler mounted camera with laser profiler according to SS902.02 A, B, and C or Mandrel according to SS902.03 and Crawler mounted camera according to SS902.01 with crack measuring capabilities according to SS902.02 C	Joint gaps Crack widths Deflection
The following types of corrugated metal conduit: 707.04, precoated, galvanized steel culverts 707.05 and 707.07, bituminous coated corrugated steel pipe with paved invert, 707.11 Polymer-precoated corrugated steel spiral rib pipe 707.13 and 707.14, bituminous lined corrugated steel pipe	Crawler mounted camera with laser profiler according to SS902.02 A, B, and C	Joint gaps Crack widths Deflection

611.13

On page 515, **Replace** the first paragraph with the following:

611.13 Conduit Evaluation. Have an independent Registered Engineer review the conduit Performance Inspection and provide a written documentation of whether defects listed in Table 611.13 are present or not. Record any other identified defects present in the conduit. Evaluate ~~all identified~~ the defects to ensure structural stability and hydraulic capacity are in conformance with the contract documents and as prescribed by AASHTO LRFD Bridge Construction Specifications, Section 26 for metal conduit, Section 27 for concrete conduit, and Section 30 for plastic conduit with modifications according to this specification. Provide written documentation of evaluations performed of all defects and any recommended repairs to the Engineer. The independent Registered Engineer cannot be an employee of the Contractor or the conduit manufacturer.

611.14

On page 517, **Replace** the entire first paragraph with the following:

611.14 Drainage Structure Evaluation. Have an independent Registered Engineer ~~review~~ evaluate the drainage structures and provide a written documentation of whether defects listed in Table 611.14 are present or not. Record any other identified defects present in the drainage structure. Evaluate all identified defects to ensure structural stability and hydraulic capacity are in conformance with the contract documents. Provide written documentation of evaluations performed of all defects and any recommended repairs to the Engineer. The independent Registered Engineer cannot be an employee of the Contractor or drainage structure manufacturer.

611.14

On page 517, **Add** the following rows to the end of Table 611.14:

Conduit connections are not fully grouted per 611.10
Conduits protrusions are present

614.03

On page 523, **Add** the following title to the beginning of the second paragraph:

A. Training and Responsible Person.

614.03

On Page 524, **Add** the following title to the beginning of the second paragraph:

B. Temporary Traffic Control Devices.

614.03

On Page 524, **Add** the following paragraph after the third paragraph:

For truck-mounted attenuators and trailer attenuators (TMAs) see 614.03.D.

614.03

On page 524, **Replace** the first sentence of the seventh full paragraph with the following:

Furnish traffic cones consisting of a highly visible orange predominant color with reboundable reflective sheeting complying with the requirements of 730.191 and in conformance with the OMUTCD.

614.03

On Page 525, **Add** the following paragraph after the first paragraph:

All temporary traffic control devices shall conform to the Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles.

614.03

On Page 525, **Add** the following title to the beginning of the second paragraph:

C. Conspicuity.

614.03

On Page 525, in the 7th paragraph **Replace** the following: "**A.** Apply one" with "1. Apply one".

614.03

On Page 525, in the 8th paragraph **Replace** the following: "**B.** Outline" with "2. Outline".

614.03

On Page 525, in the 9th paragraph **Replace** the following: "**C.** Outline" with "3. Outline".

614.03.C

On Page 526, **Replace** the second paragraph with the following:

Acceptable methods for delineating material supply vehicles are depicted in the Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles.

614.03

On Page 526, **Add** the following at the end of the subsection:

D. Truck-mounted or Trailer Attenuator (TMA). Furnish a TMA that is NCHRP-350 (manufactured prior to 1/1/20) or MASH TL-3 compliant. Do not use a TMA in place of the arrow board at the beginning of a merge taper, or as a substitute in locations where other positive protection methods are required (portable barrier/impact attenuators, tapering outside of the clear zone, etc.). Use of a TMA for a work area already otherwise protected by positive protection shall be at the Contractor's expense.

Furnish a TMA to protect each work area in the following situations:

1. When working on a multi-lane highway (45 mph and above) in a closed lane or shoulder without portable or permanent traffic barriers separating the work area from the traveled lanes.
2. Any situation on a multi-lane highway (45 mph and above) where a TMA is depicted or labeled as required or optional on a shadow vehicle in the OMUTCD.

Furnish a TMA for each work area if two or more localized work areas occur within the same stationary work zone and are separated by more than 700 feet.

Attach the TMA to the shadow vehicle in accordance with manufacturer specifications and place in advance of the work area according to recommended spacing in Table 614.03-1. Distances are considered as guidelines. However, engineering judgement should be used to alter distances to take into account traffic conditions, vehicle mix, sight distance, and other site-specific conditions.

Table 614.03-1

For Shadow Vehicles Weighing 22,000 lb. or More		
Speed Limit (MPH)	**Recommended Spacing [1]**	
	Stationary Operation (Ft)	**Moving Operation (Ft) [2]**
Greater than 55	150	172
45-55	100	150
Less than 45	74	100
For Shadow Vehicles Weighing Less than 22,000 lb. but Greater Than 9,900 lb.		
Speed Limit (MPH)	**Stationary Operation (Ft)**	**Moving Operation (Ft) [2]**
Greater than 55	172	222
45-55	123	172
Less than 45	100	100

[1] Recommended spacing is distance between front of shadow vehicle and beginning of work area to provide adequate roll ahead distance and minimize the risk of vehicles cutting in ahead of the shadow vehicle.

[2] Distances are appropriate for speeds up to 15.5 mph.

614.03.C.

On page 525, **Replace** the entire section with the following:

C. Conspicuity. Equip all vehicles with photo strobe lights, LED warning lights, or rotating beacons meeting Class 1 specifications for color and intensity as defined by the Society of Automotive Engineers (SAE).

Photo strobe lights, LED warning lights, or rotating beacons shall be horizontally visible from all directions (360 degrees) at a distance of 100 feet minimum. In order to ensure this visibility, the light shall in no way be obstructed from view by any signs or appurtenances on the vehicle.

Activate the photo strobe lights, LED warning lights, or rotating beacons and all hazard lights anytime the vehicle is entering, exiting or operating in a traveled lane at a speed less than the posted speed within the limits of the work zone or one mile of either end of the work zone.

In addition, equip all vehicles and trailers having a gross vehicle weight rating of 10,000 pounds or greater, in single or combination, with conspicuity tape. Also, delineate all NCHRP 350 Category IV equipment (arrow boards, portable changeable message signs, etc.) with conspicuity tape.

Conspicuity Tape: Use red and white, Type G, H, or J retroreflective sheeting that complies with 730.19, 730.192, and 730.193.

1. Apply one 2 inch wide (minimum) horizontal stripe of Type G, H, or J retroreflective sheeting to a minimum of 50 percent of the length of each side of the payload portion of the vehicle, rearward from the back of the cab, NCHRP 350 Category IV equipment and trailers. Space lengths of tape evenly over the length of the payload portion of the vehicle rearward from the back of the cab, NCHRP 350 Category IV equipment, and trailers. The centerline for each strip of retroreflective sheeting shall be between 15 inches and 60 inches above the road surface when measured with the vehicle empty or unladen, or as close as practicable to this area.

2. Outline the lower rear facing area of the vehicle, NCHRP 350 Category IV equipment, and trailers with 2 inch wide (minimum) horizontal stripe of Type G, H, or J retroreflective sheeting. Apply the lower horizontal markings extending the width of the vehicle, NCHRP 350 Category IV equipment, and trailer as close as practical to the edge of the vehicle, NCHRP 350 Category IV equipment, and trailer. The centerline for each strip of lower horizontal retroreflective sheeting shall be between 15 inches and 72 inches above the road surface when measured with the vehicle empty or unladen, or as close as practicable to this area.

3. Outline the upper rear facing area with two pairs of strips of 2-inch wide (minimum) retroreflective Type G, H, or J sheeting, each pair consisting of strips 12 inches long, must be positioned horizontally and vertically on the right and left upper corners of the rear of the body of each vehicle or trailer, as close as practicable to the top of the vehicle or trailer and as far apart as practicable. If the perimeter of the body, as viewed from the rear, is not square or rectangular, the strips may be applied along the perimeter, as close as practicable to the uppermost and outermost areas of the rear of the vehicle or trailer on the left and right sides.

Escort transport or delivery vehicles without proper photo strobe lights, LED warning lights, or rotating beacons or conspicuity tape to and from the work zone only with the approval of the Engineer. This exception is intended for limited use at the discretion of the Engineer and will only be considered following a written request by the Contractor. Otherwise, equip all vehicles with photo strobe lights, LED warning lights, or rotating beacons and conspicuity tape as described herein.

Acceptable methods for delineating material supply vehicles are depicted in the Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles.

614.07

On page 527, **Replace** the first sentence of the third paragraph with the following:

Keep existing signs including 630.09 Specific Service signs, Tourist-Oriented Directional Signs, and Sponsor-A-Highway signs and traffic control devices in use within the work limits during the construction period unless otherwise indicated on the plans.

614.10

On page 529, **Add** the following sentences to the end of the second paragraph:

Covering of one or more permanent or temporary vehicle or pedestrian signal head(s) shall be according to 632.25, except payment shall be included in Item 614 Maintaining Traffic.

Energized signal covers shall block light from being visible.

614.11.B

On page 529, **Replace** the entire section with the following:

B. Work Zone Marking Specifications. Equip traffic paint striping equipment for Class I and Class III markings with a computerized Data Logging System (DLS) conforming to 641.04 ~~when the length of marking exceeds 0.5 miles (0.8 km) of continuous line equivalent.~~ Furnish the Engineer daily, biweekly, and final DLS reports according to 641.04.

Unless otherwise shown on the plans, the Contractor may use 740.02 Type 1 or Type 1A paint, Supplemental Specification 807 Traffic Paint, Supplemental Specification 873 Wet Reflective Removable Tape, 740.10, or 740.06 Type I or Type II preformed material for work zone pavement markings. Do not use wet reflective optics specified in Supplemental Specification 807 with 740.02 Type 1A paint for cold weather applications. Unless using Supplemental Specification 807 Traffic Paint, furnish painted markings according to Item 642 except that:

1. For Class I or Class II work zone pavement markings, use the specified application rate from Table 614.11-1.

TABLE 614.11-1

	Line Width (inch)				
	4	6	8	12	24
Type of Pavement Marking	**Gallon per Mile of Line**				
Solid Line	22	33	44	66	132
10-foot Dashed Line	5.5	8.25	--	--	--
4-foot Dashed Line	2.2	3.3	--	--	--
Dotted Line	7.3	10.95	14.6	21.9	--
Arrows, Symbols, and Words	1.4 gallons per 100 square feet				
Glass Beads: 740.09, Type A	15 pounds per 100 square feet				

TABLE 614.11-1M

Type of Pavement Marking	Line Width (mm)				
	100	150	200	300	600
	Liter per Kilometer of Line				
Solid Line	52	78	105	157	314
3.0 m Dashed Line	13	19.5	--	--	--
1.2 m Dashed Line	5.2	7.8	--	--	--
Dotted Line	17.3	25.95	34.6	51.9	--
Arrows, Symbols, and Words	0.6 liters per square meter				
Glass Beads: 740.09, Type A	7.3 kg per square meter				

2. For Class III work zone markings, use the specified application rate from Table 614.11-2.

TABLE 614.11-2

Type of Pavement Marking	Line Width (inch)				
	4	6	8	12	24
	Gallon per Mile of Line				
Solid Line	12	18	24	36	72
10-foot Dashed Line	3	4.5	--	--	--
Dotted Line	4	6	8	12	--
Arrows, Symbols, and Words	0.75 gallons per 100 square feet				
Glass Beads: 740.09, Type A	7.5 pounds per 100 square feet				

TABLE 614.11-2M

Type of Pavement Marking	Line Width (mm)				
	100	150	200	300	600
	Liter per Kilometer of Line				
Solid Line	28	42	56	84	168
3.0 m Dashed Line	7	10.5	--	--	--
Dotted Line	9.4	14.1	18.8	28.2	--
Arrows, Symbols, and Words	0.3 liters per square meter				
Glass Beads: 740.09, Type A	3.7 kg per square meter				

Ensure that Type I and II preformed material conform to 740.06 or wet reflective preformed material conforms to Supplemental Specification 873, except do not place any preformed material containing metal on any surface unless it will be removed later. Remove work zone pavement markings of 740.06 or Supplemental Specification 873 preformed material before placement of 642 or 644 surface course markings at that location. Ensure that preformed material conforms to Item 645 or Supplemental Specification 873.

614.11.G.1.a

On page 532, **Delete** the third paragraph:

~~Use only sand, shot, or water blasting for removal of all pavement markings in preparation for placing Item 422 Chip Seal or Item 421 Microsurfacing.~~

614.16.B

On page 539, **Add** the following language as a new line at the end of the subsection:

6. TMAs.

614.16.C

On page 539, **Replace** the subsection with the following:

C. If traffic permanently damages beyond use any of the work zone traffic control items listed in 107.15, the Department will compensate the Contractor for replacement of the damaged item by Change Order provided the Contractor has pursued but failed to obtain compensation from the motorist.

614.16

On page 540, **Add** the following paragraph after the first paragraph:

C&MS Table 104.02-2 does not apply to final quantities of Law Enforcement Officer with Patrol Car.

614.16

On page 540, **Revise** the section as follows:

Item	Unit	Description
614	Lump Sum	Maintaining Traffic
614	Lump Sum	Detour Signing
614	Each	Replacement Drum
614	Each	Replacement Sign
614	Each	Object Marker, ____- Way
614	Each, Mile, Foot (Kilometer, Meter)	Work Zone Pavement Markings
614	Each	Work Zone Raised Pavement Marker
614	Sign Month	Portable Changeable Message Sign
614	Each	Work Zone Speed Limit Sign
614	Each	Work Zone Marking Sign
614	Hour	Law Enforcement Officer with Patrol Car
614	Each	Barrier Reflector
614	Each	Work Zone Crossover Lighting System
614	Each	Work Zone Impact Attenuator, ____*** Wide Hazards, ____****
614	Mile (Kilometer)	Work Zone Lane Line, Class ___, ___*, ___**
614	Mile (Kilometer)	Work Zone Center Line, Class ___, ___**
614	Foot (Meter)	Work Zone Channelizing Line, Class ____, ___*, ___**
614	Mile (Kilometer)	Work Zone Edgeline, Class ____, ___*, ___**
614	Foot (Meter)	Work Zone Gore Marking, Class II, ___**
614	Foot (Meter)	Work Zone Stop Line, Class I, ___**
614	Foot (Meter)	Work Zone Arrow, Class I, ___**
614	Foot (Meter)	Work Zone Crosswalk Line, Class I, ___**
614	Foot (Meter)	Work Zone Dotted Line, Class ___, ___*, ___**
614	Cubic Yard (Cubic Meter)	Asphalt Concrete for Maintaining Traffic

* Width of marking (4" or 6" for Lane Lines, Edgelines and Dotted Lines; 8" or 12" for Channelizing Lines and Dotted Lines).

** Type material (807 paint; 642 paint; 740.06, Type I or Type II; 873; 648; or left blank to allow any of the six.)

*** Width (24 in or over 24 in and less than 36 in).

**** Configuration (Unidirectional or Bidirectional).

617.03

On page 544, **Replace** the first paragraph of 617.03 with the following:

617.03 Prosecution. If reconditioning shoulders as part of a resurfacing project and traffic is maintained, place shoulder material along with the paving operations as rapidly as possible. Complete all shoulder reconditioning within four days following placement of the surface course and any course that results in a drop-off of 2.0 inches (50 mm) or greater. Adjacent to a safety edge constructed as part of the Work, complete all shoulder reconditioning within ten days following construction of the safety edge.

618

On Page 546 **Replace** the entire specification with the following:

ITEM 618 RUMBLE STRIPS

618.01 Description
618.02 Construction
618.03 Method of Measurement
618.04 Basis of Payment

618.01 Description. This work consists of grinding depressions longitudinally in paved shoulders (rumble strips), at locations shared by edge lines or center lines (rumble stripes), or cutting grooves transversely across lanes (transverse rumble strips).

Construct longitudinal rumble strips according to the standard construction drawings BP-9.1 (Shoulder Rumble Strips) or TC-64.10 (Rumble Stripes), and transverse rumble strips according to standard construction drawing BP-9.2 (Transverse Rumble Strips).

618.02 Construction.

A. General. Equip the cutting tool with guides or a guidance system, clearly visible to the operator, to provide for consistent alignment. Take effective measures to control dust during the grinding operation. Remove and dispose of all grinding materials deposited on the roadway pavement in a manner approved by the Engineer and before opening the roadway to traffic.

B. Longitudinal Rumble Strips. Furnish equipment with a rotary cutting head that will grind the depressions to the required dimensions. Equip the cutting head with a pattern of cutting tips to produce a smooth cut with approximately 0.06 inches (1.5 mm) between peaks and valleys. Ensure that the cutting head is on its own suspension system, independent from that of the power unit, to allow the head to align itself with the slope of the shoulder or any irregularities in the shoulder surface.

C. Transverse Rumble Strips. Use equipment to install Transverse Rumble Strips to the requirements of the plans and specifications without damaging surrounding pavement, pavement markings, or other project features.

618.03 Method of Measurement. The Department will measure longitudinal rumble strips by the number of feet (meters) or mile (kilometer) as the sum of the lengths of the individual segments. The Department will measure lengths along the inside edge of the shoulder, edge line or center line, from the center of the first depression in a segment to the center of the last depression in that segment. If longitudinal rumble strips are provided on more than location, the Department will measure lengths separately for each shoulder, center line or edge line segment and add the individual lengths together to obtain the total length for the shoulder, center line or edge line.

The Department will measure transverse rumble strips by the number of each for one pad consisting of fifteen parallel 4-inch grooves cut at 1-foot intervals.

618.04 Basis of Payment. The Department will not pay for repairing surface damage and extraneous marks caused by the Contractor's operations.

The Department will pay for longitudinal pavement marking material in accordance with Item 641.

The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
618	Feet (Meter)	Rumble Strips, Shoulder (Asphalt Concrete)
618	Mile (Kilometer)	Rumble Strips, Shoulder (Asphalt Concrete)
618	Feet (Meter)	Rumble Strips, Shoulder (Concrete)
618	Mile (Kilometer)	Rumble Strips, Shoulder (Concrete)
618	Feet (Meter)	Rumble Stripes, Edge line (Asphalt Concrete)
618	Mile (Kilometer)	Rumble Stripes, Edge line (Asphalt Concrete)
618	Feet (Meter)	Rumble Stripes, Edge line (Concrete)
618	Mile (Kilometer)	Rumble Stripes, Edge line (Concrete)
618	Feet (Meter)	Rumble Stripes, Center line (Asphalt Concrete)
618	Mile (Kilometer)	Rumble Stripes, Center line (Asphalt Concrete)
618	Feet (Meter)	Rumble Stripes, Center line (Concrete)
618	Mile (Kilometer)	Rumble Stripes, Center line (Concrete)
618	Each	Rumble Strips, Transverse (Asphalt Concrete)
618	Each	Rumble Strips, Transverse (Concrete)

619.01

On page 547, Replace the section with the following:

619.01 Description. This work consists of providing, maintaining, cleaning and subsequently removing a field office for the exclusive use of the Department for the duration of the Contract at a location approved by the Engineer.

619

On page 548, **Replace** Table 619.02-1 FIELD OFFICE with the following:

TABLE 619.02-1 FIELD OFFICE

Item	Type A	Type B	Type C
Minimum ceiling height, ft (m)	7 (2.1)	7 (2.1)	7 (2.1)
Floor space, ft² (m²)	150 (14)	500 (46)	1000 (93)
Separate enclosed room, ft² (m²) (Part of specified floor space)	0 (0)	0 (0)	100 (9)
Telephone service [1]	2	2	2
Internet service connection [5]	1	1	1
Multi-Function copier that is setup for scanning, printing and copying. [2]	1, 11×17	1, 11×17	1, 11×17
Calculator with tape	1	2	3
Desk and chair set	1	3	5
Work table, 30 × 72-inch (750 × 1800 mm)	1	2	3

Item	Type A	Type B	Type C
4-drawer, legal size, lockable metal file cabinet	---	1	2
2-drawer, metal file cabinet	1	2	2
Portable fire extinguishers [3]	1	1	2
Plan rack [4]	1	1	2
All-weather parking spaces	8	16	20

[1] For each telephone and/or computer station specified, all ethernet wiring necessary to connect the phone and/or computer and multi-function copier to the internet company system~~, and a working separate phone number for the printer for faxing~~.

[2] Copier must meet minimum specifications provided for each field office type. Contractor responsible for paper supplies, copier supplies, and maintenance of copier.

Type A:

One of the following MFC machines/series:

HP models E77822dn, E77825dn, E77830dn, E87640dn, E87650dn, E87660dn, E77822z, E77825z, E77830z, E87640z, E87650z, E87660z

Type B and C:

One of the following MFC machines/series:

HP Models: E77650dn, E77660dn, E77650dns, E77660dns, E77650z, E77660z, E77650zs, E77660zs, E77660zts, E77650z+, E77660z+, E77822dn, E77825dn, E77830dn, E87640dn, E87650dn, E87660dn, E77822z, E77825z, E77830z, E87640z, E87650z, E87660z

[3] Type 2-A:10-B:C, 5-pound (2.27 g) size

[4] Capable of handling the breakdown of 22 × 34-inch (559 × 864 mm) sized plans into ten sections.

[5] Provide a broadband internet connection capable of minimum download speeds as follows:

30 Mbps download 5 Mbps upload - Network Latency less than 50 milliseconds. If speeds are not available through an individual or singular circuit, provide the highest speed available in the area and install multiple circuits to achieve the specified speeds. When multiple broadband services are available the following is the preferred order: Cable, DSL, Cellular, and Wireless Radio (Satellite Communication is not compatible with ODOT VPN connection and will not be accepted). If a cellular network is used, provide the cellular equipment, including software and router equipment to connect to the ODOT provided Cisco ASA 5505 firewall. Supply ODOT with all documentation for the broadband circuit including all username/user ids, passwords and account information. Verify that the broadband internet connection is active and working as specified. ODOT IT personnel will confirm that bandwidth and network latency are compliant with the required field office specifications. All field office Internet connections are for ODOT use only.

621.03.E

On page 552, **Delete** “or on line” in the first sentence of the second paragraph.

622.04

On page 555, **Add** the following sentence to the end of the paragraph:

Obtain the Engineer’s written approval before substituting a proprietary portable barrier that requires anchoring for an unanchored portable barrier on a bridge deck.

622.08

On page 556, **Replace** the first sentence of the fourth paragraph with the following:

The Department will measure Portable Barrier Anchored, Portable Barrier Unanchored, Portable Barrier 50” (1270mm) and Portable Barrier 50” (1270mm) Bridge Mounted by the number of feet (meters) for each application of the barrier placed according to the plans.

622.09

On page 556, **Replace** the second paragraph with the following:

The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
622	Foot (Meter)	Concrete Barrier, Type ____
622	Each	Concrete Barrier End Anchorage, Reinforced, Type ____
622	Each	Concrete Barrier End Section, Type _____
~~622 Foot (Meter) Portable Barrier, ___" (___mm)~~		
~~622 Foot (Meter) Portable Barrier, ___" (___mm) Bridge Mounted~~		
622	Foot (Meter)	Portable Barrier, Unanchored
622	Foot (Meter)	Portable Barrier, Anchored
622	Foot (Meter)	Portable Barrier, 50” (1270 mm)
622	Foot (Meter)	Portable Barrier, 50” (1270 mm) Bridge Mounted

622.09

On page 556, **Add** the following sentence to the end of the first paragraph:

Anchoring required for approved proprietary portable barrier products when substituted for Portable Barrier, Unanchored, is incidental to the pay item. Transitions to and from Portable Barrier (Anchored or Unanchored), including all items necessary for the transitions are incidental to the pay item.

623

On page 557, **Replace** the entire section with the following:

ITEM 623 CONSTRUCTION LAYOUT AND SURVEY MONUMENTS

623.01 Description
623.02 Materials
623.03 Definitions
623.04 Survey Monument Verification
623.05 Placement, Protection and Restoration of Survey Monuments
623.06 Geodetic/Primary Project Control
623.07 Right-of-Way Staking
623.08 Construction Layout
623.09 Providing Electronic Instrumentation
623.10 Method of Measurement
623.11 Basis of Payment

623.01 Description. This work consists of furnishing the accurate horizontal and vertical locations for the construction of the Work shown in the contract documents. Acceptable methods include, placing, and maintaining construction layout stakes, real time layout utilizing survey equipment (GPS, Total Station, Level) and automated machine control and guidance. This work also includes verification, placement, protection, and any necessary restoration of project control monuments, monument assemblies, reference monuments, right-of-way monuments, property line/boundary monuments and other survey monuments.

Use Geodetic and/or Primary Project Control monuments as the basis for all construction layout staking and verification, placement, protection, and restoration of survey monuments. Ensure that all work encompassing the verification, placement, protection, and restoration of survey monuments is performed under the supervision of a Registered Surveyor and certify that the accuracy of all measurements meets Ohio Administrative Code Section 4733-37 and the *ODOT Survey and Mapping Specifications*. Ensure all construction layout is performed under the supervision of either a Registered Surveyor or a Registered Engineer.

623.02 Materials. Furnish materials conforming to:

Concrete, Class QC Misc. or QC 1 ..... 499.03
Cast frames and covers.....711.12, 711.13, or 711.14
Concrete sand (fine aggregate) 703.02.A
Stainless steel bolts 730.10
Steel rods..... 709.01
Pipe .....706.07, 706.09, or 707.45

623.03 Definitions

A. Geodetic/Primary Project Control Monument. A monument which is constructed by ODOT or its Design consultant and is positioned in compliance with the *ODOT Survey and Mapping Specifications*.

B. Survey Monuments. Includes primary project control monuments (including azimuth marks and temporary benchmarks), monument assemblies, centerline monuments, centerline reference monuments, Right-of-Way monuments, property line/boundary monuments and local, state or federal geodetic control monuments.

C. Monument Assembly. A monument typically within paved areas, that consists of a steel rod housed inside a monument assembly with a cast frame and cover according to SCD RM-1.1 that is used to define a geometric position of a point on the centerline of Right-of-Way or a point of common report such as a section corner, lot corner, or VMS corner.

D. Centerline Monument. A monument typically outside of paved areas that consists of a steel rod and aluminum cap encased in concrete according to SCD RM-1.1 where the surveyed position defines a geometric point on the centerline of Right-of-Way.

E. Centerline Reference Monument. A monument outside of paved areas that consists of a steel rod and aluminum cap encased in concrete according to SCD RM-1.1, where the surveyed position references a geometric point on the centerline of Right-of-Way with a known bearing/station and offset distance.

F. Right-of-Way Monument. A property boundary monument set according to SCD RM-1.1 to comply with Ohio Administrative Code Section 4733-37, "Standards for Boundary Surveys in the State of Ohio" and recited in the Right-of-Way deeds to convey property or easement rights. Right-of-Way monuments are set at property corners, property line intersections, points along the Right-of-Way and angle points on the Right-of-Way.

G. Azimuth Mark. A project control monument set for use as a "backsight" point.

H. Temporary Benchmark. A monument with an elevation transferred from a primary project control monument used for construction layout purposes only.

623.04 Survey Monument Verification. Verify the position of survey monuments shown in the Contract Documents including the project control and those shown in the right-of-way plans and locate

any additional survey monuments if discovered within the right-of-way in the project work area . Generate a report detailing the surveyed location of all monuments. Use standard acceptable surveying measurement techniques suitable to meet the requirements of Ohio Administrative Code Section 4733-37, "Standards for Boundary Surveys". Survey monument verification is required on all projects where survey monuments are specified in the Contract Documents including pavement resurfacing, reconstruction and repair projects where monument assemblies will be adjusted or reconstructed to grade.

Use the Department's standardized verification report template. The "Survey Monument Verification Report" template can be downloaded from the following website:

www.dot.state.oh.us/divisions/constructionmgt/admin/pages/default.aspx

A. Preconstruction Survey Monument Verification. Preconstruction Survey Monument Verification is performed to identify any discrepancies or changes to the usability of the project control monuments specified in the Contract Documents and to identify all required survey monuments within the right-of-way in the project work area that could be damaged or destroyed by construction activities. If additional survey monuments are discovered within the right-of-way in the project work area and are not shown in the Contract Documents, locate, protect, reference, and preserve them in the same manner as survey monuments in the Contract Documents. Include the additional survey monuments in the Survey Monument Verification Report. Perform this work before beginning earthwork, resurfacing, or construction activities. Have a Registered Surveyor prepare a Survey Monument Verification Report detailing the point number, surveyed coordinates, station, offset, a description of each survey monument found and the calculated differences in the Northing, Easting and Elevation from the plan location. Descriptions should include the size, material, condition, depth and any cap stamping or markings. Any differences between plan and observed coordinates exceeding 0.10 feet will be highlighted for remediation as approved by the District Survey Operation Manager and detail remedial actions for each necessary monument in the Survey Monument Verification Report. Have the Registered Surveyor sign, seal, and date the Survey Monument Verification Report and submit it to the Engineer and the District Survey Operations Manager.

Unless required by the District Survey Operations Manager, Preconstruction Survey Monument Verification is not required for projects without project control monuments and when the anticipated work only requires adjustment or reconstructing monument assemblies to grade without direct changes to the monument within the assembly.

B. Post Construction Survey Monument Verification. Post Construction Survey Monument Verification is performed to ensure that all required survey monuments as specified in the Contract Documents, and additional monuments found during the Preconstruction Survey Monument Verification, are preserved, set, reset, and/or adjusted to grade. Perform this work after completion of final grading and/or resurfacing and construction activities. Have a Registered Surveyor prepare a Survey Monument Verification Report detailing the point number, surveyed coordinates, station, offset, and a description of each survey monument. Include the size, material, condition, depth any cap stamping or markings, and calculate the differences in the Northing, Easting and Elevation from the plan location. Differences exceeding 0.10 feet will be highlighted for remediation as approved by the District Survey Operation Manager and detail remedial actions for each necessary monument in the Survey Monument Verification Report. Have the Registered Surveyor sign, seal and date the Survey Monument Verification Report and submit it to the Engineer and the District Survey Operations Manager. Post Construction Survey Monument Verification is required for standard resurfacing projects for all monument assemblies adjusted or reconstructed to grade. Primary Project Control Monuments do not require post construction verification unless specified by the Contract Documents or requested directly by the Engineer.

623.05 Placement, Protection and Restoration of Survey Monuments. Construct or replace all required survey monuments specified in the Contract Documents. Do not disturb survey monuments, cornerstones, or boundary monuments during construction unless specified in the Contract Documents. Restore survey monuments damaged or destroyed by construction activities, unless directed otherwise by the Engineer. Restore damaged survey monuments at locations specified in the Contract Documents or in their original location if the monument was not included in the Contract Documents. For a survey monument that cannot be installed in the location shown on the plans, notify the Engineer who will contact the District Survey Operations Manager to provide direction. Report monuments placed in locations other than in the specified locations in the Post Construction Survey Monument Verification Report. Do not place a monument in an alternate location without the prior approval of the District Survey Operations Manager. Refer to the Department's *Real Estate Manual, Appendix K,* for guidance on how to proceed with setting monuments in alternate locations.

623.06 Geodetic/Primary Project Control. Geodetic/Primary Project Control governs all positioning for Department projects. Use project control information provided on the plans for all project related survey operations.

623.07 Right-of-Way Staking. Stake Right-of-Way lines where work will be performed before beginning the work. Stake Right-of-Way lines by placing tall stakes, properly identified and readily discernible, at points of change in width or direction of the Right-of-Way line and at points along the line so that at least two stakes can be seen distinctly from any point on the line. The Engineer will not require the Contractor to set additional stakes to locate a utility line that is not included as a pay item in the contract, or to determine the property line between properties.

623.08 Construction Layout. Construction Layout will be performed in a manner to allow the contractor to properly construct the improvements on, below and above the ground at locations as defined by the contract documents and to allow for proper verification of said locations by the Department. All layout work will be relative to the Geodetic/Primary Project Control monuments. Applicable methods include, but are not limited to the following:

a. Furnish construction layout hubs, nails and stakes as required to construct the project per the Contract Documents.

b. Automated machine control and guidance utilizing alignments and models defined by the project plans included in the Contract Documents.

c. Real time layout by GPS, Total Station or Leveling Device per the Contract Documents and relative to the Geodetic/Primary Project Control monuments.

Submit a copy of the construction layout notes and raw data files to the Engineer upon request. The construction layout notes must contain enough information for the Engineer to verify the construction layout.

The Contractor is responsible for having the finished Work conform to the lines, grades, elevations and dimensions shown on the plans. Any inspection or checking of the Contractor's layout by the Engineer and the acceptance of all or any part of it does not relieve the Contractor of that responsibility.

The removal of construction layout stakes at the completion of the Work is a final cleanup item that is required as a condition of full payment for Item 624 Mobilization.

623.09 Providing Electronic Instrumentation. If specified as a pay item, provide the Engineer with electronic instrumentation so that the Department can verify the construction layout, perform check

sections, and document pay items. Provide a survey-grade, global navigation satellite system (GNSS) receiver and data collector. Provide equipment that meets the requirements of the Department's *Survey and Mapping Specifications*.

Provide equipment, software, and all three-dimensional models needed to verify layout, perform check sections, and document pay items. Train the Engineer on how to use the provided equipment and software and provide technical assistance during the duration of the Work.

Upon completion of the Work, the electronic equipment, computer and software will remain the property of the Contractor.

If using GNSS methods to construct the project and a pay item for providing electronic instrumentation is not specified, provide the Engineer with the three-dimensional models in electronic format when requested. Provide the models at no additional expense to the Department.

623.10 Method of Measurement. Estimated unit quantities for constructing new monuments, adjusting or reconstructing monuments to grade, and replacement of Survey Monuments expected to be destroyed are included in the Contract Documents. The Contractor will be compensated on a unit basis for additional survey monuments found, located, and reconstructed or replaced within the right-of-way in the project work area but not shown on the plans.

Survey Monuments on or outside of the Construction Limits are the Contractor's responsibility to protect and restore as required. The Department will not pay for restoration of these items.

623.11 Basis of Payment. Payment for lump sum Construction Layout Stakes and Surveying includes payment for Construction Layout, Right of Way staking, and Placement, Protection and Restoration of Survey Monuments. Payment for lump sum items Pre/Post Construction Survey Monument Verification and Report includes payment for all surveying necessary to locate, verify and report survey monuments in Survey Monument Verification. The Department will consider the cost of locating new survey monuments to be included in the unit price bid for the survey monument.

The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
623	Lump Sum	Construction Layout Stakes and Surveying
623	Lump Sum	Providing Electronic Instrumentation
623	Each	Primary Project Control Monument, Type A
623	Each	Primary Project Control Monument, Type B
623	Each	Monument Assembly, Type C
623	Each	Monument Assembly, Type D
623	Each	Monument Assembly, Adjusted to Grade
623	Each	Monument Assembly, Reconstructed to Grade
623	Each	Monument Assembly Removed and Reset
623	Each	Reference Monument, Type A
623	Each	Right of Way Monument, Type B
623	Lump Sum	Preconstruction Survey Monument Verification and Report
623	Lump Sum	Post Construction Survey Monument Verification and Report

625

On page 562, Replace "625.20 Plastic Caution Tape" in the list with the following:
625.20 Underground Warning / Marking Tape

625.05

On page 563, **Replace** "Plastic caution tape" in the material list with the following:
Underground warning / marking tape..... 725.22

625.05

On page 563, **Delete** the following from the Materials list:
~~Multiple cell conduit~~ .....~~725.20~~

625.12

On page 566, **Replace** the third sentence of the first paragraph to the following:
Use of conduit material shall comply with the NEC.

625.15

On page 569, **Add** the following sentence at the end of the seventh paragraph:
This compensation is for invoiced cost without mark-up.

625.20

On page 572, **Replace** the section with the following:

625.20 Underground Warning / Marking Tape. Install tape approximately 6 to 10 inch (150 to 250 mm) below the final finished grade. Place with the printed side up and parallel with the finished surface. Ensure that the tape is not pulled, distorted, or otherwise misplaced in completing the trench backfill. ~~Provide approximately 10 ft (3 m) of tape inside each adjacent pull box connecting the~~ underground utility run. Bond the tracer wire to a good earth ground in each pull box. If a tracer wire is embedded in the tape, bond the tracer wire to a good earth ground.

625.22

On page 575, **Delete** the fourth sentence in the first paragraph.
~~Trench in paved areas shall be separated for payment into Type A for pavements or sidewalks less than 6 inches (150 mm) thick and Type B for pavements 6 inches (150 mm) or greater.~~

625.22

On page 575, **Replace** the first sentence in the 6th paragraph with the following:
Underground warning / marking tape will be measured to the center of a light pole foundation, the center of a light tower foundation, the center of a pull box, the center of the pole of an embedded pole mounted power service, the center of the foundation for a power service with a foundation, or the wall of the building when the power service for the lighting in, on or within the building with no allowance for elevation change.

625.23

On page 576, **Replace** the pay item for "Plastic Caution Tape" with the following:
625 Foot (Meter) Underground Warning / Marking Tape

Revise the "Trench in Paved Area, (Type)" pay item as follows
625 Foot (Meter) Trench in Paved Area

626.01

On page 577, **Revise** the first paragraph as follows.

626.01 Description. This work consists of furnishing and installing barrier reflectors on guardrail blockouts, concrete barrier, cable barrier, retaining wall, and bridge parapets.

626.02

On page 577, **Revise** the third paragraph as follows.

Use barrier reflectors that are mountable on guardrail blockouts, concrete barriers, cable barrier, retaining walls, and bridge parapets. For wall or parapet mount, the barrier reflector may not extend further than 5 inches (125 mm) in a horizontal direction towards the traffic lanes.

626.04

On page 578, **Add** the following paragraph after the third paragraph.

Install reflectors that attach to the cable barrier on the cable that is nearest to traffic. If more than one cable is nearest to traffic, attach to the highest cable nearest to traffic. Install them centered between posts.

626.04

On page 578, **Add** the following paragraph after the eight paragraph.

For all median cable barrier reflectors, use bi-directional reflectors.

626.04

On page 578, **Revise** the ninth paragraph as follows.

Use one-way and bi-directional guardrail blockout, concrete barrier, retaining wall, and bridge parapet barrier reflectors according to the following table:

626.04

On page 579, **Revise** the first table as follows.

Mounting Location	
Concrete barrier, retaining walls, bridge rail or bridge parapets	
Type 1	Barrier Reflector
Guardrail	
Type 2	Corrosion Resistant Metal Guardrail Blockout Reflector
Type 3	Acrylic or Polycarbonate Plastic Guardrail Blockout Reflector
Type 4	Spring Loaded Guardrail Blockout Reflector
Type 5	L-Type Guardrail Blockout Reflector
Cable Barrier	
Type 6	Cable Barrier Reflector

630.04

On page 581, **Replace** the fourth paragraph with the following:

For flat sheet, double faced mile marker, and double faced street name signs, use Type G, H or J reflective sheeting for background and reflective legends. For extrusheet signs, use Type G reflective sheeting for the background, and use Type J, ASTM D 4956 Type XI reflective sheeting for reflective legends, shields and symbols (including hazardous material plaque, airport symbol, arrows and borders). Apply reflective sheeting to the surface according to the manufacturer's recommendations,

with no blisters, wrinkles, tears, or blemishes. Do not use reboundable or damage control sheeting for permanent signs.

630.04

On page 582, **Replace** the sixth full paragraph and the sticker design and alternate sticker design under Figure 1 with the following:

Silk screen or digitally print the fabrication data onto the face of the sticker, and include the month and year of fabrication, state project number, sign manufacturer name, the sign process (silkscreen, digital, cut vinyl), and the sheeting manufacturer brand. At the time of sign erection, indicate the erection data by scratching out the appropriate month and year.

FIGURE 1

Sticker design:

630.04

On page 583, **Replace** the first sentence of the last paragraph with the following:

Fabricate sign post reflectors with flat sheet aluminum and match the reflective sheeting type to the sheeting type used for the corresponding sign.

630.06.B.

On page 585, **Replace** the first sentence of the fourth paragraph with the following:

When specified, furnish sign support identification stickers of Type F reflective sheeting listing the support type, design number, span/arm length, county, route, and section number (example: TC-15.116, design 1, 80 ft span, CUY-90-17.58).

630.06.B.

On page 585, **Delete** from the second sentence of the fifth paragraph the following:

Fabricate box trusses from ~~aluminum or~~ steel tubular members with built-in camber and mark each section "TOP".

630.09

On page 587, **Replace** the first paragraph with the following:

630.09 Specific Service and Tourist-Oriented Directional Signs. Maintain existing Specific Service (logo) signs, ~~and~~ Tourist-Oriented Directional Signs (TODS), and Sponsor-A-Highway signs in accordance with 614.07 unless indicated in the plans."

630.15

On page 590, **Replace** "Span Wire Sign Support TC-17.10, Design ____" pay item with the following.

630 Each Span Wire Sign Support, Type TC-17.11, Design _____

632

On page 596, **Revise** "632.09 Pedestrian Pushbutton" as follows.

632.09 Pedestrian Pushbutton and Accessible Pedestrian Pushbutton

632.03

On page 597, **Delete** "732.08" from Detectors in the material list.

Detectors ..... 732.07~~, 732.08~~

632.03

On page 597, **Replace** Tether Wire in the material list as shown below.

Tether Wire..... 732.18

632.05

On page 598, **Add** the following to Table 632.05-1:

TABLE 632.05-1 TABLE AND WIRE IDENTIFICATION

Cable	**Tag**
Ground	GND
Power (2 wire)1∅ 120 volt	AC +AC- or ACN
Power (3 wire) 1∅ 120/240 volt Neutral wire	AC + 1, AC + 2 AC- or ACN
Phase A Phase 1 Phase 1 northbound left turn lanes	∅ A ∅ 1 ∅ 1 NBLT
Phase A, pedestrian signal	∅ A PD
Radar, Advance Detection Phase, Direction	RAD-Adv ∅2, NB
Radar, Stop Line Detection Phase, Direction	RAD-SL ∅1, SBLT
Overlap, phase A + C Overlap, phase 1 + 6	∅ A + C ∅ 1 + 6
Detector lead-in, phase A Detector lead-in, phase 1 Detector lead-in, phase 1 northbound left turn lanes	DET A DET 1 DET 1 NBLT
Detector lead-in, phase A (call type) Detector lead-in, phase 1 (call type) northbound thru lanes	DET A CALL DET 1 CALL NB-THRU
Detector harness[1]	DET A
Interconnect	IC
Pre-emption, fire	PE FIRE
Pre-emption, railroad	PE RR
[1]Place the tag next to the MS plug at the detector amplifier.	

632.06

On page 599, **Replace** the second paragraph with the following:

Install signals in a plumb condition, using a balance adjuster only if approved by the engineer. Rigidly mount heads to mast arms with the yellow module located in front of the mast arm. Use drop pipes/extenders of suitable length only when necessary to bring the bottom of the signal heads to a proper roadway clearance. Drop pipes/extenders shall be kept as short as necessary on backplated signals. Use of drop pipes/extenders greater than 1.5 feet in length must be approved by the Engineer. Use disconnect hangers for suspended heads only when specified.

632.06

On page 599, **Replace** the third paragraph with the following:

Orient each signal face to its traffic approach, and lock faces in place by the serrated or other type device incorporated in signal housing and support hardware. Before closing serrations, apply a bead of Room-Temperature Vulcanizing (RTV) silicone to all serrated surfaces and then tighten to achieve positive locking. RTV silicone shall be white to facilitate visual inspection. On heads with dual concentric serrated rings, completely fill the space between the rings with RTV silicone.

632.06

On page 599, **Add** the following paragraph after the third paragraph:

For span wire installations, do not use balance adjusters on one-way heads or tethered heads.

632.09

On page 599, **Revise** the first sentence in the first paragraph as follows.

632.09 Pedestrian Pushbutton and Accessible Pedestrian Pushbutton.

632.15

On page 601, **Replace** the first sentence of the first paragraph with the following:

632.15 Signal Support. Furnish supports with mast arms with the required pole and arm length, damping device if arm length requires, anchor bolt circle diameter, and anchor bolt size.

632.15

On page 601, **Replace** the fifth paragraph with the following:

Conform to the requirements of AASHTO LRFDLTS-1, including all interim releases.

632.24

On page 604, **Add** the following sentence at the end of the first paragraph:

This compensation is for invoiced cost without mark-up.

632.25

On page 604, **Replace** the first paragraph with the following:

Cover vehicular signal heads if erected at intersections where traffic is maintained before energizing the signals. Cover pedestrian signal heads when specified in the plans. Use a sturdy opaque covering material specifically made for use with traffic signals and ensure that the color of the cover is different than the signal head, tan or ~~beige~~ white, so that it is clear to drivers and pedestrians the heads are covered, not dark. Use a method of covering and cover attachment and materials as approved by the Engineer. Covers are to be free of text, pictures, or any type of advertising. Maintain covers and remove them when directed by the Engineer.

632.25

On page 604, **Add** the following paragraph after the second paragraph.

Do not operate covered signals at night and ensure no conflicting signal light is visible at night. Comprise covers of 16 oz./yd. vinyl-coated polyester fabric consisting of no more than 2 layers sewn together. Completely cover signal, including central slits or ports in the cover, any time no active work is occurring on the signal installation.

632.29

On page 606, **Revise** the first sentence in the second paragraph as follows.

The Department will measure Pedestrian Pushbutton and Accessible Pedestrian Pushbutton by the number of individual units and will include pedestrian pushbutton signs.

632.29

On page 607, **Replace** the first sentence of the fourth paragraph with the following:

The Department will measure Signal Support, Combination Signal Support, Strain Pole, Combination Strain Pole, Wood Pole, and Pedestal by the number of complete units of each, and will include pole

arms, weather-heads and blind half couplings, damping device if arm length requires, anchor bolts and conduit ells furnished for foundations.

632.30

On page 608, **Add** after the "Pedestrian Pushbutton" pay item add the following pay item.

632 Each Accessible Pedestrian Pushbutton

633

On page 609, **Delete** the following from the table of contents:

~~**633.07 Controllers**~~

633

On page 609, **Delete** the following from the section index:

~~**633.06 Testing and Prequalification**~~

633

On page 609, **Delete** the following from the section index:

~~633.14 Centrally Controlled Arterial Traffic Signal System~~

633.01

On page 610, **Revise** the first sentence to the following.

This work consists of furnishing and installing traffic signal control equipment, including ~~controllers,~~ cabinets, auxiliary equipment, and specified accessories, completely wired, at the locations shown on the plans and ready for service.

633.03

On page 610, **Delete** the following from the last paragraph:

Furnish material and equipment conforming to:

Concrete (cabinet foundations and work pads)
QC Misc or QC 1.....499, 511
Conduit 725.04, 725.051, 725.052
~~Controller unit~~ ..... ~~733.02~~
Cabinet and auxiliary equipment 733.03
Cabinet riser 733.04
Flasher controller 733.05
~~Controller, master, traffic responsive~~ ..... ~~733.06~~
Remote monitoring station..... 733.07
Uninterruptible Power Supply..... 733.09

633.06

On page 611, **Delete** the entire section.

633.07

Beginning on page 611, **Delete** the entire section.

~~**633.07 Controllers.** Install controller units, consisting of the timing unit, software, and signal timing, into the specified type of prewired cabinet.~~

~~Program controller units as shown on the plans unless otherwise directed by the Engineer. If the plan timing data or the supplemental timing data supplied by the Engineer does not exactly fulfill the~~

~~timing requirements of the installed equipment, notify, in writing, the Engineer of the problem and identify the discrepancies. The Engineer will consult with the maintaining agency and notify the Contractor within 2 weeks. After programming, briefly operate controllers, with the signals turned off by means of the signal shutdown switch, to ensure that operation is reasonable and conforms to the plans.~~

~~If the plans show two or more intersection controllers operated in a progressive signal system, coordinate signals by relating the various controller cycle start times to a zero time base, or other cycle start time at an adjacent signalized intersection. Ensure that the controller unit software provides coordination capability to allow associated controllers to be operated within the progressive traffic system. Coordination equipment shall supervise the operation of its associated controller by causing the end of certain phases and the beginning of the following phases to occur at set points. Program coordination timing according to the coordination timing data shown on the plans or provided by the Engineer.~~

633.13

On page 613, **Delete** the entire section.

~~**633.13 Controller, Master, Traffic Responsive.** The traffic responsive master controller supervises and controls the operation of an interconnected system of local controllers. Ensure that the master controller is able to communicate with a remote monitoring station. Locate this master controller in a local intersection controller cabinet unless otherwise shown on plans. If the local controller cabinet size is not sufficient to accommodate the master controller and its associated wiring, furnish the proper size cabinet for the local intersection controller to house the local controller, master controller, modem, and all auxiliary devices.~~

633.14

On page 613, **Delete** the entire section.

~~**633.14 Centrally Controlled Arterial Traffic Signal System.** Install this construction item on signal systems with a minimum of fifty (50) networked signalized intersections in jurisdictions who employ dedicated engineering and/or traffic signal operations staff. Install, test, and operate the station, consisting of computer equipment, communications equipment, and central control software, in one or more locations in the maintaining agency's facilities as shown in the plans. The maintaining agency shall furnish communications at these stations.~~

633.19

On page 614, **Delete** the first two paragraphs:

~~The Department will measure Controller Unit, Type ___, with Cabinet, Type ___by the number of each complete unit, and will include controller unit with software, all required auxiliary equipment, loop detector units, and a prewired cabinet, with all items completely wired and tested. Ground mounted cabinets will include anchor bolts and conduit ells for installation in the foundation. Pole mounted cabinets will include pole mounting hardware.~~

~~The Department will measure Controller Unit, Type __by the number of each controller timing unit with software, and will include any signal timing programming or installation. The Department will measure Controller Unit, Type ___, Furnish Only by the number of each controller timing unit with software, and will exclude any signal timing programming or installation~~

633.19

On page 615, **Delete** the second paragraph:

~~The Department will measure Controller, Master, Traffic Responsive by the number of each unit, and will include installation, signal system software, programming, and any increase in cabinet size to~~

~~house the master controller in the local intersection cabinet. The Department will measure Controller, Master, Traffic Responsive, Furnish Only by the number of each unit, and will include software, but exclude any programming or installation.~~

633.19

On page 615, **Delete** the third paragraph:

~~The Department will measure Centrally Controlled Arterial Traffic Signal System by the number of each location shown on the plans, and will include all equipment, testing, and software.~~

633.20

On page 615, **Delete** the following items:

~~633 Each Controller Unit, Type ___, with Cabinet, Type ___~~
~~633 Each Controller Unit, Type ___~~
~~633 Each Controller Unit, Type ___, Furnish Only~~
~~633 Each Controller, Master, Traffic Responsive~~
~~633 Each Controller, Master, Traffic Responsive, Furnish Only~~

633.20

On page 615, **Delete** the following:

~~633 Each Centrally Controlled Arterial Traffic Signal System~~

641

On page 627, **Revise** the table of contents to the following:

641.01 Description
641.02 Materials
641.03 General
641.04 Equipment
641.05 Pavement Preparation
641.06 Layout and Premarking
641.07 Line Placement Tolerance
641.08 Marking Types
641.09 Two-Way Radio Communication
641.10 Removal of Pavement Markings
641.11 Unsatisfactory Materials and Deduction for Deficiency
641.12 Method of Measurement
641.13 Basis of Payment

641.04

On page 628, **Replace** the entire subsection with the following:

Equipment. Equip long line pavement marking equipment with a computerized Data Logging System (DLS), including a cab mounted display. For center line, lane line, and edge line markings, when the length of marking exceeds 0.5 mile (0.8 km) of continuous line equivalent, provide the Table 641.04-1 DLS capabilities.

Table 641.04-1

Provide the highway number with the county and beginning and ending county log points rounded to the nearest thousandths of a mile, the beginning and ending coordinates determined by a

Global Positioning System receiver with at least 16 foot accuracy, and the direction of travel in terms of increasing or decreasing county log points. The Department will provide mapping information downloadable through Transportation Information Mapping System (TIMS) online LRS layer at https://gis.dot.state.oh.us/tims
Provides cellular capabilities for field data transport to website.
Provide GPS mapping system that is capable of real time (within 20 minute) tracking of the Department cloud DLS report format, Table 641.04-2 requirements, and color coded alarms for a 20 percent deficiency in film thickness, bead rate, and wet reflective optic rate.
Send report to the Engineer or their designated representative by email at 7:00 AM the day after the work is completed.
Transfer raw data collected by the DLS directly to a secure server.
Provide flagging of data entered manually.
Ensure the DLS manufacturer provides a Department login with direct access to stored data summary on a secure password protected website.

Record as a separate DLS report line entry the Table 641.04-2 information for each route section marked, when the length of center line, lane line and edge line marking exceeds 0.5 mile (0.8 km) of continuous line equivalent. A route section is defined as one direction of a contiguous section of highway (without breaks) with the same route number designation. Continuous line equivalent is defined as 0.5 mile (0.8 km) of edge line, 0.25 mile (0.4 km) of double yellow center line, or 2 mile (3.2 km) of lane line. DLS documentation is not required for center line, lane line, and edge line markings of 0.5 mile (0.8 km) continuous line equivalent or less, and for channelizing lines of any length.

If the DLS equipment fails, finish that day's work only and resume when the DLS equipment is working. Provide documentation of the corrective work that was required to make the DLS and ancillary equipment operational. Repair the DLS before resuming work. Document the application and material usage quantities from the time of the DLS failure and make calculations to determine the gallons or pounds of binder per mile and pounds of beads, wet reflective optics, or both per mile.

The Department will provide a standard DLS long report form (CA-T-9, CA-T-10, CA-T-11, or CA-T-12), that prescribes the correct DLS report format and required content prior to beginning of work. Ensure the DLS records start time once the project or report line is started and the first gun is on. In addition to the Department DLS report format required content, document in accordance with the DLS at least the Table 641.04-2 requirements.

Table 641.04-2 Additional DLS Report Requirements.

Measure and record application vehicle speed to nearest 0.1 MPH (0.16 km/h),
Measure and record weight or volume of material used by color,
Measure and record weight or volume of material used by line type,
Measure and record weight or volume of material used by line width.

The DLS must store data and export to a secure server on a daily basis. Ensure the data is in Microsoft Excel format, or a comma or spaces delimited text file adequate for insertion into a computerized spreadsheet. Ensure the DLS manufacturer provides the Engineer a direct access login to the data being exported to the secure server. Provide data in the Department cloud DLS report format. Ensure the data is available to the Engineer within 24 hours of the pavement marking work and may be retrieved by the Engineer or designated field personnel for inclusion with documentation reporting. Ensure the electronic records are completed in their final form prior to the records being removed from the pavement marking equipment.

Ensure each DLS has at least an annual calibration of all mechanical and electrical components and its software function and output confirmed by the DLS manufacturer or their designated representative. Ensure evidence of the annual calibration is carried by a signed and dated stamp or seal affixed to the inside of the driver's door of each striper.

A. Traffic Paint, Polyester, Epoxy. Ensure the cab mounted display shows the actual material application rate and film thickness.

B. Thermoplastic, Spray Thermoplastic. Ensure the cab mounted display shows the actual bead application rate.

Use application equipment that includes a kettle for melting the thermoplastic material and maintaining it at the proper temperature. Equip the kettle with a thermostat to control the temperature of the melted thermoplastic material and to prevent overheating. Use equipment that continuously mixes and agitates the molten thermoplastic material. Ensure that the parts of the equipment that convey the thermoplastic material from the kettle to the application point maintains it at the required temperature.

Attach an automatic dispenser for glass beads, wet reflective optics, or both to the equipment so that the beads, optics, or both are immediately and uniformly dispensed over the marking surface. Equip the dispenser with an automatic cut-off control synchronized with the cut-off of the thermoplastic material.

641.05

On page 629, **Add** the following after the first sentence in the first paragraph:

Before applying marking material, the pavement surfaces must be completely dry. Test for moisture using the following test procedures, if needed as directed by the Engineer:

MOISTURE TEST

Tape a 12 inch (300 mm) square sheet of thin plastic to the road surface, sealing all edges.
After 15 minutes examine the side of the sheet facing the road surface.
If more than a sparse amount of moisture is present, do not apply marking material.

641.08.H.

On page 631, **Add** the following sentence at the end of the paragraph:

H. Symbol Markings. Place all railroad, school, bicycle and handicap symbol markings using white markings. A railroad marking includes the 16 inch (400 mm) crossbuck, two 72 inch (1.8 m) "R"s, two 24 inch (600 mm) transverse lines, and a stop line. A school marking includes the word "SCHOOL" and two 16 inch (400 mm) transverse lines. A shared lane marking includes the bicycle symbol and two sharrows. A bicycle crossing symbol includes the bicycle symbol and the word "XING".

641.11

On page 632, **Revise** the header to the following:

641.11 Unsatisfactory Materials and Deduction for Deficiency.

641.11

On page 632, **Replace** the second paragraph with the following:

The Department will consider materials unsatisfactory if conformance to at least one of the following:

A. Deficiency of marking material or glass beads is 20 percent or more.

B. Materials applied outside the temperature or application requirements in Items 642, 643, and 646 without written approval of the Engineer.

C. Markings not meeting the performance parameters contained in Supplement 1047, Appendices C, D, E, ~~and~~ G, or a combination of the Appendices.

1. Numerical rating of 8 or lower for Daytime Color (Appendix C)
2. Composite rating of 8 or lower for Night Visibility (Appendix D)
3. Numerical rating of 9 or lower for Durability (Appendix E)
4. Less than the initial measurement for Retroreflectivity (Appendix G)

Replace pavement markings and glass beads in all sections determined to be unsatisfactory by retracing over the unsatisfactory markings at the full thickness specified in Items 642, 643 and 646.

641.12

On page 632, **Add** the following sentence between the second and third sentences:

The Department will measure Two-Way Left Turn Arrow as one pair of two opposing left turn arrows.

642.02

On page 633, **Add** the following to the to the end of the first sentence of the first paragraph:

"in accordance with supplement 1089."

642.02

On page 633, **Revise** the third sentence of the second paragraph to the following:

Samples not meeting the manufacturer's production ranges will require the Contractor to re-apply, at his expense, any markings using that sample.

642.04

On page 633, **Add** the following after the first sentence of the second paragraph.

Furnish the Engineer documentation the material being delivered is within the manufacturer's recommended shelf life from the date of manufacture.

643.02

On page 636, **Add** the following to the to the end of the first sentence of the second paragraph:
"in accordance with supplement 1089."

643.04

On page 636, **Delete** the first sentence of the third paragraph.

~~After sampling of resin is completed, transfer the entire contents of each material container to the striper tanks.~~

644.01

On page 638, **Add** the following to the first paragraph:

644.01 Description. This work consists of furnishing and applying screed extruded or ribbon gun thermoplastic pavement markings according to Item 641, 740.01, 740.04, 740.09, and the additional requirements specified below.

644.02

On page 638, **Add** the following to the to the end of the first sentence of the second paragraph:
"in accordance with supplement 1089."

644.03

On page 638, **Replace** the entire section with the following:

Equipment. When using thermoplastic pavement marking trucks, equip all thermoplastic pavement marking trucks for center line, lane line and edge line markings with a computerized Data Logging System (DLS) conforming to 641.04 when the length of marking exceeds 0.5 mile (0.8 km) of continuous line equivalent. A DLS is not required for markings applied with hand carts.

Ensure that the application equipment applies lines with a square end and can apply broken lines. Furnish application equipment for applying markings that consists of dies of varying widths to produce different widths of lines. Do not use pans, aprons, or similar devices that the die overruns.

Use equipment that ensures uniformity in the thickness and width of lines. Use equipment that forms lines 12 inches (300 mm) wide or less by one application pass, and lines wider than 12 inches (300 mm) by no more than two passes. Do not allow individual passes to overlap or to be separated by a gap greater than 1/4 inch (6 mm).

644.04

On page 640, **Replace** the fifth full paragraph with the following:

The Department will consider materials unsatisfactory if conformance to at least one of the following:

A. Deficiency of thermoplastic marking material or glass beads is 20 percent or more.

B. Materials applied outside the temperature or application requirements in 644.04 without written approval of the Engineer.

C. Markings not meeting the performance parameters contained in Supplement 1047, Appendices C, D, E, and G.

1. Numerical rating of 8 or lower for Daytime Color (Appendix C)
2. Composite rating of 8 or lower for Night Visibility (Appendix D)
3. Numerical rating of 9 or lower for Durability (Appendix E)
4. Less than the initial measurement for Retroreflectivity (Appendix G)

Replace thermoplastic markings and glass beads in all sections determined to be unsatisfactory by entirely removing the unsatisfactory thermoplastic material by grinding as per 641.10 and then reapplying at the full thickness specified in 644.04. Do not apply a layer of sprayed thermoplastic to sections determined to be unsatisfactory to achieve the required thickness.

646.02

On page 643, **Add** the following to the to the end of the first sentence of the second paragraph:
"in accordance with supplement 1089."

647.01

On page 648, **Add** the following to the first sentence of the first paragraph after "740.08":
, 740.09

647.02

On page 648, **Add** the following sentence after the second sentence:
Glass beads, Type E 740.09

647.04.B.

On page 649, **Replace** the second sentence of the second paragraph with the following:
Drop-on glass beads are required.

647.04.C.

On page 649, **Replace** the second sentence of the second paragraph with the following:
Drop-on glass beads are required.

647.05

On page 649, **Add** "647 Each Speed Measurement Marking, Type B125" after "647 Each Shared Lane Marking".

648.02

On page 650, **Add** the following to the to the end of the first sentence of the second paragraph:
"in accordance with supplement 1089."

648.03

On page 650, **Replace** the entire section with the following:

Equipment. Equip all striping equipment for center line, lane line and edge line markings with a computerized Data Logging System (DLS) conforming to 641.04 when the length of marking exceeds 0.5 mile (0.8 km) of continuous line equivalent.

Ensure that the application equipment applies lines with a square end and can apply broken lines. Furnish application equipment for applying spray thermoplastic markings that produces different widths of lines.

Use equipment that ensures uniformity in the thickness and width of lines. Use equipment that forms lines 8 inches (200 mm) wide or less by one application pass.

648.04

On page 651, **Delete** the second sentence in the first paragraph and the table that follows the first paragraph:

~~Test for moisture using the following test procedures, if needed as directed by the Engineer:~~

~~**MOISTURE TEST**~~
~~Tape a 12 inch (300 mm) square sheet of thin plastic to the road surface, sealing all edges.~~
~~After 15 minutes examine the side of the sheet facing the road surface.~~
~~If more than a sparse amount of moisture is present, do not apply spray thermoplastic.~~

648.05

On page 652, **Replace** the sixth paragraph with the following:

The Department will consider materials unsatisfactory if conformance to at least one of the following:

A. Deficiency of spray thermoplastic marking material or glass beads is 20 percent or more.

B. Materials applied outside the temperature or application requirements in 648.05 without written approval of the Engineer.

C. Markings not meeting the performance parameters contained in Supplement 1047, Appendices C, D, E, and G.

1. Numerical rating of 8 or lower for Daytime Color (Appendix C)
2. Composite rating of 8 or lower for Night Visibility (Appendix D)
3. Numerical rating of 9 or lower for Durability (Appendix E)
4. Less than the initial measurement for Retroreflectivity (Appendix G)

Replace or reapply spray thermoplastic markings and glass beads in all sections determined to be unsatisfactory.

661.02

On page 676, **Revise** the first paragraph second sentence with the following.

Provide plant materials that are sourced from nurseries licensed by the Ohio Department of Agriculture or state equivalent, healthy specimens, typical of their species or variety, and that exhibit a normal habit of growth as set forth in the most current edition of the American Standard for Nursery Stock (ANSI Z60).

661.06

On page 676, **Add** the following sentence in the first paragraph after the second sentence.

Stockpiled materials can be inspected by ODA with advanced notice.

700.00

On Page 687 **Add** the following table row after specification 409:

421	Microsurfacing Emulsion and Tack Coat	CSS-1hM: Certified Material. At the refinery or source as directed by OMM. Project and/ or Plant Sample per 421.12. Non-certified material is sampled and approved by OMM before use.	CSS-1hM: Certified material: Submit to OMM. Non-certified material: Submit to OMM. Do not use until approved.

		421 Tack Coat per 421.09: Project and/ or Plant Sample per 421.12. Tag and ship sample to the District lab for OMM Asphalt section testing. Document in SM.	421 Tack Coat per 421.09. Dilute per 421.09. Do not use non-certified material to dilute.

700.00

On page 689, **Revise** the table line with the following:

661	Planting Trees Shrubs, Perennials and Vines	Only accept materials from licensed nurseries. See OMM website for list of Ohio Department of Agriculture list of licensed suppliers. Inspect material for condition. Plant material should be sealed until used. Document in SM .	Final acceptance should take place after period of establishment. Notify District Testing if rejecting material.

700.00

On Page 689, for Spec. Number 701.11, **Replace** "Ground Granulated Blast Furnace Slag (GGBFS)" with "Slag Cement".

700.00

On Page 689, for Spec. Number 701.13 **Replace** "Fly Ash" with "Fly Ash/Natural Pozzolan".

700.00

On Page 689 **Add** the following to the 701.01 row:

701.01 701.02 701.04 701.05 701.07 701.09 701.15	Cement, Hydraulic ASTM Types I, IA, II, III, IL, Masonry Type IS(<25)	Verify manufacturer on Concrete Plant Batch Ticket is on Certified List for Supplement 1028 maintained by OMM. Verify material against bill of lading description. Document in SM.	

700.00

On Page 690 **Replace** the second full table row with the following:

702.02 702.03 702.04 702.07 702.12 702.13	Cut Back Asphalt Cut Back Asphalt Emulsions Emulsified Asphalts	Certified material: At the refinery or source as directed by OMM. Project and/ or Plant: One sample per each 25,000 gallons. None for less than 300 gallons.	Certified material: Submit to OMM. Non-certified material: Submit to OMM. Do not use until approved.

	Asphalt Emulsion MWS Non-Tracking Asphalt Emulsion SBR Asphalt Emulsion	Non-certified material: Will be sampled and approved by OMM before use. 702.13 – Provide Certified Test Data per specification requirements.	

700.00

On Page 690 **Add** the following table row after the third full table row:

702.08	Cold Liquid-Applied Elastomeric Waterproofing Membrane	Provide Certified Test Data per specification requirements.	

700.00

On Page 693 **Add** the following row after 705.26:

705.27	Carbonate Micro-fines	Verify manufacturer on Concrete Plant Batch Ticket is on Certified List for S 1016 maintained by OMM. Verify material against bill of lading description. Document in SM

700.00

On page 696, **Replace** 707.11 with the following:

707.11	Polymer-precoated corrugated steel spiral rib pipe	Products will be supplied by a source on the Certified List for S 1019 maintained by OMM. Receive with TE-24. Check dimensions and markings. Document in SM.	Notify District Testing and OMM Structural Welding and Metals section, if rejecting material because material non-performs or looks defective during use.

700.00

On page 703, **Replace** 712.11 with the following

712.11	Temporary Erosion Control Mats Material [Types A through I]	Inspect material for condition and dimension. ~~Manufacturer's certified test data required for acceptance.~~ Field Acceptance item.	Notify District Testing if rejecting material.

700.00

On page 705, **Replace** 725.11 B, 725.11 E, 725.11 F, and 725.11 G with the following.

725.11 B	Lamps for Luminaires	Inspect for condition, markings and conformance to plan requirements. Document in SM.	Notify District Testing if rejecting material. If material non-performs or looks defective during use

			notify District Testing and OMM.
725.11 E	Conventional Luminaires for High Intensity Discharge Lamps (including Optical system, lamp, ballast and housing)	Inspect for condition, dimension, markings and conformance to plan requirements. Document in SM.	Notify District Testing if rejecting material. If material non-performs or looks defective during use notify District Testing and OMM.
725.11 F	Wall Mounted Underpass Luminaires (including Optical system, lamp, ballast and housing)	Inspect for condition, dimension, markings and conformance to plan requirements. Document in SM.	Notify District Testing if rejecting material. If material non-performs or looks defective during use notify District Testing and OMM.
725.11 G	High Mast/Low Mast Luminaire (including Optical system, lamp, ballast and housing)	Inspect for condition, dimension, markings and conformance to plan requirements. Document in SM.	Notify District Testing if rejecting material. If material non-performs or looks defective during use notify District Testing and OMM.

700.00

On page 706, **Delete** the following:

~~725.20~~	~~Multiple Cell Conduit and Fittings~~	~~Verify type and brand name of material is on QPL at the time of use.~~ ~~Inspect for condition, dimension, markings and conformance to plan requirements.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ ~~If material non-performs or looks defective during use notify District Testing and OMM.~~

700.00

On page 709, **Add** the following after 730.23:

730.24	Digital Printing	No field acceptance requirements.- part of 730.19,191,192 or 193 items.	

700.00

On page 709, **Revise** the table line with the following:

732.06	Pedestrian Pushbuttons and Accessible Pedestrian Pushbutton	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non-performs or looks defective during use

			notify District Testing and OMM.

700.00

On page 709, **Delete** 732.07 A from the table:

~~732.07.A~~	~~Loop Detector Units NEMA TS 1~~	~~Verify type and brand name of material is on TAP at the time of use.~~ Inspect for conformance to dimension and ~~condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ If material non-performs or ~~looks defective during use notify District Testing and OMM.~~

700.00

On page 710, **Delete** 732.08 from the table:

~~732.08~~	~~Loop Detector Units, Delay and Extension Type~~	~~Verify type and brand name of material is on TAP at the time of use.~~ ~~Inspect for conformance to dimension and condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ ~~If material non-performs or looks defective during use notify District Testing and OMM.~~

700.00

On page 711, **Delete** 733.02 E, 733.02 F, and 733.03 A from the table:

~~733.02. E~~	~~Controller Unit Type 2070L~~	~~Verify type and brand name of material is on TAP at the time of use.~~ Inspect for conformance to dimension and ~~condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ If material non-performs or ~~looks defective during use notify District Testing and OMM.~~
~~733.02. F~~	~~Controller Unit Type 2070E~~	~~Verify type and brand name of material is on TAP at the time of use.~~ Inspect for conformance to dimension and ~~condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ If material non-performs or ~~looks defective during use notify District Testing and OMM.~~

~~733.03.A~~	~~Cabinet Type TS 1~~	~~Verify type and brand name of material is on TAP at the time of use.~~ Inspect for conformance to dimension and ~~condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ If material non-performs or ~~looks defective during use notify District Testing and OMM.~~

700.00

On page 711, **Delete** 733.02.C, 733.02.D, 733.02.G, and 733.06 from the table:

~~733.02.C~~	~~Controller Unit Type TS2/A1~~	~~Verify type and brand name of material is on TAP at the time of use.~~ ~~Inspect for conformance to dimension and condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ ~~If material non-performs or looks defective during use notify District Testing and OMM.~~
~~733.02.D~~	~~Controller Unit Type TS2/A2~~	~~Verify type and brand name of material is on TAP at the time of use.~~ ~~Inspect for conformance to dimension and condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ ~~If material non-performs or looks defective during use notify District Testing and OMM.~~
~~733.02.G~~	~~Controller Unit Type 2070LX~~	~~Verify type and brand name of material is on TAP at the time of use.~~ ~~Inspect for conformance to dimension and condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ ~~If material non-performs or looks defective during use notify District Testing and OMM.~~
~~733.06~~	~~Controller, Master, Traffic Responsive~~	~~Assure the same manufacturer as the supplied controller unit 733.02.~~	~~Notify District Testing if rejecting material.~~

700.00

On page 711, **Revise** 733.03 D as follows:

733.03 D	Cabinet Type 336L	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non-performs or looks defective during use notify District Testing and OMM.

700.00

On page 711, **Delete** 733.03 E:

~~733.03.E~~	~~Cabinet Type 336~~	~~Verify type and brand name of material is on TAP at the time of use.~~ Inspect for conformance to dimension and ~~condition.~~ ~~Document in SM.~~	~~Notify District Testing if rejecting material.~~ If material non-performs or ~~looks defective during use~~

			~~notify District Testing and OMM.~~

700.00

On page 711, **Revise** 733.04 A as follows:

733.04 A	Cabinet Riser for ~~TS 1 –~~ TS-2 cabinet	Field inspect for 1/4 aluminum thickness and accept.	Notify District Testing if rejecting material.

700.00

On page 712, **Revise** 733.07 to the following:

733.07	Remote Monitoring Station	Compatible with the supplied ~~733.02 and 733.06~~ Supplemental Specification 809.10.G unit.	Notify District Testing if rejecting material.

700.00

On page 712, **Revise** 740.09 A to the following:

740.09.A	Glass Beads – for 740.02	Verify material is on Approved List maintained by OMM. Accepted with TE-24. Inspect container for appropriate markings. Inspect material for uniform consistency. Document in SM.	

700.00

On page 712, **Revise** 740.09 B to the following:

740.09.B	Glass Beads – for 740.03	Verify material is on Approved List maintained by OMM. Accepted with TE-24. Inspect container for appropriate markings. Inspect material for uniform consistency. Document in SM.	

700.00

On page 712, **Revise** 740.09 C to the following:

740.09.C	Glass Beads – for 740.04	Verify material is on Approved List maintained by OMM. Accepted with TE-24. Inspect container for appropriate markings. Inspect material for uniform consistency. Document in SM.	

701.00

On Page 714 **Replace** section 701.00 with the following:

701.00 Acceptance. Provide cements meeting 701.01, 701.02, 701.04, 701.05, 701.07 and 701.09 and certified according to Supplement 1028; fly ash or natural pozzolan meeting 701.13 and certified according to Supplement 1026; slag cement meeting 701.11 and certified according to Supplement 1034; and micro silica meeting 701.10 and certified according to Supplement 1045, without prior sampling, testing and approval by the Department. Lists for certified cement, fly ash, natural pozzolan, slag cement and micro silica sources are maintained by the Laboratory.

701.11

On Page 714 **Replace** section 701.11 with the following:

701.11 Slag Cement. Provide slag cement according to ASTM C 989, Grade 100 minimum.

701.13

On Page 714 **Replace** the first paragraph of section 701.13 with the following:

701.13 Fly Ash or Natural Pozzolan for Use in Portland Cement Concrete. Provide fly ash or natural pozzolan according to ASTM C 618, Class C, F, or N, except ensure a maximum loss on ignition (LOI) of 3 percent for fly ash and 5 percent for natural pozzolan.

701.15

On Page 714, **ADD** the following after the last paragraph of 701.13:

701.15 Portland-limestone Cement, Type IL. Provide portland-limestone cement according to ASTM C 595, Type IL. The maximum allowable limestone content is fifteen percent by mass. Do not use Type IL when Type II is specified.

702

On Page 715 **REPLACE** the 1ST paragraph of 702 with the following:

Acceptance. Asphalt binders 702.01 and liquid asphalts 702.02, 702.03, ~~and~~ 702.04, 702.07, 702.12, 702.13, and 702.16 may be acceptable for shipment to and immediate use in construction projects. Acceptance is according to Supplement 1032 . Material will meet specification requirements and no tolerances are given for material falling out of specification requirements. The remaining materials may be acceptable for shipment to and immediately used in construction projects based on meeting the requirements of Department TE-24, QPL, or certified test data based on what each material requires.

702.01

On Page 715, **Replace** the first sentence with the following:

General. According to AASHTO M 320-17 Table 1 and Supplement 1105 except as follows.

702.01

On Page 715 **REPLACE** the 4th paragraph of 702.01 with the following:

Materials and Manufacture. Replace the requirements of AASHTO M 320-17 Table 1 Section 5 "Materials and Manufacture" Section with the following:

702.01

On Page 716, **Add** before the next-to-last sentence of the first full paragraph the following:

Do not use paraffin wax, organic wax, or like materials.

702.01

On Page 716, **Add** the following sentence after the fourth sentence in the second full paragraph (5.3):

Do not use recycled engine oil bottoms (REOB), vacuum tower asphalt extender (VTAE), or like materials as modifiers.

702.01

On Page 716 **Replace** the sixth full paragraph with the following:

5.7 PAV aged all PG grades at 212 ºF (100 ºC).

702.09

On Page 721 **Add** new section 702.09 before 702.12 as follows:

702.09 Hot Applied Asphaltic Joint Adhesive. Provide hot applied asphaltic joint adhesive meeting the following requirements:

Table 702.09-1

Test	Description	Requirement
ASTM D 3236	Brookfield Viscosity @ 400°F (205°C)	4,000 - 10,000 CP
ASTM D 5329	Cone Penetration @ 77°F (25°C)	60-100 dmm
ASTM D 5329	Flow @ 140°F (60°C)	5 mm Max.
ASTM D 5329	Resilience @ 77°F (25°C)	30% Min.
ASTM D 113	Ductility @ 77°F (25°C)	30 cm Min.
ASTM D 113	Ductility @ 39.2°F (4°C)	30 cm Min.
ASTM D 5329	Tensile Adhesion @ 77°F (25°C)	500% Min.
AASHTO T 53	Softening Point	170°F Min.
ASTM D 5329	Asphalt Compatibility	Pass

Furnish hot applied asphaltic joint adhesive according to the Department's TE-24.

702.12

On Page 721, **Replace** the section with the following:

702.12 Non-Tracking Asphalt Emulsion. Provide certified non-tracking asphalt emulsion material meeting Table 702.12-1 and Supplement 1128 and Supplement 1032. Emulsion will comply with all specification requirements for at least 30 days after sample date.

Table 702.12-1

Tests on emulsion, AASHTO T 59, unless otherwise designated:	
Viscosity, Saybolt Furol at 77 °F (25 °C) (SFS)	20 to 100
Storage Stability Tests, 24-hr (% difference), max.	1.0
Settlement tests, 5-day (% difference), max.	5.0
Sieve Tests (%) (Distilled Water), max.	0.30
Distillation, Residue % solids, min. [1]	50
Oil distillate, %, max.	3

[1] Products may use residual by evaporation to perform residual and may use the material to perform residual tests but must be submitted during approval process in S-1128. Will be required to perform residual by distillation to obtain oil distillate %.

702.16

On Page 722, **Replace** the entire section with the following:

702.16 Polymer Emulsified Binder. Material will meet specification requirements of the table below.

TABLE 702.16 POLYMER EMULSIFIED BINDER

Tests on Emulsion (AASHTO T 59**):**	**Type A (b)**	**Type B (c,g)**	**Type C (h)**
Saybolt Furol Viscosity (g)	120-550 (50 ºC)	20-100 (25 ºC)	20-100 (25 ºC)
Storage stability, 24 hrs., % difference, max (a)	1	1	1
Demulsibility, 35 ml of 0.8% Dioctyl Sodium Sulf., min	50	60	
Demulsibility, 35 ml of 0.02N, CaCl2, %, min		60	
Particle Charge Test	Positive		Positive
Sieve test, (distilled water), %, max	0.1	0.05	0.10
Distillation to 177 ºC, residue % solids (d)	66	63	62
Oil distillate, %, max	2	2	
Tests on Distillation Residue:			
Penetration, 100g, 5 sec @77 ºF(25ºC) AASHTO T 49	70-125	90-150	40-90
Softening point, º C, min AASHTO T 53	57		60
Solubility, %, min AASHTO T44 or ASTM D7553 (i)	97.5	97.5	97.5
Elastic Recovery, 50 ºF (10º C), %, min AASHTO T 301, (e),(f)	60	58	50
Ductility, 25 °C, 5 cm/min, (cm), min. AASHTO T 51			40

(a) After standing undisturbed for 24 hours, the surface will show no white, milky colored substance, but will be a smooth homogeneous color throughout.
(b) CRS-2P, test within 20 days of project sampling. Limits for both certified source and project samples.
(c) CRS-1P and HFRS-1P, test within 20 days of project sampling. Limits for both certified source and project samples.
(d) See Supplement 1013. For Type C if natural latex is used, use the Oven Evaporation method in AASHTO T 59 in place of distillation and use this residue for further testing.
(e) Straight molds. Hold at test temperature for 90 minutes. Place in ductilometer and elongate 20 cm at 5 cm/min. Hold for 5 minutes and cut. After 1 hour retract the broken ends to touch and note elongation in cm (X) to the nearest 0.01cm. Percent Recovery = ((20-X)/20) x 100. Report elastic recovery to nearest 0.1%.
(f) SBR, SBS, & SB
(g) Minimum of 70 SFS for project acceptance
(h) CSS-1hM, test within 30 days of sampling. Limits for both certified source and project samples. Do not use port addition of the polymer to the emulsified asphalt. Include the percent residue on the Bill of Lading.
(i) On base asphalt only

702.17 B.

On Page 724 **REPLACE** the 2nd full paragraph with the following:

The option for using premixed and prepackaged Type II crack sealant is permitted provided (1) the fibers and the fiber binder are according to the requirements as shown and, (2) the fiber binder is according to the manufacturer's specifications, and (3) must be on Department's QPL. Furnish certified test data from the fiber binder manufacturer annually to OMM, and when requested by OMM. Furnish a letter of certification with each shipment stating that the material complies with specification requirements.

702.17.E.

On page 725, after 702.17.D., **Add** the following:

E. Type V Crack Sealant. Provide a prepackaged, preapproved hot-applied asphalt mastic sealant meeting ASTM D8260-20, Type 2. Provide certified test data to the Engineer

Furnish materials according to the Department's QPL.

703.04.A

On page 731, **Replace** the last sentence in the 2nd paragraph with the following:
Crushed Steel Slag (OH, EAF or BOF) conforming to 703.01.E and 440.02 may be used for coarse and fine aggregate in asphalt concrete base used in flexible pavements.

703.05.A.1

On page 732, **Replace** the paragraph with the following:

1. Provide fine aggregate consisting of natural sand or sand manufactured from stone, gravel, ACBFS or, for intermediate courses only, steel slag (OH, EAF or BOF) conforming to 703.01.E and 440.02.

703.05.B.1

On page 732, **Replace** the paragraph with the following:

1. Provide coarse aggregate consisting of CCS, crushed ACBFS, washed gravel, or for intermediate courses only, steel slag (OH, EAF or BOF) conforming to 703.01.E and 440.02.

703.05.C

On page 733, **Add** the following sentence to the end of the paragraph:
Should the sample contain less than 10 percent of any of the sizes specified in AASHTO T104 Section 5.1, that individual size shall not be held to the above maximum loss requirement.

705.01

On page 747, **Replace** the section with the following:

705.01 Glass Fiber Reinforced Polymer (GFRP) Dowel Bars. Furnish round and straight fiber reinforced polymer (GFRP) dowel bars. Ensure resin used to manufacture the GFRP bars consists of an epoxy vinyl ester resin. Ensure the glass fiber used is ECR glass which meets ASTM D578. Ensure that the minimum glass fiber content is 70 percent by weight. Furnish dowel bars of a type meeting the dimensional requirements of the standard construction drawings. Provide certified test data according to 101.03 with each shipment.

705.28

On page 757, **Add** the following section:

705.28 Glass Fiber Reinforced Polymer (GFRP) Deformed Bars. Furnish GFRP reinforcement according to ASTM D7957 except as noted. Furnish deformed bars of a type meeting the dimensional requirements of the standard construction drawings. Furnish certified material according to Supplement 1138.

The Mean Tensile Modulus of Elasticity limit (ASTM D7957 Table 1) shall meet or exceed 8700 ksi (60 GPa).

The Mean Ultimate Tensile Strain limit (ASTM D7957 Table 1) shall meet or exceed 1.4%.

The Tensile Modulus of Elasticity limit (ASTM D7957 Table 2) shall meet or exceed 8700 ksi (60 GPa).

The Ultimate Tensile Strain limit (ASTM D7957 Table 2) shall meet or exceed 1.4%.

The Minimum Guaranteed Ultimate Tensile Force (ASTM D7957 Table 3) shall be as follows:

Bar Designation No	Minimum Guaranteed Ultimate Tensile Force Kip (kN)
2 (M6)	6.1 (27)
3 (M10)	13.2 (59)
4 (M13)	27.6 (123)
5 (M16)	36.6 (163)
6 (M19)	51.9 (231)
7 (M22)	68.5 (305)
8 (M25)	89.9 (400)
9 (M29)	124 (550)
10 (M32)	138 (615)

705.29

On page 758, **Add** the following section:

705.29 Synthetic Fibers for use in Portland Cement Concrete. Provide Type III synthetic, non-metallic fibers in accordance with ASTM C 1116 and ASTM D7508 with the following exceptions:

1. Aspect Ratio – Length/Equivalent Diameter, min…….70 – 100
   max……100
2. Tensile Breaking Strength, min….....70,000 psi (482 MPa)
3. Modulus of Elasticity, min….....800,000 psi (5515 MPa)
4. Length: 1.5 inches (38 mm) to 2.25 inches (57 mm)
5. Dosage Rate: Minimum of 4 pounds per cubic yard (2.4 kg/m^3)

Test the synthetic fibers in accordance with ASTM C 1609 and ASTM C 1579 utilizing an AASHTO-accredited laboratory for portland cement concrete materials and in accordance with the following table:

Required Hardened Fiber Reinforced Concrete Properties

Physical Test	Specification	Requirement
Equivalent Flexural Strength Ratio ($R^{150}_{T,150}$)*	ASTM C 1609	Minimum of 25%
Crack Reduction Ratio (CRR)	ASTM C 1579	Minimum reduction >85%
*Test specimens when the concrete flexural strength at first crack (f_1) is a minimum of 600 psi. For 6 inch x 6 inch x 20 inch fiber reinforced beam the maximum required net deflection value of L/150 of the 18 inch span length is 0.12 inch.		

Furnish materials according to the Department's QPL.

706.05

On page 771, **Add** the following language to the beginning of the second paragraph:
Provide Shop Drawings according to 611.04 and

706.05

On page 772, **Replace** the second paragraph with the following:

7.1 For the following box sizes, span by rise, refer to ASTM C1577: 6x4, 5, 6; 7x4, 5, 6, 7; 8x4, 5, 6, 7, 8; 9x4, 5, 6, 7, 8, 9; 10x4, 5, 6, 7, 8, 9, 10; 11x4, 5, 6, 7, 8, 9, 10, 11; and 12x4, 5, 6, 7, 8, 9, 10, 11, 12 feet. For the following box sizes, span by rise, refer to SS940: 14x4, 5, 6, 7, 8, 9, 10; 16x4, 5, 6, 7, 8, 9, 10; 18x4, 5, 6, 7, 8, 9, 10; and 20x4, 5, 6, 7, 8, 9, 10 feet.

707.01

On page 788, **Replace** the table with the following:

Pipe			**Pipe-Arch**	
Diameter	**Wall Thickness**		**Size**	**Wall Thickness**
(inch)	**(inch)**		**(inch)**	**(inch)**
6	0.052			
8	0.064			
10	0.064			
12	0.064			
15	0.064		17 × 13	0.064
18	0.064		21 × 15	0.064
21	0.064		24 × 18	0.064
24	0.064		28 × 20	0.064
27	0.064			
30	0.064		35 × 24	0.064
33	0.064			
36	0.064		42 × 29	0.064
42	0.064		49 × 33	0.079
48	0.064		57 × 38	0.109
54	0.079		64 × 43	0.109
60	0.109		71 × 47	0.138
66	0.138		77 × 52	0.168
72	0.138		83 × 57	0.168
78	0.168			
84	0.168			

707.01

On page 789, **Replace** the first table with the following:

Pipe		Pipe-Arch	
Diameter	**Wall Thickness**	**Size**	**Wall Thickness**
(mm)	**(mm)**	**(mm)**	**(mm)**
150	1.32		
200	1.63		
250	1.63		
300	1.63		
375	1.63	430 × 340	1.63
450	1.63	530 × 380	1.63
525	1.63	610 × 460	1.63
600	1.63	710 × 510	1.63
675	1.63		
750	1.63	885 × 610	1.63
825	1.63		
900	1.63	1060 × 740	1.63
1050	1.63	1240 × 840	2.01
1200	1.63	1440 × 970	2.77
1350	2.01	1620 × 1100	2.77
1500	2.77	1800 × 1200	3.51
1650	3.51	1950 × 1320	3.51
1800	3.51	2100 × 1450	4.27
1950	4.27		
2100	4.27		

707.11

On page 792, **Revise** the following to:

707.11 Polymer-Precoated Corrugated Steel Spiral Rib Conduits. Provide conduits that have a center-to-center rib spacing of 7 1/2 inches (190 mm). Provide conduits and fittings according to AASHTO M 36, Type IR, with the following modifications:

6.1 Fabricate pipe from polymer-precoated, on both sides, steel sheet according to AASHTO M 246.

7.2.2The ribs shall conform to AASHTO M 196, Section 7.2.2.

7.7.1Reroll the ends of the individual pipe sections to form at least two annular corrugations on each end. Paint the rerolled end with zinc rich paint.

8.1.2 Ensure that the minimum wall thickness (coated) of steel pipe is as follows:

Pipe

Diameter (inch)	Wall Thickness (inch)		Diameter (mm)	Wall Thickness (mm)
18	0.064		450	1.63
21	0.064		525	1.63
24	0.064		600	1.63
30	0.064		750	1.63
36	0.064		900	1.63
42	0.064		1050	1.63
48	0.064		1200	1.63
54	0.079		1350	2.01
60	0.079		1500	2.01
66	0.109		1650	2.77
72	0.109		1800	2.77
78	0.109		1950	2.77
84	0.138		2100	3.51
90	0.138		2250	3.51

9.1 Coupling bands shall have annular corrugations.

9.2 Coupling bands shall conform to 707.01.

9.3 A bell and spigot joint according to ASTM A 760 (A760M) may be used with the following modifications:

9.3.1 These joints may be used for conduits ranging in size from 18 (450mm) to 48 (1200mm) inches in diameter.

9.3.2 Ensure the bell and spigot has a soil tight joint by use of a shop applied gasket on the bell end and a field applied gasket on the spigot end.

9.3.3 Provide a minimum of 0.064 (1.63mm) inch nominal sheet thickness or not more than two (2) nominal sheet thickness thinner than the thickness of the pipe to be joined.

14.1 Ensure that the certification and sampling conform to 707.01.

707.12

On page 793, **Replace** the table with the following:

Pipe

Diameter (inch)	Wall Thickness (inch)		Diameter (mm)	Wall Thickness (mm)
18	0.064		450	1.63
21	0.064		525	1.63
24	0.064		600	1.63
30	0.064		750	1.63
36	0.064		900	1.63
42	0.064		1050	1.63
48	0.064		1200	1.63
54	0.079		1350	2.01
60	0.079		1500	2.01
66	0.109		1650	2.77
72	0.109		1800	2.77
78	0.109		1950	2.77
84	0.138		2100	3.51
90	0.138		2250	3.51

707.62

On page 802, **Delete** the entire section.

707.65

On page 803, **Replace** the entire section with the following:

707.65 Corrugated Polypropylene Smooth Lined Pipe. Provide smooth lined corrugated polypropylene pipe, closed profile polypropylene pipe, couplings, and fittings according to AASHTO M 330, Type S or Type D.~~, with the following modification:~~

~~12.1 Provide a letter of certification to cover each shipment of material verifying that it meets specification requirements.~~

Only provide materials from manufacturers certified according to Supplement 1066.

707.69

On page 803, **Delete** the entire section:.

~~**707.69 Polypropylene Triple Wall Pipe.** Provide polypropylene triple wall pipe and fittings from 12 to 60-inch diameters according to AASHTO M 330 with the following modification:~~

~~12.1Provide a letter of certification to cover each shipment of material verifying that it meets specification requirements.~~

708.01

On Page 804, **Replace** the second paragraph with the following:

5.1 A green colorant approximately AMS-595A-34159.

708.02 B.1.f

On page 804, **Replace f.** with the following.

f. Color. Greenish gray, approximating AMS-595A-34159**,** visual comparison.

708.02 C.1.a

On page 805, **Replace a.** with the following.

a. Color. White, meeting or exceeding, AMS-595A-37875 according to ASTM E 1347.

708.02 D.1.a

On page 806, **Replace a.** with the following.

a. Finish, Specular gloss, ASTM D 523. Use AMS-595A-16440 Gray: 70 % minimum after 3000 hours weathering resistance. Color change less than 2.0 ΔE*, (C.I.E 1976 L*a*b*) ASTM D2244.

708.02.D.1.f

On page 806, **Replace f.** with the following:

f. Colors.

(1) Specified.[2]

Brown	AMS-595A, 10324
Green	AMS-595A, 14277
Blue	AMS-595A, 15526
[2] If not defined in the plans, the Engineer will specify from the list.	

(2) Elective. As specified on the plans.

709.00

On Page 808, **Replace** 709.00 in its entirety with the following:

709.00 Epoxy Coated Steel Reinforcement. Provide epoxy coated reinforcing steel according to ASTM A 775. Furnish certified material according to Supplement 1068.

Mechanical splices of epoxy coated steel reinforcement shall be in accordance with 709.19.

The following modifications apply to ASTM A775:

5.1 Ensure that steel reinforcing bars to be coated are deformed and conform to 709.01, 709.03, or 709.05, and are free of oil, grease, or paint.

5.2 Ensure that the coating material meets the requirements listed in Annex A1 and is a color that facilitates inspection of the installed bar.

8.3.1 Evaluate the adhesion of the coating by bending production coated bars around a mandrel of specified size according to the bending tables in ASTM A 615 or ASTM A 996 as applicable. Perform the bend test for adhesion of the coating at a uniform rate and ensure that it takes up to 90 seconds to complete. Place the two longitudinal deformations in a plane perpendicular to the mandrel radius and ensure that the test specimens are at thermal equilibrium between 68 and 86 °F.

12.1 Random sampling for ODOT's QA testing requires three 30-inch samples for each bar size delivered to ODOT projects.

14.1 Report of test results required.

Where reinforcing bar cages for prestressed concrete beams are fabricated by tack welding, patch the areas damaged by the tack welding according to ASTM A 775, Section 11, permissible Amount of Damaged Coating and Repair of Damaged Coating.

709.13

On Page 810, **Replace** the fourth paragraph with the following:

If the Contractor elects to use basket supports for positioning of the above dowel bars as specified in 451.09.B or as shown on the plans, provide a fusion-bonded epoxy coated basket dowel bar assembly. Repair uncoated areas with surface preparation and patching material equivalent to the original epoxy coating.

709.16

On Page 811, **Replace** 709.16 in its entirety:

709.16 Galvanized Steel Reinforcement. Provide galvanized steel reinforcement in accordance with ASTM A767, Class 1 or ASTM A1094. Furnish certified material according to Supplement 1068.

Galvanized steel reinforcement may be provided as an option to 709.00. Provide to the Engineer written notification and updated Plan sheets for the reinforcement bar lists identifying affected bars.

Mechanical splices of galvanized steel reinforcement shall be in accordance with 709.19.

The following modifications apply to ASTM A767:

5.1 Ensure that steel reinforcing bars to be galvanized are deformed and conform to 709.01, 709.03, or 709.05.

7.3.2 Fabrication after galvanizing: The Department will not accept reinforcement galvanized according to ASTM A767 to be fabricated after galvanizing.

8.1 Random sampling for ODOT's QA testing requires three 30-inch samples for each bar size delivered to ODOT projects.

9.2 All damaged coating shall be repaired in accordance with 711.02.

10.1 Report of test results required.

The following modifications apply to ASTM A1094:

5.1 Ensure that steel reinforcing bars to be galvanized are deformed and conform to 709.01, 709.03 or 709.05.

8.1 Random sampling for ODOT's QA testing requires three 30-inch samples for each bar size delivered to ODOT projects.

9.1 All damaged coating shall be repaired in accordance with 711.02.

10.1 Report of test results required.

709.17

On Page 811, **Add** the following new section:

709.17 Chromium Steel Reinforcement. Provide deformed chromium steel reinforcement in accordance with ASTM A1035, Type CS, Grade 100 unless otherwise specified in the Plans. Furnish certified material according to Supplement 1068.

Mechanical splices of chromium steel reinforcement shall be in accordance with 709.

The following modifications apply to ASTM A1035:

16.2 Report of test results required.

17.1 Random sampling for ODOT's QA testing requires three 30-inch samples for each bar size delivered to ODOT projects.

709.18

On Page 811, **Add** the following new section:

709.18 Stainless Steel Reinforcement. Provide deformed stainless steel reinforcement in accordance with ASTM A955, Grade 75, UNS Designations S31803, S32205, or S32304. Furnish certified material according to Supplement 1068.

Mechanical splices of stainless steel reinforcement shall be in accordance with 709.19.

The following modifications apply to ASTM A955:

19.2 Report of test results required.

20.1 Random sampling for ODOT's QA testing requires three 30-inch samples for each bar size delivered to ODOT projects.

709.19

On Page 811, **Add** the following new section:

709.19 Mechanical Splice Systems. Provide mechanical splice systems for concrete reinforcement with the following structural requirements:

A. The tensile capacity determined according to the ASTM A1034 Monotonic Tension Test, or similar, shall not be less than 125 percent of the specified yield strength of the bar in tension (Fy).

B. The total slip in the mechanical splice system determined according to the ASTM A1034 Slip Test, or similar, measured after preloading to 5% Fy, loading in tension to 50% Fy and relaxing to 5% Fy, shall not exceed the following:

Bar Size	Maximum Slip (in)
#4 - #6	0.020
#7 - #9	0.028
#10 - #11	0.036
#14	0.048
#18 and larger	0.060

Material and coating for the mechanical splice systems shall be similar and compatible to the spliced reinforcement. Furnish material from the Approved List certified according to Supplement 1134.

Random sampling for ODOT's QA testing requires three mechanical splice samples and six 30-inch long bar samples for each bar size spliced on an ODOT project.

710.06

On page 815, **Replace** the first sentence of the first paragraph with the following:

Furnish deep beam rail according to AASHTO M 180, Type II or VI, Class A, with the following modifications:

710.12

On page 816, **Revise** the first paragraph with the following.

710.12 Square-Sawed and Round Guardrail Posts. Furnish pressure treated sawed posts of a timber grade in accordance with AASHTO M 168, 710.14, and 712.06. Furnish round guardrail posts according to 710.12, 710.14, and 712.06. Cut posts from growing timbers that are free from unsound or loose knots and rot and from injurious or excessive shake, and season checks that exceed 1/4 inch (6 mm) in width.

710.12

On page 816, **Delete** the last paragraph.

~~Furnish square sawed posts that are free from injurious cross grain and sapwood.~~

710.14

On page 817, **Revise** the first paragraph with the following.

710.14 Pressure Treated Guardrail and Fence Posts, Braces, and Blocks. Furnish pressure treated guardrail and fence posts, braces, and blocks according to AASHTO M 133 and 710.11, 710.12, and 712.06.

710.16

On page 817, **Revise** the first paragraph with the following.

710.16 Guard Posts. Furnish pressure treated wood posts according to 710.14. Furnish posts that are either sawed 5 by 6 in (125 by 150 mm) in cross section or 5 1/2 in + 1/2 in (138 mm) diameter round when measured 30 inches (0.75 m) from the top. Furnish posts that are 5 feet, 3 inches (1.6 m) in length and are embedded such that 30 inches (0.75 m) remains exposed. Ensure that the center-to-center spacing is spaced at 6 feet (1.8 m) intervals, unless otherwise shown on the plans.

712.06.E

On page 827, **Revise** the first and second paragraphs with the following.

E. Incising. Incise Douglas Fir lumber 3 inches (75 mm) or more thick on all four sides. Incise lumber less than 3 inches (75 mm) thick on the wide faces only, except as shown on the plans.

Incise Douglas fir with a minimum dimension of 2 inches (50 mm) using a suitable power-driven machine before treatment. Southern Yellow Pine is not required to be incised.

711.23

On Page 823, **Replace** the next to last sentence of the third full paragraph with the following:

Minimum thickness for the internal plates is 0.1046 inch (12 Gauge).

712.06.F

On page 827, **Replace** the first paragraph with the following.

F. Amount of Preservative. Pressure preservative treat all species of structural timber, lumber, piling, posts, and blocks in accordance with the appropriate AWPA U1 Commodity Standard or AASHTO M 133.

712.06.H

On page 828, **Revise** the [a] section below the table with the following.

[a] Sizes shown are nominal dressed sizes

The sweep must not exceed .08 foot in 10 feet.

Sawn wood sign posts must be graded per the following:

Southern Pine Inspection Bureau (SPIB) Standard Grading Rules

Western Wood Products Association (WWPA) Standard Grading Rules

West Coast Lumber Inspection Bureau (WCLIB) Standard Grading Rules

Posts must be treated per current AASHTO M 133: Preservatives and Pressure Treatment Processes for Timber standards and AWPA U1 Commodity Specification A.

Douglas fir and Hem-Fir posts must be incised prior to treatment.

Inspection shall be in accordance with AWPA M2.

Quality control shall be in accordance with AWPA M3.

Care and field treatment of the posts shall be in accordance with AWPA M4.

712.12

On page 833, **Add** the following to the section:

712.12 Tied Concrete Block Mat. Furnish materials tested according to ASTM D6460 with a minimum un-vegetated shear stress value of 12 psf with Type 1 Underlayment. The Department will determine acceptance based on independent third-party test data. Furnish materials with the following underlayment options:

Type 1 Underlayment: Temporary Erosion Control Mat

Type 2 Underlayment: Temporary Erosion Control Mat and Turf Reinforcing Mat

Furnish products according to the Department's QPL.

712.16

On page 835, **Insert** Item 712.16 after the last paragraph of Item 712.15:

712.16 Prefabricated Geocomposite Drain (PGD). Furnish Prefabricated Geocomposite Drain (PGD) consisting of a drainage core with geotextile fabric bonded to one side. Use drainage core material consisting of a preformed, stable, polymer plastic material with a cusped or geonet structure. Use drainage core that supports the geotextile and provides a bonding surface for the geotextile at intervals not exceeding 1-1/8 inches (29 mm) in any direction. Supply core that provides at least 14 square inches per square foot of flat area in contact with the geotextile.

Furnish a geotextile fabric composed of over 85% of polyester, polypropylene, polyolefin, or polyamide fibers by weight, that are formed into a stable network to ensure the performance during handling, installation, and service life. Use geotextile fabric that is resistant to chemical attack, rot, and mildew. Use geotextile fabric that is free of treatments or coatings that would adversely change the hydraulic properties of geotextile after installation. Furnish PGD that has the geotextile fabric covering the full length of the drainage core and has minimum 3 inch (76 mm) wide flaps/flanges of fabric extending beyond both longitudinal edges of the drainage core. Do not supply PGD that has ripped or torn geotextile fabric.

Furnish PGD in rolls, or in another acceptable manner, wrapped with an opaque, waterproof wrapping. Label or tag each roll or package to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number, and date of manufacture. Prior to installation, protect the PGD from mud, dirt, dust, debris, harmful ultraviolet light, direct sunlight or temperature greater than 140 ˚F (60 °C). Furnish 3 inch (76 mm) wide, plastic tape for the sealing, seaming, and splicing the PGD. Furnish waterproof tape designed for underground applications that provides a strong bond that does not deteriorate over time in a buried condition. Furnish fittings and accessories provided by the manufacturer if available.

Submit Certified Test Data showing the product will meet or exceed the requirements listed in Tables 712.16-1 and 712.16-2.

TABLE 712.16-1 REQUIRED PGD CORE PROPERTIES

Property	**Test Method**	**Unit**	**Required Value**		
			Conventional Abutment/Wall Height		
			<10 ft (3m)	**10 to 30 ft (3 to 9m)**	**30 to 50 ft (9 to 15m)**
Thickness	ASTM D5199	in (mm)	0.4 to 1.0 (10 to 25)		
Minimum Compressive Strength	ASTM D1621	psf (kPa)	4625 (221)	10625 (508)	16625 (796)
Minimum In-Plane Flow Rate*	ASTM D4716	gal/min/ft (l/min/m)	5 (62)	15 (186)	25 (310)

* Tested under a confining pressure of 3,600 psf (172 kPa) and a hydraulic gradient of 1.0.

TABLE 712.16-2 REQUIRED PGD GEOTEXTILE PROPERTIES

Property	**Test Method**	**Unit**	**Required Value**		
			Percent *In Situ* Soil Passing 0.075 mm		
			<15	15 to 50	>50
Minimum Permittivity	ASTM D 4491	sec^{-1}	0.5	0.2	0.1
Apparent Opening Size	ASTM D 4751	mm	AOS ≤ 0.43	AOS ≤ 0.25	AOS ≤ 0.22
Minimum Grab Strength	ASTM D 4632	lb (N)	157 (700)		

Maximum Elongation	ASTM D 4632	%	50
Minimum Trapezoidal Tear Strength	ASTM D 4533	lb (N)	56 (250)
Minimum Puncture Strength	ASTM D 6241	lb (N)	309 (1375)
	or ASTM D 4833	lb (N)	58 (260)

720.01

On page 836, in the second paragraph, **Replace** "730.192 or 730.192" with "730.192 or 730.193"

721.01

On page 836, **Add** the following sentence as the first sentence of the first paragraph:
Furnish castings conforming to Supplement 1062.

721.02

On page 836, **Add** the following sentence as the first sentence of the first paragraph:
Furnish prismatic retroreflectors conforming to Supplement 1062.

721.03

On page 836, **Replace** the section in its entirety with the following:

721.03 Casting Adhesive. Furnish casting adhesives that conform to Supplement 1062.07 - Raised Pavement Marker Casting Adhesive Acceptance Procedure.

Only furnish material listed on the Department's QPL.

725.11.B

On page 841, **Delete** the third paragraph.

725.11.E

On page 843, **Delete** the second paragraph.

725.11.F

On page 843, **Delete** the seventh paragraph.

725.11.G

On page 844, **Delete** the fifth paragraph.

725.19.H

On page 847, **Revise** the first paragraph second sentence to the following:

Ensure that the pole and any cross arms or pole key is Southern Pine or Western Red Cedar, full length, pressure treated in compliance with specifications of the American Wood Protection Association or AASHTO M-133.

725.20

On page 848, **Delete** the entire section.

725.21

On page 848, **Revise** the first sentence to the following:

Ensure that the complete luminaire support from the luminaire(s) down through the connection to the foundation or other structure to which the luminaire support is attached conforms to the requirements of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* LTS-6 (2013), except that the 40% hand-hole width criterion of 11.9.2 is not required.

725.21.B.1.

On page 851, **Replace** the second sentence of the second paragraph with the following:

Ensure that the luminaire ring is supported by three wire ropes equally spaced around the ring. Ensure that the three wire ropes are of the same material and construction. Ensure that the wire rope for this purposed is 3/16 inch (5 mm) minimum diameter ~~and either galvanized steel hoisting cable or~~ aircraft grade stainless steel control cable composed of 7 strands of 19 wires each. Ensure that each wire rope support cable is connected to the ring by a corrosion resistant device that will allow the connection to develop the full breaking strength of the wire rope while permitting ready adjustment of the length of the wire rope to level the ring. Ensure that the ring is equipped with a minimum of three spring loaded roller tipped centering arms equally spaced around the ring that are in continuous contact with the pole shaft and that the guide arm rollers are of a nonabrasive, water resistant material.

725.21.B.2.

On page 852, **Replace** the third sentence of the paragraph with the following:

2. Head Frame Assembly. Ensure that the head frame is fabricated from steel which conforms to the requirements of ASTM A 36/A 36M. Ensure that the head frame assembly is equipped with pulleys for the wire ropes hoisting cables and rollers for the main power cord to the luminaire ring. Ensure that each hoisting cable sheave has a tread diameter of ~~at least~~ 2~~0~~5 times the cable diameter for ~~galvanized~~ stainless steel cable, that the groove for the hoisting cable has a semi-circular in cross section with a radius of one-half the cable diameter plus 1/64 inch (0.4 mm), that the sheave has an oil-impregnated bronze bushing and that the shaft on which the sheave turns is of stainless steel. Ensure that the rollers for power cord run on AISI 304 stainless steel shafts between cold-rolled steel plates. Ensure that bending radius of the power cord is not less than 7 inches (180 mm). Ensure that keeper bars have been provided over the power cord and ring support cables to keep them in their respective tracks. Ensure that a guide is provided to separate the individual cables as they pass between the head frame and the top of the pole. Ensure that the head frame mechanism is protected from the weather by a domed cover of either copper free spun aluminum or fiberglass. Ensure that each head frame is identified by a raised or engraved marking applied in a prominent location which identifies the manufacturer and the year that the head frame was manufactured and that such marking remains legible after the head frame has been galvanized.

725.22

On page 854, **Replace** the section to the following:

725.22 Underground Warning / Marking Tape. Furnish tape that is an inert material, at least 5 inch (125 mm) wide ~~approximately 6 inch (150 mm) wide~~ composed of polyethylene or polypropylene plastic, highly resistant to alkalis, acids or other chemical components likely to be encountered in soils. Furnish tape in accordance with the ORC 3781.29 color code and with black identifying lettering in accordance with Table 725.22-1 printed on one side only.

Table 725.22-1 Underground Utility Facility Color Codes

Identifying Lettering	Color
ELECTRIC	Red
GAS	Yellow
COMMUNICATION	Orange
WATER	Blue
SEWER	Green

Furnish tape in continuous rolls with the identifying lettering repeated continuously the full length of the tape. Unless otherwise noted, furnish tape containing a high-strength core with a break strength of at least 3000 lb (1361 kg) when tested to ASTM D6775. Unless otherwise noted, furnish tape with a minimum diameter #12 AWG HDPE insulated copper clad steel tracer wire and connect tracer wire to ground in accordance with manufacturer recommendations. Provide certified data verifying compliance with these requirements.

726.01

On page 854, **Revise** the first paragraph as follows.

726.01 Barrier Reflectors. Furnish concrete barrier, cable barrier, retaining wall, bridge parapet, bridge rail or guardrail blockout reflector body housings of the following Type:

726.01

On page 855, **Add** the following paragraph after the eleventh paragraph.

Type 6, Cable Barrier Reflector. Furnish nylon, or polycarbonate plastic cable barrier reflectors. Products will have a minimum of 22.5 square inches of Type G, H, J, or Reboundable reflective sheeting visible to drivers traveling in both directions. Products will either be attached to the cable or ground mounted. Ground mounted products will meet the requirements of 720.03. Use products that are structurally reinforced to withstand the force of thrown plowed snow. New products will be tested by the Department for a minimum of one winter season before approval.

730.14

On page 858, **Replace** the entire section with the following:

730.14 Aluminum Castings. Furnish certified material according to Supplement 1092 or 1093.

A. Furnish sand castings according to ASTM B 26/B 26M, 356-T6 or T7.

B. Furnish self-aligning aluminum extrusheet sign mounting clips with manufacturer identification mark conspicuously incorporated in relief on the top surface of the casting, and in accordance with Supplemental Specification 992.

C. Furnish permanent mold castings according to ASTM B 108, 356-T6 or T7.

730.24

On page 860, **Add** the following section after section 730.23:

730.24 Digital Printing. Fabricate digitally printed signs using opaque and transparent color inks along with a clear UV overlaminate protectant film applied to the entire sign surface, sticker surface, or both that the manufacturer of the reflective sheeting guarantees according to Supplement 1049. Temporary work zone signs with black ink only do not require protective film. Ensure digitally printed colors meet the applicable daytime and nighttime color requirements of ASTM D4956 "Standard Specification for Retroreflective Sheeting for Traffic Control."

Sign fabricators using digital printing methods to produce regulated traffic signs must be certified by the manufacturer of the reflective sheeting whose materials are used to produce the delivered signs. Certified sign fabricators must undergo an audit process by the manufacturer of the reflective sheeting to ensure they have the proper training, equipment, color calibrations, manufacturing capabilities, manufacturing application processes and the materials required to fulfill the sheeting manufacturer's warranty obligations. Sign fabricators must recertify annually with the manufacturer of the reflective sheeting or utilize a 3rd party certifier approved by the manufacturer of the reflective sheeting. ODOT may require proof of Sign Fabricator Certification with the execution of a purchase order (P.O.) or construction contract for signs.

731.06

On page 861, **Revise** the first paragraph to the following:

731.06 Sign Flasher Assembly. Furnish beacons consisting of single traffic signal sections with 8 or 12-inch (200 or 300 mm) yellow lenses. Ensure that the flasher control unit flashes the beacons at a rate for each beacon of between 50 to 60 times per minute with the light period from one-half to two-thirds of the total cycle. Furnish flasher control units that have all solid state components and that meet NEMA TS-2. House control units within a weatherproof corrosion-resistant enclosure with a lockable door. Include the LED lamps.

731.07

On page 861, **Revise** the first paragraph to the following:

731.07 School Speed Limit Sign Assembly. Furnish yellow beacons that are 8 inches (200 mm) or 12 inches (300 mm). Ensure that the flashers flash the beacons alternately at a rate for each beacon of 50 to 60 times per minute with the light period from one-half to two-thirds of the total cycle. Furnish flashers that have all solid state components and that meet NEMA TS-2. Ensure that the backing members with hardware are compatible with the method of support.

732.01

On page 862, **Replace** the first paragraph with the following:

732.01 Vehicular Signal Heads, Conventional. Ensure that vehicular traffic signal heads conform to the ITE "Vehicle Traffic Control Signal Heads" standard. In conformance with the above standard, provide signal heads that are of cast nonferrous corrosion resistant metal. For span mounted and non-tethered and free swinging installations, and for span mounted with tether and backplates or rigid mounted, use polycarbonate plastic heads with coloring obtained through colored plastic and not painted.

732.01

On page 862, **Replace** the third paragraph with the following:

Furnish signal heads with required mounting hardware. Furnish signal face orientation to traffic by serrated rings or other devices on housing sections and mounting hardware. Permit adjustment in increments not greater than 5 degrees of rotation and not affected by wind gusts when locked. Furnish galvanized steel or aluminum spacers and drop pipes 1 1/2 inches (38 mm) nominal pipe size (1.90 inch (48 mm) actual diameter). Ensure that disconnect hangers have at least twelve terminals unless a greater number is required. Tethered heads shall use 3/4-inch unpainted cast aluminum span wire clamps and cable entrance adapters with integral tri-studs (no tri-stud inserts), stainless steel hardware, and a single steel-reinforced mounting hole. Free-swinging heads shall use cast iron span wire clamps and cable entrance adapters with tri-studs. Tri-studs shall be secured to the head using stainless steel nylon-insert or distorted thread locknuts. A neoprene gasket placed under the clamp washer in the top signal section shall effectively seal the entrance adapter on the signal to make a waterproof connection

and shall have a minimum thickness of 3/32 inch. Provide cutaway visors, unless specified otherwise, with all heads, and the inside surface of the visors shall have a finish of flat black. All other exterior surfaces of the signal head and hardware shall have a finish of Federal Yellow or Gloss Black to closely agree with Federal Standard 595, Color 13655 or Color 17038. The coating system used shall be durable, uniform, and weather resistant.

732.01

On page 863, **Replace** the first full paragraph with the following:

For polycarbonate signal heads, ensure a minimum wall thickness of 0.11 in (2.79 mm).

732.04.A.1.j.

On page 865, **Replace** the last sentence with the following:

The optical assembly shall be used for all ball and arrow modules and shall be optional on ~~arrow and~~ pedestrian modules.

732.06

On page 869, **Replace** the last sentence of the second paragraph with the following:

Furnish housing with manufacturers applied external surfaces black Color 17038 or yellow Color 13655, Federal Standard 595, unless specified otherwise in the Plans.

732.06

On page 869, **Replace** the third paragraph with the following:

The pushbutton shall be a minimum of 2 inches across in at least one dimension. The force required to activate the pushbutton shall be no greater than 3.5 pounds (15.5N) and operate with a closed fist. There shall be a visible and audible indicator that the button press has occurred.

732.06

On page 869, **Add** the following section after the fourth paragraph.

A. Accessible Pedestrian Pushbutton. Use a pushbutton with a tactile arrow with high visual contrast, a continuous locator tone and a speech walk message for the Walking Person indication, and a speech pushbutton information message. Ensure all elements of the pushbutton are programmable and include all equipment necessary to program the pushbutton. Ensure the sign included with the pushbutton is the R10-3e.

732.06

On page 869, **Revert** the fourth paragraph to the following:

Furnish materials according to the Department's TAP list.

732.07.A.

Beginning on page 869, **Delete** the entire section.

~~**A. NEMA TS-1.** Ensure that the loop detector units comply with the requirements of NEMA TS-1, section 15, with the following modifications. Furnish shelf mounted loop detector units that are powered from 120 volts. Use solid state isolated output units for all controller applications where directly connected to a solid state digital controller unit. Ensure that the conductors in the cable harness for loop input pins are twisted three to five times per 1 foot (300 mm).~~

~~Ensure that the electrical connections for four-channel shelf-mounted units either are the 19-pin MS connector, as required by the foregoing specification, or consist of four connectors of the type required for single-channel shelf-mounted detector units.~~

~~If specified, design detector unit electrical connection plugs or wiring harness such that any multi-channel shelf-mounted detector unit may be readily replaced with single-channel detector units. Accomplish this by furnishing only units with the connector type required for single-channel shelf-mounted detector units, or by wiring the controller back panel to single-channel harnesses which are, in turn, plug-connected to an adapter harness which is mated to the multi-channel connector of the detector unit.~~

~~Furnish loop detector unit with an LED or LCD display indication of call strength (ΔL/L or equivalent). This display shall be a bar graph or numerical display with at least eight (8) discrete levels indicated.~~

~~Furnish materials according to the Department's TAP List.~~

732.08

On page 870, **Delete** the entire section.

732.11

On page 871, **Replace** the second sentence in the first paragraph with the following:
Furnish tubes that are circular or regular polygons with twelve or more sides.

732.11

On page 871, **Replace** the sixth sentence of the first paragraph with the following:

The Pole Identification Tag shall be clearly and deeply stamped with the ODOT Standard Construction Drawing Number, Design Number, and the fabrication date of the pole (e.g., TC-81.22, DES. 12, 05-12) in characters with a minimum height of 3/8 in.

732.12

On page 872, **Replace** the fourth sentence of the first paragraph with the following:

The Pole Identification Tag shall be clearly and deeply stamped with the ODOT Standard Construction Drawing Number, Design Number, and the fabrication date of the pole (e.g., TC-81.22, DES. 12, 05-12) in characters with a minimum height of 3/8 in.

732.21

On page 875, **Revise** the second paragraph to the following:
Furnish materials according to the Department's QPL.

732.22

On page 875, **Revise** the first sentence to the following:
732.22 Backplates. Furnish louvered backplates constructed of wrought sheet aluminum, according to ASTM B 209 (B 209M), 6061-T6, 0.050 inch (1.3 mm) minimum thickness.

732.22

On page 875, **Replace** the tenth sentence with the following:
Reflective sheeting shall be Type J, ASTM D4956 Type XI.

733.01

On page 875, **Delete** the second definition.

~~**"NEMA TS-1" and "Type TS-1"** refers to equipment manufactured in conformance with the National Electrical Manufacturers Association (NEMA) Standards Publication No. TS-1.~~

733.01

On page 875, **Add** the following as the first paragraph:

"ATC" refers to equipment manufactured in conformance with the Advanced Transportation Controller Standard, a joint standard of AASHTO, ITE, and NEMA.

733.02

On page 876, **Delete** the entire section.

733.03

On page 879, **Delete** the following from the second paragraph:

Supply two through four phase controller operation with a minimum twelve position backpanel, configured for four pedestrian movements and four overlaps, with a ~~twelve channel NEMA TS-1 conflict monitor or~~ NEMA TS-2 malfunction management unit.

733.03

On page 879, **Delete** the following from the fourth paragraph:

For signal phasing configurations that require a larger capacity backpanel or conflict monitor, supply a 16 position backpanel with a ~~16 channel NEMA TS-1 conflict monitor or~~ NEMA TS-2 malfunction management unit.

733.03.15.

On page 880, **Add** the following paragraph after number 15:

Furnish 60-month warranties or the manufacturers' standard warranty, whichever is greater for the following equipment:

a. ATC/NEMA Cabinet & Equipment
   (1) Bus Interface Units
   (2) Malfunction Management Units
b. ATC/CalTrans Cabinet & Equipment
   (1) Model 2010/2018 Conflict Monitor Units

Ensure that the warranty period begins on the date of shipment to the project. Ensure that each unit has a permanent label or stamp indicating the date of shipment. Label shall indicate the equipment vendor name and or logo.

733.03.A.

Beginning on page 880, **Delete** the entire section.

~~**A. Type TS-1.**~~

~~**1. Cabinets.** Furnish a cabinet size that provides ample space for housing the controller unit and all associated electrical devices furnished with it, together with any other auxiliary devices that are specified. Furnish a cabinet with sufficient shelf space to accommodate all existing, proposed, and designated future equipment. Ensure that the space provided accommodates the appropriate controller unit frame as designated in NEMA TS-1, Section 14.~~

~~Construct the cabinets of cast aluminum or sheet aluminum, drawn or formed, with aluminum support and stiffening of members provided as necessary. Ensure that the exterior is smooth with no sharp edges. Weld all joints. Ensure that the cabinet is rigid and is designed to support all components. Ensure that the application of the following loads do not result in breakage, deformation, or loss of weatherproof qualities: a 100-pound (445 N) load applied to any 1-inch (25 mm) square surface of the cabinet or door (open or closed), in any direction; or a 300-pound (1.3 kN) load applied vertically downward to any 4-inch (100 mm) square of the top surface or to the top edge of the closed and latched door.~~

~~Provide cabinet exterior surfaces of bare aluminum. When the plans specify a cabinet color, prime and finish all cabinet exteriors with two coats of high-grade enamel paint of the specified color. Ensure that the cabinet interior surfaces are the same as the exterior, or may be painted flat white.~~

~~Ensure that the cabinet contains at least one rain-tight louvered vent equipped with a replaceable filter. Install vents to allow for the release of excessive heat and any explosive gases that might enter the cabinet.~~

~~Ensure that the cabinets are functional in design and have a door in the front providing access to substantially the full interior area. Attach a gasket of elastomeric material to the cabinet or door to form a weatherproof seal. Furnish door hinge pins of stainless steel or equivalent corrosion resistant material. Furnish a door stop to retain the door in at least a 90 degree open position.~~

~~Include a small, hinged, and gasketed door-in-door (police door) on the outside of the main controller door. Ensure that the door-in-door does not allow entrance to the controller mechanism nor to exposed electrical terminals, but provides access to a small switch panel and compartment (police panel).~~

~~Fit the cabinet with the necessary provisions for mounting, with a bottom conduit connection provided for pole-mounted cabinets. Furnish suitable hardware and equipment for each cabinet mounting method, including bolts for drilled and tapped holes on metal supports, pole attachment clamps, pedestal slipfitter, and anchor bolts and conduit ells for installation in concrete foundations. Furnish steel anchor bolts that are galvanized at least 1 inch (25 mm) beyond the threads. Certified cabinet anchor bolts are not required.~~

~~Directly place all equipment designed for shelf mounting on a shelf except for loop detector units (amplifiers) and similar devices designed for stacking on each other. Arrange components on shelves and devices on the door so that a 1-inch (25 mm) minimum space separates them when the door is shut. Ensure that plugs, wires, controls, or similar items do not compromise this space.~~

~~Reserve a minimum 4-inch (100 mm) clear area on the bottom of the cabinet for the routing of cables. Do not locate panel mounted equipment in the bottom 6 inches (150 mm) of the cabinet. Do not locate shelves or components within 6 inches (150 mm) of the bottom of foundation mounted cabinets.~~

~~Arrange all equipment for easy withdrawal and replacement, without the necessity of disturbing adjacent equipment. Permanently locate devices within the cabinet to allow free circulation of air and that do not restrict air flow from fan ducts or vents.~~

~~Ensure that the auxiliary equipment operates within a weatherproof cabinet at ambient temperatures between -30 and 165 °F (-34 and 74 °C).~~

~~When terminals and panel mounted devices with exposed electrical contact points are located next to shelf mounted equipment, provide spacers, shelf lips, or other means to assure that component units cannot be accidentally moved into contact with any exposed electrical terminal points.~~

~~Ensure that load switches, relays, flashers, fuses, switches, terminal blocks, and other equipment mounted or plugged into the back or side panels are readily accessible. Ensure that switches, controls, and indicator lights are visible and easily operable without moving the components from their normal shelf positions.~~

~~Furnish an aluminum shelf with integral storage compartment in the space immediately below the controller. Ensure the storage compartment has telescoping drawer guides for full extension. Ensure the compartment top has a non-slip plastic laminate attached.~~

~~Furnish LED strip lighting for internal illumination.~~

~~Furnish materials according to the Department's TAP List.~~

~~2. Accessory Equipment~~

~~**a. Ventilating Fan.** Equip all cabinets with a forced air ventilating fan. Furnish a fan that provides a capacity of at least 100 cubic feet (2.8 m^3) per minute. Furnish a fan that is thermostatically controlled and adjusted to start at cabinet temperatures above 120 °F (49 °C) and to stop when the temperature has dropped below 100 °F (38 °C).~~

~~**b. Load Switches.** Furnish all cabinets with solid state, triple-signal load switches complying with NEMA TS-1, Section 5. Additionally, ensure that all load switches have both input and output indicators.~~

~~**c. Conflict Monitor.** Furnish all cabinets with a separate solid-state conflict monitor device. Ensure that the cabinet wiring, in the event of monitor disconnection, transfers the signals to a flashing condition. Furnish conflict monitors that comply with NEMA TS-1, Section 6. Additionally, ensure that all conflict monitors are capable of causing the signals to flash as a result of the following events:~~

~~(1) All red lamps associated with a load switch are burned out;~~

~~(2) Within one second when red and green, or yellow and green color pairings are displayed on the same phase;~~

~~(3) The absence of a minimum yellow interval.~~

~~Ensure that the monitor indicates the exact load switch output channel upon which the failure event occurred. Furnish conflict monitors that are capable of storing a minimum of nine fault events (event logging feature). Furnish a monitor that utilizes a LCD display and has a RS-232 port for connection to a laptop computer. Furnish software and connector cables to diagnose the conflict monitor.~~

~~**d. Flashers.** Furnish solid-state flashers that comply with NEMA TS-1, Section 8. When signals have a normal stop-and-go sequence that includes flashing, either ensure that the controller unit generates that flashing display or provide flashers. For this purpose, provide separate flashers from those provided for emergency back-up. Furnish flashers that are designed with two circuits of at least 10 amperes each.~~

~~Equip each controller cabinet with terminals that are wired so that, by an interchange of jumpers, the flashing operation is arranged to display either flashing yellow or flashing red on the vehicular signals.~~

~~**e. Relays.** Ensure that the relays required for proper operation of the specified equipment are furnished and completely wired. Furnish relays that are enclosed, readily replaceable, and designed for one-million operations without failure or need for adjustment.~~

~~**f. Surge Protection Devices.** Furnish surge protection on incoming power lines, interconnect lines, and detector leads.~~

~~The primary surge protection device (SPD) shall be an EDCO SHA-1250 or approved equal. A plug-in base shall be used to hold the device. All wiring connections shall be made to the base, and appropriate cabinet clearances maintained, to allow the SPD module to be relaced by hand without the use of tools.~~

~~Furnish loop detector lead-in cable protection that consists of devices installed in each detector circuit where the lead-in connects to the terminal block. House each device in a case that consists of two stages; a 3-electrode gas tube arrestor and a semiconductor circuit. Ensure that the arrestor shunts to ground a common mode transient with a 1,000 ampere peak and an 8/20 microsecond wave-shape, ionizing at 400 volts within 100 nanoseconds when subjected to a 1,000 volt per microsecond transient. Furnish a semiconductor circuit that clamps a differential transient to 30 volts within 40 nanoseconds of the appearance of the transient, and a common mode transient to 30 volts within 500 nanoseconds of the ionization of the gas tube arrestor. Ensure that the second stage is able to withstand a peak current of 13 amperes. Furnish a device that has impedance characteristics compatible with the detector unit so as not to cause false calls or increase the loop impedance above the sensitivity of the detector unit.~~

~~Furnish pedestrian pushbutton inputs with the same protection as specified for the loop detector lead-in cables.~~

~~Protect interconnect cable against transients by devices across each conductor of the cable and ground. The devices may be either 2 or 3-terminal devices. If 3-terminal devices are used, connect two conductors and ground to the same device. Furnish a protection device that consists of a gas tube arrestor with a maximum ionization voltage of 1000 volts on a 10,000 volt per microsecond transient or a maximum ionization voltage of 950 volts on a 3000 volt per microsecond transient. Ensure that the maximum time from beginning of the transient to ionization is 1.1 microseconds on a 10,000 volt per microsecond transient. Ensure that the device is not ionized by normal voltage variations on a 120-volt AC line. Furnish a device that is able to withstand a 10,000 ampere peak with an 8/20 microsecond waveshape.~~

~~**g. Main Power Breaker.** Furnish an incoming AC+ power line that is controlled by a main circuit breaker rated at 240 volts and an auxiliary breaker, with capacity and wiring as specified in NEMA TS-1, Section 10.3.2.2 and Figure 10-4.~~

~~If a power service disconnect switch is located before the controller cabinet, the neutral (AC-) and the grounding bar in the controller cabinet shall not be connected together as shown in NEMA TS-1, Figure 10-4.~~

~~**h. Radio Interference Filter.** Furnish an incoming AC+ power line that contains a radio frequency interference (RFI) filter installed between the main circuit breaker and the solid state equipment. Also, provide RFI filtering for the load switches and flasher, unless the equipment furnished provides signal and flasher circuits switching at the zero voltage point of the power line sinusoid wave form.~~

~~**i. Convenience Outlet and Light.** Wire a convenience outlet into the cabinet for use by electrical maintenance equipment. Ensure that the outlet contains at least one standard duplex three-wire NEMA 5-15 receptacle of the ground fault circuit interrupting (GFCI) type. Wire a second non-GFCI convenience outlet, not fed thru the UPS system (if used). Furnish and mount a white LED lamp in the upper portion of the cabinet. Furnish a door switch to control the convenience light.~~

~~**j. Manual Control and Pushbutton.** When required by the plans, provide intersection controller units with means for substituting manual operation of interval timing for automatic interval timing. Ensure that manual operation provides the same interval sequence as when the controller unit is operating automatically.~~

~~Obtain manual interval timing by a momentary pushbutton contact switch mounted on a 5-foot (1.5 m) minimum flexible weatherproof extension cord. Store that switch and cord behind the small door-in-door.~~

~~**k. Switches.** Furnish completely wired switches that are required for proper operation of specified equipment. Clearly and permanently label switches as to function and setting position, and ensure that they are accessible without the necessity of moving components.~~

~~**(1) Signal Shutdown Switch.** Furnish a cabinet with a signal shutdown switch for turning off the power to the signals at the intersection. Ensure that this switch only affects the power to the signals, and allows the controller to continue in operation. Locate the switch in the panel behind the small door-in-door (police door).~~

~~**(2) Auto/Flash Switch.** Furnish a cabinet with a flash control switch for activating the flashing of vehicular signals in a preselected emergency flash display. Ensure that the operation of the flash control switch causes a flashing display even under conditions of controller unit malfunction or of its removal from the cabinet. Ensure that the operation of the switch overrides any operation commands from a local or remote time switch. Locate the switch in the panel behind the small door-in-door (police door).~~

~~Program the transfer to and from flashing operation, when called remotely or by a local time switch, to occur only at points in the cycle allowed by the OMUTCD.~~

~~**(3) Automatic/Manual Transfer Switch.** Furnish a cabinet with an automatic/manual transfer switch. In the automatic position, ensure that the controller unit automatically sequences the signal head displays. In the manual position, ensure that the signal phase or interval sequencing occurs only upon manual activation of the manual control pushbutton. Locate the switch in the door-in-door (police door). Ensure that it is unnecessary, when switching from manual to automatic operation, or vice versa, to do so at any certain time or to make any time adjustments.~~

~~**(4) Run/Stop-Time Switch.** Furnish a cabinet with a run/stop-time switch that activates the controller stop-time feature when in the "stop-time" position. Locate the run/stop-time switch on a switch panel in the cabinet.~~

~~**(5) Controller Shutdown Switch.** Furnish a cabinet with a controller shutdown switch that cuts off power to the controller unit, conflict monitor, and detector units. Ensure that power is not cut off to those components required to maintain flashing operation. Locate the controller shutdown switch on a switch panel in the cabinet.~~

~~**(6) Coordinated/Free Switch.** Furnish controllers operated in a coordinated system with a coordinated/free switch. Ensure that this switch allows the choice of operating the controller under the supervision of a coordination device or operating the controller independently of coordination control. Locate the coordinated/free switch on a switch panel in the cabinet.~~

~~**(7) Detector Test Switches.** Furnish momentary contact switches that will enter a vehicular or pedestrian call for any actuated phase. Furnish a switch for each actuated phase vehicular and pedestrian detection input. Conveniently group and label the switches.~~

~~**l. Terminal Blocks.** Furnish cabinets that include terminal blocks mounted on panels on the walls of the cabinet. Ensure that the blocks are not obstructed by shelf-mounted devices. Furnish sufficient terminal sets for each individual harness wire as well as for contacts of signal load switches, flasher transfer relays, flasher, and other components. Also, provide separate terminal sets for field wiring connections, including power, signal, interconnection, and detector lead-in cables. Group terminal sets to separate higher voltage (120 VAC) from lower voltage, and arrange them into logical groups. Protect terminal blocks from accidental contact during the installation and removal of shelf-mounted equipment. Locate the blocks no closer than 4 inches (100 mm) from the bottom of pole and pedestal mounted cabinets, and no closer than 6 inches (150 mm) from the bottom of foundation mounted cabinets.~~

~~Ensure that the terminal points are UL listed as suitable to carry the rated loading. Ensure that the capacity and size of the terminals are as specified in NEMA TS-1, Section 10.2.5. Ensure that the terminal points for signal field wiring for each circuit accommodates at least four 12 AWG conductors with spade type terminals.~~

~~Furnish terminal points for incoming power wiring that accepts either spade terminals or bare stranded wire and are suitable for either aluminum or copper conductors.~~

~~Space terminal sets for easy wiring. Furnish at least six reserve terminal sets for controllers. Harnesses may terminate on the back of terminal blocks using through-panel terminals. Clearly mark terminal sets for ready identification including through-panel terminals that are identified on both sides. Ensure that the contact between adjacent terminal points are made by bus bar, or by wire jumpers having spade type terminals securely attached to each end.~~

~~**m. Terminal Buses.** Furnish a cabinet with supply terminal buses fed from the line side of the incoming 120 VAC power line, after the phase wire has passed through the main power switch. Ensure that the requirements for use of radio interference filters are according to Item 8 of this Section, with the buses supplying load switches and with flashers being filtered when required. Ensure that a signal bus-~~

~~relay controls power to the bus supplying power for the signal load switches. . The following overrides NEMA requirements for signal bus relays. A solid-state relay shall be used for the signal bus relay. The signal bus relay shall maintain output equal to or above the rating of the cabinet main overcurrent protection device over the NEMA TS-2 Environmental Operating Range of -50 to +185 degrees F (-45 to +85 degrees C).~~

~~Furnish a common terminal bus for the connection of the neutral wire of the incoming 120 VAC power line. Ensure that the common bus has sufficient terminal points to accommodate all potential cabinet wiring as well as field wiring. Use a separate common terminal, insulated from the panel, for the interconnect common.~~

~~Furnish bus terminal points that comply with Item 12 of this Section for conductor accommodation, attachment and identification.~~

~~**n. Grounding System/Bus Bars.** Furnish a cabinet that includes a grounding system as specified in NEMA TS-1, Section 10.3.2.1 with an adequate number (minimum of three) of ground terminal points.~~

~~**o. Wiring.** Neatly organize and route the harnesses and wiring bundles to individual terminals. Ensure that the harness provides a wire for each pin or contact of the device. Connect each wire to a marked terminal position. Use labeled spade type terminals or plug connections on all harness wiring. Group and lash or restrain wire bundles in such a manner that they will not interfere with the access to components, terminal blocks or buses, or the legibility of terminal identification. Ensure that the harnesses are of sufficient length to reach any point within the cabinet. Ensure that the cables and harness bundles are easily traced through the cabinet to their terminations. Route all wiring terminated on printed circuit boards (as commonly done for BIU backpanel connectors) at right angles to the pin array; no wires shall pass over the connector pins.~~

~~Wire the cabinet so that controller pin connections associated with a given phase number matches the phase number assigned to the specified traffic movement as shown on the plans.~~

~~Furnish all wiring with stranded conductors. Ensure that the wiring is adequate for the voltage and load that represents the ultimate load of the devices connected. Ensure that the ampacity rating of the wires are as specified in NEMA TS-1, Section 10.3.3.1. Ensure that the wiring is color coded as follows:~~

~~(1) Solid white, AC common.~~

~~(2) Solid green or green with yellow stripes, equipment ground.~~

~~(3) Solid black, AC line side power (AC+).~~

~~**p. Loop Detector Units.** Furnish loop detector units that comply with the requirements of NEMA TS-1, Section 15, with the following modifications:~~

~~(1) Furnish loop detector units that are shelf mounted and powered from 120 volts.~~

~~(2) Ensure that the unit uses solid-state isolated output devices.~~

~~(3) Furnish conductors in the cable harness for loop input pins that are twisted three to five times per foot (300 mm).~~

~~(4) Furnish detector unit electrical connection plugs or wiring harness that are designed such that any multi-channel shelf mounted detector unit is readily replaced with single channel detector units. Furnish only units with the connector type required for single channel shelf mounted detector units, or by wiring the controller back panel to single channel wiring harnesses which are, in turn, plug connected to an adapter harness that is mated to the multi-channel connector of the detector unit.~~

~~(5) When shown on the plans, supply delay and extension timing capability on the detector unit; otherwise, the controller unit software requirements of 733.02 will provide these features.~~

~~(6) Ensure that the harness provides a wire for each pin or contact of the device.~~

~~(7) Furnish loop detector unit with an LED or LCD display indication of call strength (ΔL/L or equivalent). This display shall be a bar graph or numerical display with at least eight (8) discrete levels indicated.~~

~~If vehicle detector types other than "loop" detectors are required by the plans, provide these detectors by separate bid item.~~

~~Furnish TS-1 cabinets according to the Department's TAP List.~~

733.03.B.1.h.

On page 888, **Replace** the first paragraph with the following.

Section 7.3, unless otherwise specified in the plans, provide a Size 5 cabinet for pole mounted cabinets, Size 7 for ground mounted cabinets. Supply larger cabinets if required to house the equipment to meet the plan requirements; ~~such as master controllers~~ such as additional ITS equipment, preemption devices, 16 position backpanels or special detection units.

733.03.B.2.

On page 888, **Replace** the entire section with the following:

2. Furnish loop detector and pedestrian inputs that have lightning/surge protection ~~as specified in 733.03.A.2.f.~~.

Furnish loop detector lead-in cable protection that consists of devices installed in each detector circuit where the lead-in connects to the terminal block. House each device in a case that consists of two stages; a 3-electrode gas tube arrestor and a semiconductor circuit. Ensure that the arrestor shunts to ground a common mode transient with a 1,000 ampere peak and an 8/20 microsecond wave-shape, ionizing at 400 volts within 100 nanoseconds when subjected to a 1,000 volt per microsecond transient. Furnish a semiconductor circuit that clamps a differential transient to 30 volts within 40 nanoseconds of the appearance of the transient, and a common mode transient to 30 volts within 500 nanoseconds of the ionization of the gas tube arrestor. Ensure that the second stage is able to withstand a peak current of 13 amperes. Furnish a device that has impedance characteristics compatible with the detector unit so as not to cause false calls or increase the loop impedance above the sensitivity of the detector unit.

Furnish pedestrian pushbutton inputs with the same protection as specified for the loop detector lead-in cables.

733.03.B.6.

On page 889, **Revise** the first paragraph to the following.

6. The primary surge protection device (SPD) shall be an EDCO SHA-1250 or approved equal. A plug-in base shall be used to hold the device. All wiring connections shall be made to the base, and appropriate cabinet clearances maintained, to allow the SPD module to be replaced by hand without the use of tools. Cabinet power distribution shall conform to Figure 5-4, NEMA TS-2 2003 v02.06. In addition, ~~locates a non GFCI NEMA 5-15 utility outlet on the right side power panel.~~ install three (3) non GFCI NEMA 5-15 utility outlets on the right side of the power panel for a total of six (6) receptacles. These outlets shall be powered independently of the UPS by direct connection to incoming utility power through a 15-amp circuit breaker labeled "UTILITY OUTLET."

733.03.B.8.

On page 889, **Delete** the entire section:

~~8. Include datakey module. Provide a datakey with each controller, taped securely to the top of the controller chassis.~~

733.03.C.2

On page 890, **Add** the following after c.

d. Use 332L ground mount cabinets that have an auxiliary output file. Ensure the auxiliary output file is in accordance with the Caltrans TEES 2009, Section 6.4.5.3 Output File #2 and come with two flasher blocks and six load switches. Ensure all channels from the output file are monitored by the CMU.

733.03.C.6.g.1

On page 899, **Revise** the first paragraph to the following.

(1) Install an RS232 port for laptop communications on the front panel of the Monitor. If specified in the plans, an ~~IP~~ ethernet port shall be used in place of RS232.

733.03.D.

On page 900, **Delete** 733.03.D in its entirety.

733.03

On page 901, **Replace** "**E. Type 336L.**" with the following:

D. Type 336L.

733.05

On page 903, **Revise** the first sentence to the following:

733.05 Flasher Controller. Furnish solid-state flasher that complies with NEMA TS-2, ~~Section 8,~~ and have two circuits, each rated at 10 amperes.

733.05

On page 903, **Revise** the second sentence of the paragraph to the following:

Furnish a cabinet that conforms to applicable requirements of 733.03.~~A~~ B, except that the following items are not required: a small door-in-door (police door), shelves, and a fan.

733.06.B.1.

On page 903, **Replace** the first paragraph with the following.

1. Design. Furnish a solid state, digital microprocessor master controller design. Furnish a controller that uses menu driven prompts. If the master controller is used with Type 2070 controllers, provide software unless otherwise shown on the plans.

733.06

On page 903, **Delete** the entire section.

733.07.B.1

On page 905, **Revise** the sentence to the following:

1. Local intersection controller (see ~~733.02~~ Supplemental Specification 809.10.G)

733.07.C

On page 906, **Revise** the first sentence to the following:

Furnish controller units conforming to ~~733.02~~ Supplemental Specification 809.10.G for the type of controller shown on the plans.

733.09.A.

On page 907, **Replace** the second paragraph with the following:

Furnish a UPS compatible with all of the following traffic signal equipment; NEMA TS-2 controllers and cabinets, Model 332 & 336 cabinets, 2070 controller and electrical service pedestals.

733.09.C.

On page 909, **Add** the following paragraph after the fifth paragraph:

Furnish UPS battery according to the Department's TAP List.

733.09.D.

On page 909, in the first paragraph, **Replace** the first sentence with the following.

Furnish an enclosure mountable to a standard Model 332, NEMA TS-2 traffic signal cabinet and be constructed of natural unpainted aluminum.

733.10

On page 909, **Delete** the entire section.

~~**733.10 Centrally Controlled Arterial Traffic Signal System**. Furnish materials according to the Department's TAP List.~~

740.02

On page 910, **Replace** the third sentence in the first paragraph with the following:

Furnish Type 1 paint that will not deteriorate in storage, within one year after date of receipt, to the extent that it cannot be readily broken up with a paddle to a smooth uniform paint capable of easy application by spray. Furnish Type 1A paint that will not deteriorate in storage in accordance with the manufacturer's recommendation.

740.04.G

On page 913, **Replace** the first sentence of the section with the following:

Furnish yellow material containing a minimum of 5 percent by weight of primary yellow lead free pigment (measured according to ASTM D 126 or Department approved lab method).

740.07

On page 915, **Delete** the words "slow cure" from the second sentence of the first paragraph:

Furnish a ~~slow cure~~ material capable of retaining reflective glass beads 740.09 type D, after application.

740.07.A.

On page 915, **Replace** the first sentence of the section with the following:

A. Formulation. Furnish epoxy formulated as a Long Life Pavement Marking System, capable of providing a minimum of 4 years of performance~~, free of any peroxides and any Tri-methyolpropane Tri-acrylate) TMPTA and other multi-functional monomers~~.

740.07.D.

On page 915, **Replace** the first sentence of the section with the following:

D. Laboratory Drying Time. Ensure that the pavement marking material, when mixed in the proper ratio and applied at the properly prescribed wet film thickness at 75 ± 2 °F (24 ± 0.5 °C) and with the proper saturation of glass beads, exhibit a no tracking time ~~of no greater than 40 to 45 minutes~~ conforming to Table 740.07-1when tested according to ASTM D 711.

740.07.E.

On page 915, **Replace** the first sentence of the section with the following:

E. Field Time to No-Track. Furnish pavement marking material that will be in "no tracking condition" ~~between 15 to 45 minutes~~ conforming to Table 740.07-1.

740.07.K.

On page 916, **Add** the following table between the first and second paragraphs:

Table 740.07-1

Description	Slow Dry Epoxy Requirement	Fast Dry Epoxy Requirement
Laboratory Dry Time ASTM D 711	≤ 45 minutes	≤ 10 minutes
Field Time to No-Track	Between 15 to 45 minutes	< 10 minutes

740.08

On page 916, **Replace** the section in its entirety with the following:

740.08 Heat-Fused Preformed Thermoplastic Pavement Marking Material. Furnish heat-fused preformed thermoplastic pavement marking materials conforming to the following:

Material Type	Thickness	Pre-heat	Post-heat
Type A90	90 mil (2.29 mm)	Yes	Yes
Type B90	90 mil (2.29 mm)	No	Yes
Type A125	125 mil (3.18 mm)	Yes	Yes
Type B125	125 mil (3.18 mm)	No	Yes

Furnish heat-fused preformed thermoplastic pavement marking materials conforming to AASHTO M249 with the following the following requirements:

A. Pigments. Furnish white material with sufficient titanium dioxide pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. Furnish yellow material with sufficient pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. The yellow pigments must be organic and must be heavy-metal free.

B. Heating indicators. Furnish the material with the top surface of the material (same side as the factory applied surface beads) shall have regularly spaced indents. The closing of these indents during application, shall act as a visual cue that the material has reached a molten state allowing for satisfactory adhesion and proper bead embedment, and as a post-application visual cue that the application procedures have been followed.

C. Skid Resistance. Furnish the material with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E 303.

D. Environmental Resistance. Furnish the material that must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline.

Ensure that the material contains reflective glass beads, 740.09 Type E. Prequalify materials according to Supplement 1047. Furnish materials according to the Department's Approved List.

740.09.A.

On page 916, **Add** the following sentence to the end of the second paragraph:

Furnish materials according to the Department's Approved List.

740.09.B.

On page 917, **Add** the following sentence to the end of the third paragraph:

Furnish materials according to the Department's Approved List.

740.09.C.

On page 917, **Add** the following sentence to the end of the third paragraph:

Furnish materials according to the Department's Approved List.

740.09.D.

On page 918, **Replace** the 4th paragraph with the following

Determine the moisture-resistance of the glass beads ~~on the basis of~~ based on AASHTO T 346 section 9.

740.09.D.

On page 918, **Add** the following sentence to the end of the 5th paragraph:

Furnish materials according to the Department's Approved List.

740.09.E

On page 918, **Add** the following new section after section 740.09.D. Type D.:

E. Type E. Furnish heat-fused preformed plastic pavement marking materials that contain a minimum of thirty percent (30%) intermixed graded glass beads by weight and factory applied coated surface beads in addition to the intermixed beads at a rate of 1 lb. (± 10%) per 10 sq. ft.

Furnish factory applied coated surface beads with the following specifications:

1) Minimum 80% rounds
2) Minimum refractive index of 1.50

Furnish intermixed graded glass beads and factory applied coated surface beads that conform to Type 1 and/or Type 3 AASHTO M247 as recommended by the manufacturer.

Use materials certified according to Supplement 1089.

Furnish materials according to the Department's Approved List.

740.10.A

On page 918, **Revise** the entire section to the following:

A. Composition.

	White	**Yellow**
Binder	25% Min.	25% Min.
TiO_2 Pigment (Type II Rutile)	10% Min.	
Lead-Free Pigment (Yellow 83)	N/A	*
Inter mixed Glass Beads	30% Min. (by weight)	30% Min. (by weight)
Filler	35% Max.	42% Max.

*amount of lead-free pigment is at the discretion of the manufacturer, as long as all other compositional requirements are met.

740.10.B.

On page 918, **Revise** the second sentence of the first paragraph to the following:

Ensure at least one third of the binder composition is maleic modified glycerol ester of rosin and is no less than 8 percent by weight of the entire material formulation.

740.10.C.

On page 919, **Revise** the second paragraph to the following:

Use lead-free Pigment Yellow 83 produced to meet the requirements of AMS-STD-595A Color No. 13538.

740.10.E.

On page 919, **Revise** the second paragraph to the following:

Visually match yellow spray thermoplastic with AMS-STD-595A No. 13538. Ensure daytime reflectance (Y) is greater than 45.

740.10.J.

On page 919, **Revise** the third sentence of the first paragraph to the following:

Test sample with a male indenter 5/8 inch (15.875 mm) and no female Die, at room temperature.

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 821
ARROW BOARD

April 20, 2012

821.01 Description
821.02 Materials
821.03 Use and Operation
821.04 Basis of Payment

821.01 Description. This work consists of furnishing, installing, maintaining and removing arrow boards.

821.02 Materials. Furnish materials conforming to:

Arrow Board.....921.02

821.03 Use and Operation. Locate arrow boards as shown in the plans or as directed by the Engineer. Supply all lubricants and parts necessary to obtain continuous operation and provide all service. Inspect the operation of the unit daily including weekends and holidays. Arrange with the Engineer an acceptable method of obtaining service for a malfunctioning panel within 2 hours of a reported malfunction.

Limit use of Type A arrow boards to low-speed 20 - 35 mph urban streets. Use of Type B arrow boards is appropriate for intermediate-speed 40 – 50 mph facilities and for maintenance or mobile operation on high-speed roadways. All arrow boards used in stationary traffic control operation on high-speed 55 mph or greater, high-volume roadways shall be Type C.

Fully charge battery and solar/battery units when first set up. Verify daily that the unit is operating satisfactorily and the remaining battery charge is sufficient for at least 2 more days.

An arrow board in the arrow mode shall be used only for stationary or moving lane closures on multi-lane roadways. For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow board shall be used only in the caution mode. Arrow boards shall not be used to laterally shift traffic.

Lock the control cabinet when left unattended.

Type A and B arrow boards used in mobile operations may be powered by the vehicle's electrical system, but shall not be left unattended when so powered. Caution is advised to prevent the vehicle's electrical system from running down while the arrow board is

being operated during frequent stops, as a run-down of the battery would leave the arrow board to be inoperative.

When an arrow board is not being used, it should be removed; if not removed, it should be shielded; or if the previous two options are not feasible, it should be delineated with retroreflective temporary traffic control devices.

821.04 Basis of Payment. The lump sum bid for 614 Maintaining Traffic includes the cost of arrow boards.

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 844
CONCRETE PATCHING WITH EMBEDDED GALVANIC ANODE PROTECTION
April 20, 2018

844.01 Description
844.02 Materials
844.03 Construction
844.04 Galvanic Anode Installation
844.05 Electrical Continuity
844.06 Quality Control
844.07 Method of Measurement
844.08 Basis of Payment

844.01 Description. This work consists of removing all loose and disintegrated concrete; preparing the surface; furnishing and placing reinforcing steel; placing forms; installing embedded galvanic anodes and placing concrete patches, including curing of same. Perform work according to C&MS 519 except as noted.

844.02 Materials. Furnish pre-manufactured galvanic anodes designed for cathodic protection when embedded in concrete and tied to steel reinforcing. The core of the anode shall consist of a minimum of 100 grams of electrolytic high grade zinc in compliance with ASTM B 418 Type II cast around a pair of steel tie wires and encased in a highly alkaline cementitious shell with a pH of 14, or encased in a material that uses activation methods to assure performance. The anodes shall have one side that is less than 1½-inches in height.

Furnish galvanic anodes according to the Department's Approved List. Supply a certification of compliance to the engineer before starting work. Deliver, store, and handle all materials according to the manufacturer's instructions.

Repair concrete shall be hydraulic cement-based material with a 28-day moist cured electrical resistivity less than 15,000 ohm-cm according to ASTM C 1760. Do not use non-conductive repair materials such as magnesium ammonium phosphate concrete and epoxy mortars or bonding agents. Concrete mixes containing high levels of supplementary cementitious materials such as silica fume, ground-granulated blast furnace slag, fly ash or metakaolin may not meet the resistivity requirement.

844.03 Cleaning and Repair of Reinforcing Steel. Clean exposed reinforcing steel of rust, mortar, etc. to provide sufficient electrical connection and mechanical bond. If significant reduction in the cross section of the reinforcing steel has occurred, replace or install supplemental reinforcement as directed by the Engineer. Secure loose reinforcing steel by tying tightly to other bars with steel tie wire.

844.04 Galvanic Anode Installation. Install embedded galvanic anodes in accordance with manufacturer's recommendations, as shown on the plans, and as listed in this specification.

A. Install galvanic anodes to existing reinforcement along the perimeter of the repair at spacing as specified on the plans. In no case shall the distance between anodes exceed 30 inches nor shall the distance between the anode and the edge of the repair exceed 6 inches.

B. Provide a 1-inch clearance between anodes and substrate to allow repair material to encase anode. If necessary, increase the size of the repair cavity to accommodate the anodes.

C. Secure the galvanic anodes as close as possible to the patch edge using the anode tie wires. Wrap tie wires around the cleaned and uncoated reinforcing steel at least one full turn in opposite directions and then tighten the tie wires to allow little or no free movement. If the anode is to be tied onto a single bar, or if less than 1½-inch of concrete cover is expected, place anode beneath the uncoated bar and secure to reinforcing steel. If 1½-inch concrete cover will exist over the anode, the anode may be placed at the intersection between two bars and secured to each bar.

844.05 Electrical Continuity. Confirm electrical connection between every anode tie wire and uncoated reinforcing steel with a multi-meter. The maximum DC resistance shall be 1 Ohm. Confirm electrical continuity of every exposed uncoated reinforcing steel within the repair area. Steel reinforcement shall be considered continuous when the DC resistance is 1 Ohm or less. If necessary, establish the electrical continuity with uncoated steel tie wire.

844.06 Quality Control. Provide the Engineer a report documenting the resistance measurement for every reinforcing bar in each repair area. The report shall be signed by the contractor's employee responsible for supervision of the repair work.

844.07 Method of Measurement. The Department will measure Concrete Patching with Galvanic Anode Protection in accordance with C&MS 519.07.

844.08 Basis of Payment. The Department will pay for accepted quantities at the contract price as follows:

ITEM	UNIT	DESCRIPTION
844	Square Foot	Concrete Patching with Galvanic Anode Protection

Designer Note:
Do not use this specification for total patch areas less than 5 ft^2. Include quantities for individual patches too small for anodes with the total patching quantities for SS844 where SS844 is specified. Anode spacing shall be specified by the designer. Anode spacing is dependent upon the reinforcing steel density; chloride content; and amount of zinc per anode. The density of the reinforcing steel is the total surface area of the bar (ft^2) within a square foot of concrete (regardless of depth). Corrosion levels in the concrete can be broken into three measurable categories based on ASTM C 1152 Acid-Soluble Chloride of Mortar and Concrete: Light corrosion levels: < 4 lb/yd^3, Moderate corrosion levels 4 to 8 lb/yd^3 and High corrosion levels: > 8 lb/yd^3. In lieu of coring to determine chloride thresholds, the following general guidelines may be considered: Light corrosion for concrete aged 0-15 years and exposed to deicing salt or concrete of any age not directly exposed to deicing salt; Moderate corrosion for concrete aged 16-30 years and exposed to deicing salt; High corrosion for concrete 31 years and older and exposed to deicing salt. The following anode spacing guidelines are based a minimum zinc content of 100 grams per anode and to mitigate the initiation of new corrosion activity:

Anode Spacing (Inches)

Steel Density Ratio	Light Corrosion Levels	Moderate Corrosion Levels
<0.3	30	30
0.31-0.6	28	24
0.61-0.9	26	20
0.91-1.2	22	18
1.21-1.5	20	16
1.51-1.8	18	14
1.81-2.1	17	12

For higher corrosion levels or for protection of reinforcement which is significantly corroded, contact a technical representative from one of the approved products listed on the AL for more information.

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 921
ARROW BOARD

April 20, 2012

921.01 Description. This Supplemental Specification sets forth the requirements for Arrow Boards.

921.02 Materials. The Arrow Board shall consist of the following components: flasher panel, lamps, controls, power supply and mounting.

Furnish materials according to the Department's Approved List.

A. Flasher Panel. The flasher panel shall be of corrosion resistant metal construction of adequate design and strength. The panel shall be finished flat black. The panel type shall be one of the three below.

Panel Type	Minimum Size	Minimum Number of Elements
A	48 x 24 in (1200 x 600 mm)	12
B	60 x 30 in (1500 x 750 mm)	13
C	96 x 48 in (2400 x 1200 mm)	15

The Arrow Board shall be designed for operation in 100% humidity and temperatures from -20°F to +130°F (-29°C to +54°C).

B. Lamps. The lamps shall be LED. The lamp shall be fitted with a 360° hood at least 5" (125 mm) long.

Color output of light shall be amber.

The lamps shall be securely mounted and positioned in the panel perpendicular to the panel face and oriented so that the lamp location lug (on the back of the lamp) is on the horizontal center line through the lens.

The lamps shall be wired in circuits that can be switched to display any one of the following messages: left arrow, right arrow, left and right, caution bar, and corner caution.

C. Controls. Each Arrow Board shall contain a flasher control and a dimmer control unit housed in a cabinet which can be locked.

1. **Flasher Control.** The flash rate for the sign panel shall be 25 to 40 flashes per minute. The flasher shall not cause electromagnetic interference. The lamps shall have a minimum "on time" of 50% and a maximum of 66%.

2. **Dimmer Control.** Lamp intensity shall be variable by means of a photoelectrically controlled circuit which shall reduce lamp output during low ambient light conditions. Lamp intensity shall be at the nighttime level whenever the ambient illumination is in or below the range of 2 foot-candle (21 lux) to 5 foot-candle (54 lux) and shall be at daytime level when ambient illumination is in or above the range of 5 foot-candle (54 lux) to 10 foot-candle (108 lux). If controls provide for continuous adjustment of lamp intensity with respect to ambient illumination, then lamp intensity shall increase linearly from nighttime intensity at 5 foot-candle (54 lux) to daytime intensity at 3250 foot-candle (35,000 lux). A time delay shall be built into the control to prevent false operation due to light flashes. The photoelectric control shall contain a switch which shall override the photoelectric control.

D. Power Supply. Battery and solar/battery units shall have a no-charge-life of not less than 15 days. No-charge-life is the number of consecutive days that the system can continue to function (double arrow mode, normal dimming during 12 hour night, full output during 12 hour day) starting with a full battery charge and with no additional charge provided by the solar cells.

E. Mounting. The Arrow Board may be trailer or vehicle mounted or mounted on a rigid supporting device, behind barrier wall, suitable for maintaining it in the designated position. Each of the mounting methods shall be suitably stable such as to prevent movement due to high winds or passage of large vehicles.

When a trailer is used, construction shall be such as to transport the Arrow Board and appurtenances adequately and legally as well as support them properly during operation. The trailer shall be equipped with devices which shall provide leveling and stability during operation.

Minimum Arrow Board mounting height shall be 7 feet (2.1 m) above the pavement surface (measured to the bottom of the panel), except on vehicle-mounted panels, which should be as high as practical.

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

173 Cleveland

TO

180 Akron

Route	I-80
Direction	EB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

Close 1 Lane

Month	January							February							March						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	85	125	133	133	141	130	100	105	142	150	134	108	149	111	127	150	151	161	172	173	113
1 AM - 2 AM	65	89	103	99	106	94	71	74	105	113	101	91	105	80	92	115	115	117	119	120	104
2 AM - 3 AM	57	73	81	82	85	69	56	63	91	89	84	71	78	59	74	84	95	100	109	85	64
3 AM - 4 AM	48	77	84	87	92	76	45	59	87	96	91	82	71	49	74	96	95	108	102	83	58
4 AM - 5 AM	69	93	99	105	105	72	47	82	95	107	107	96	75	53	82	115	114	121	127	91	54
5 AM - 6 AM	119	166	179	184	172	92	56	148	178	191	168	141	106	64	161	194	198	200	205	111	67
6 AM - 7 AM	268	341	354	358	334	145	84	318	380	378	310	272	155	100	332	373	374	387	371	177	110
7 AM - 8 AM	444	567	582	579	549	194	117	565	657	660	525	454	214	141	598	654	633	631	594	244	162
8 AM - 9 AM	437	560	569	558	546	253	155	577	623	621	513	496	286	196	577	656	641	662	607	318	217
9 AM - 10 AM	374	469	490	486	461	323	226	484	526	496	427	432	368	282	477	501	540	560	538	409	315
10 AM - 11 AM	362	441	445	451	436	391	310	466	476	461	408	437	448	384	475	494	505	538	548	490	450
11 AM - 12 PM	408	450	464	468	458	467	377	510	481	472	426	443	535	507	508	509	535	572	601	576	565
12 PM - 1 PM	463	482	497	503	487	499	433	531	509	519	458	503	552	534	545	538	549	613	629	603	652
1 PM - 2 PM	474	510	517	543	512	512	496	565	537	521	476	528	545	573	550	575	581	631	669	589	684
2 PM - 3 PM	520	546	549	571	587	508	514	597	592	568	531	616	551	571	614	615	625	738	734	587	680
3 PM - 4 PM	585	582	607	630	628	505	519	694	654	658	594	663	533	608	658	684	698	783	824	595	718
4 PM - 5 PM	639	680	699	752	721	500	524	765	780	753	670	731	519	606	749	796	818	839	918	575	721
5 PM - 6 PM	609	694	734	763	722	455	496	780	797	754	664	739	485	583	770	827	897	871	931	543	646
6 PM - 7 PM	452	523	540	532	569	384	393	539	575	548	471	567	406	494	549	572	630	664	715	462	594
7 PM - 8 PM	352	378	390	375	411	311	337	392	422	379	341	447	341	400	394	427	442	487	530	364	480
8 PM - 9 PM	268	307	322	319	341	264	272	333	348	312	269	345	285	329	352	376	370	416	408	305	374
9 PM - 10 PM	236	253	262	287	285	231	207	278	276	275	231	286	241	257	301	307	335	351	344	266	308
10 PM - 11 PM	204	202	219	237	224	191	163	228	237	206	175	251	205	208	259	239	279	280	304	227	217
11 PM - Midnight	162	162	176	184	176	138	119	185	178	161	144	187	167	160	209	196	203	227	240	161	180

Close 2 Lanes

Month	January							February							March						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	170	250	267	266	282	259	201	209	285	300	269	216	299	222	255	300	302	323	345	346	226
1 AM - 2 AM	129	177	206	198	213	188	142	148	210	225	202	182	210	160	184	231	231	234	238	240	209
2 AM - 3 AM	113	146	163	164	170	138	112	126	181	179	168	141	156	117	147	168	191	200	218	169	127
3 AM - 4 AM	96	154	167	174	183	152	89	118	174	192	181	163	141	98	149	191	190	215	204	167	117
4 AM - 5 AM	138	187	198	211	211	144	93	164	190	214	214	191	151	106	163	230	227	241	253	181	108
5 AM - 6 AM	237	331	358	368	345	185	112	295	356	381	336	282	211	128	323	388	395	400	410	222	133
6 AM - 7 AM	535	681	707	717	667	291	167	636	760	756	621	543	309	199	665	746	747	774	741	354	220
7 AM - 8 AM	889	1,133	1,165	1,157	1,098	389	234	1,131	1,315	1,321	1,051	908	428	281	1,196	1,308	1,267	1,262	1,188	488	324
8 AM - 9 AM	873	1,119	1,138	1,115	1,092	506	310	1,154	1,245	1,241	1,026	991	572	392	1,154	1,311	1,283	1,323	1,214	636	433
9 AM - 10 AM	747	939	981	972	921	645	453	969	1,051	992	854	864	737	563	954	1,003	1,081	1,121	1,076	818	631
10 AM - 11 AM	724	882	891	903	872	783	619	931	952	923	817	873	896	768	950	988	1,009	1,076	1,096	979	900
11 AM - 12 PM	816	901	927	937	916	934	753	1,019	962	945	851	887	1,070	1,015	1,016	1,017	1,070	1,144	1,203	1,152	1,129
12 PM - 1 PM	926	964	995	1,006	974	998	866	1,062	1,018	1,038	916	1,007	1,103	1,067	1,090	1,075	1,097	1,226	1,258	1,206	1,303
1 PM - 2 PM	947	1,021	1,035	1,087	1,023	1,025	991	1,129	1,075	1,042	952	1,055	1,090	1,146	1,101	1,149	1,163	1,261	1,338	1,177	1,368
2 PM - 3 PM	1,040	1,092	1,097	1,142	1,174	1,015	1,028	1,194	1,184	1,136	1,062	1,232	1,103	1,142	1,228	1,230	1,250	1,477	1,469	1,174	1,361
3 PM - 4 PM	1,170	1,163	1,215	1,260	1,256	1,010	1,039	1,387	1,308	1,315	1,188	1,326	1,066	1,215	1,317	1,368	1,396	1,565	1,647	1,189	1,435
4 PM - 5 PM	1,278	1,359	1,399	1,504	1,441	1,000	1,049	1,530	1,560	1,505	1,340	1,461	1,039	1,211	1,498	1,591	1,636	1,678	1,836	1,150	1,442
5 PM - 6 PM	1,217	1,388	1,469	1,526	1,445	909	992	1,560	1,594	1,508	1,329	1,478	970	1,166	1,539	1,654	1,795	1,741	1,862	1,086	1,292
6 PM - 7 PM	904	1,046	1,080	1,064	1,138	769	786	1,079	1,150	1,095	943	1,135	811	988	1,098	1,144	1,261	1,328	1,430	925	1,187
7 PM - 8 PM	703	755	779	750	822	623	675	783	844	757	683	893	681	801	788	855	884	974	1,059	728	960
8 PM - 9 PM	535	614	644	639	683	528	543	667	696	624	537	690	571	658	704	752	740	833	817	610	748
9 PM - 10 PM	473	506	525	573	570	461	413	556	552	550	461	571	482	514	601	615	670	702	688	531	616
10 PM - 11 PM	408	405	438	475	448	381	327	456	474	413	349	502	410	415	518	478	557	559	608	453	434
11 PM - Midnight	324	323	353	367	352	276	239	370	356	322	288	374	334	320	419	392	406	454	480	321	360

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

173 Cleveland

TO

180 Akron

Route	I-80
Direction	EB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Close 1 Lane

Month	April							May							June						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	108	154	161	178	187	176	122	129	148	164	173	196	185	138	164	179	194	178	212	239	172
1 AM - 2 AM	98	117	121	133	135	132	86	93	124	124	129	137	129	90	109	141	136	150	160	145	111
2 AM - 3 AM	69	90	94	111	108	95	64	74	97	98	108	119	99	71	90	109	110	130	127	104	81
3 AM - 4 AM	68	93	87	105	109	92	64	70	85	97	113	118	104	56	78	104	105	122	135	103	68
4 AM - 5 AM	84	111	116	124	130	94	58	93	110	113	130	134	98	62	95	120	121	144	130	114	74
5 AM - 6 AM	176	199	208	210	209	123	66	166	185	217	213	219	123	79	167	204	216	230	224	142	87
6 AM - 7 AM	350	384	401	404	373	170	123	376	357	420	413	404	201	122	387	402	421	424	425	218	142
7 AM - 8 AM	615	672	668	667	597	258	158	626	602	699	686	641	284	178	596	639	654	641	615	304	215
8 AM - 9 AM	593	656	712	681	608	351	222	603	608	702	697	649	375	245	624	700	677	687	651	407	287
9 AM - 10 AM	506	578	572	591	560	447	356	541	546	590	615	589	477	374	584	605	607	631	630	505	416
10 AM - 11 AM	480	549	532	571	610	539	473	524	538	561	590	621	545	531	587	575	608	633	650	588	572
11 AM - 12 PM	530	544	565	608	654	618	605	596	595	585	667	685	657	695	634	611	635	699	757	722	725
12 PM - 1 PM	550	554	585	664	686	641	649	607	630	621	687	733	690	777	677	649	665	744	771	765	826
1 PM - 2 PM	566	592	624	682	716	636	711	650	659	655	706	755	684	800	719	668	694	774	815	767	876
2 PM - 3 PM	638	642	647	757	774	638	752	705	727	725	775	833	651	833	760	708	744	805	860	766	868
3 PM - 4 PM	693	730	748	825	838	631	760	767	777	797	892	960	663	830	813	782	818	886	976	706	896
4 PM - 5 PM	793	842	861	928	909	611	741	889	841	925	1,037	1,036	634	836	917	896	932	1,013	1,012	683	872
5 PM - 6 PM	810	846	907	953	909	573	741	893	877	914	1,025	963	584	785	901	875	942	1,030	1,000	624	819
6 PM - 7 PM	555	589	663	714	684	495	663	647	649	632	742	768	515	702	667	691	683	791	768	551	762
7 PM - 8 PM	411	453	495	538	516	415	553	459	492	492	542	567	441	614	524	487	519	574	584	483	621
8 PM - 9 PM	346	367	377	453	411	357	427	408	434	440	483	473	395	521	463	421	418	499	489	445	560
9 PM - 10 PM	302	338	328	388	359	294	325	353	364	387	419	408	348	413	400	380	361	448	425	383	435
10 PM - 11 PM	232	247	238	297	288	244	248	254	282	279	328	322	290	288	316	298	301	375	375	336	338
11 PM - Midnight	192	195	207	226	245	182	158	204	205	229	240	285	203	188	255	250	246	283	323	252	233

Close 2 Lanes

Month	April							May							June						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	216	307	321	356	375	352	244	258	295	327	346	393	370	277	327	357	387	355	425	479	345
1 AM - 2 AM	195	235	242	267	270	264	172	186	248	248	257	274	259	181	218	283	271	301	319	290	222
2 AM - 3 AM	137	179	188	223	216	191	127	148	193	195	215	238	198	141	180	219	221	260	255	207	161
3 AM - 4 AM	136	187	175	210	218	185	128	140	170	195	226	237	208	112	155	209	211	245	269	207	135
4 AM - 5 AM	167	222	231	247	260	188	116	185	221	227	260	269	196	123	191	241	242	287	259	227	148
5 AM - 6 AM	352	398	415	419	418	245	132	332	370	434	427	439	247	158	335	408	433	460	449	284	174
6 AM - 7 AM	700	767	802	807	747	340	245	752	713	840	826	808	402	243	774	803	842	848	849	436	285
7 AM - 8 AM	1,231	1,343	1,335	1,335	1,193	517	315	1,252	1,204	1,397	1,372	1,282	567	356	1,192	1,279	1,308	1,283	1,230	607	429
8 AM - 9 AM	1,187	1,312	1,423	1,362	1,216	702	444	1,206	1,217	1,405	1,393	1,298	751	489	1,247	1,399	1,355	1,374	1,301	813	573
9 AM - 10 AM	1,011	1,156	1,144	1,183	1,120	894	712	1,081	1,092	1,179	1,230	1,177	955	748	1,167	1,210	1,215	1,262	1,260	1,011	831
10 AM - 11 AM	960	1,098	1,064	1,142	1,220	1,078	945	1,048	1,075	1,123	1,180	1,243	1,091	1,062	1,174	1,150	1,216	1,266	1,301	1,175	1,145
11 AM - 12 PM	1,060	1,087	1,129	1,216	1,308	1,235	1,209	1,192	1,189	1,170	1,333	1,370	1,314	1,390	1,269	1,222	1,270	1,398	1,515	1,444	1,450
12 PM - 1 PM	1,101	1,108	1,171	1,327	1,373	1,282	1,297	1,214	1,260	1,242	1,374	1,466	1,379	1,553	1,355	1,298	1,330	1,488	1,541	1,529	1,651
1 PM - 2 PM	1,131	1,184	1,249	1,364	1,433	1,273	1,422	1,299	1,318	1,310	1,412	1,509	1,368	1,600	1,438	1,336	1,389	1,549	1,630	1,535	1,752
2 PM - 3 PM	1,275	1,284	1,294	1,513	1,547	1,276	1,504	1,410	1,453	1,449	1,549	1,666	1,302	1,666	1,519	1,415	1,487	1,610	1,721	1,531	1,736
3 PM - 4 PM	1,386	1,460	1,496	1,650	1,675	1,263	1,519	1,533	1,555	1,593	1,785	1,919	1,326	1,660	1,627	1,565	1,636	1,773	1,952	1,413	1,792
4 PM - 5 PM	1,586	1,685	1,722	1,857	1,817	1,222	1,482	1,777	1,683	1,850	2,075	2,072	1,267	1,672	1,835	1,793	1,863	2,026	2,025	1,366	1,745
5 PM - 6 PM	1,619	1,693	1,814	1,906	1,817	1,145	1,481	1,786	1,755	1,828	2,050	1,927	1,167	1,569	1,803	1,750	1,884	2,061	2,001	1,248	1,637
6 PM - 7 PM	1,110	1,178	1,326	1,429	1,368	990	1,326	1,295	1,298	1,264	1,484	1,537	1,030	1,404	1,334	1,382	1,366	1,583	1,536	1,102	1,524
7 PM - 8 PM	821	905	990	1,076	1,033	829	1,106	919	984	984	1,083	1,133	881	1,227	1,047	973	1,038	1,149	1,168	965	1,242
8 PM - 9 PM	691	734	753	905	822	714	854	815	868	879	966	947	790	1,043	926	842	837	998	978	890	1,120
9 PM - 10 PM	605	676	656	775	718	588	649	706	728	775	839	816	696	826	799	761	722	896	850	765	869
10 PM - 11 PM	463	494	476	595	577	488	496	509	565	559	656	645	580	576	632	595	602	750	751	672	676
11 PM - Midnight	384	389	414	452	489	364	315	408	409	457	480	569	406	375	510	500	492	565	646	504	465

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

173 Cleveland

TO

180 Akron

Route	I-80
Direction	EB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

Close 1 Lane

Month	July							August							September						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	156	181	188	202	220	222	194	166	175	179	188	198	256	184	158	163	167	177	202	226	190
1 AM - 2 AM	117	131	134	149	160	148	121	129	132	130	146	144	156	151	105	126	124	140	148	167	120
2 AM - 3 AM	86	102	103	114	122	111	84	95	112	106	110	126	105	91	80	101	100	120	124	112	87
3 AM - 4 AM	90	88	103	115	132	98	64	84	99	107	121	125	107	68	77	95	105	112	119	93	66
4 AM - 5 AM	109	113	127	137	138	107	66	98	129	127	147	130	108	67	94	116	117	131	138	104	61
5 AM - 6 AM	186	191	204	219	228	145	87	172	197	203	205	213	136	87	183	198	202	219	218	140	75
6 AM - 7 AM	360	376	395	391	400	213	130	370	390	398	394	395	194	122	385	388	406	421	423	202	119
7 AM - 8 AM	584	598	641	629	579	283	191	601	626	643	651	592	285	197	644	668	678	700	646	295	197
8 AM - 9 AM	613	645	665	680	633	390	270	604	704	699	699	663	390	278	642	678	707	731	654	435	277
9 AM - 10 AM	555	585	594	653	623	496	415	569	611	596	621	607	521	420	568	577	591	643	616	499	421
10 AM - 11 AM	580	587	600	636	685	606	561	585	602	594	655	648	636	586	586	562	574	639	649	612	584
11 AM - 12 PM	633	634	652	677	748	771	734	647	618	623	680	745	745	803	597	607	579	664	718	697	758
12 PM - 1 PM	691	686	690	749	806	769	850	687	647	667	707	726	792	888	647	630	629	693	776	748	859
1 PM - 2 PM	712	712	700	766	847	799	891	737	683	696	772	814	810	963	680	633	654	734	794	718	863
2 PM - 3 PM	770	751	778	839	894	790	955	767	715	729	834	870	782	975	720	712	700	793	841	752	886
3 PM - 4 PM	800	823	790	858	959	805	880	820	785	825	892	909	796	1,015	809	784	789	869	916	690	834
4 PM - 5 PM	870	910	873	970	1,070	750	870	904	895	944	998	1,013	768	935	911	887	910	993	1,012	678	857
5 PM - 6 PM	877	919	951	1,040	1,022	672	870	906	933	977	1,006	954	705	850	883	866	930	975	1,027	666	898
6 PM - 7 PM	650	714	708	757	778	576	734	683	688	720	754	781	588	754	668	655	718	746	828	569	785
7 PM - 8 PM	511	514	529	592	600	506	609	499	500	529	570	609	506	653	469	487	496	573	625	461	646
8 PM - 9 PM	434	431	429	498	519	440	520	410	439	434	453	476	463	546	410	402	427	499	478	405	553
9 PM - 10 PM	366	383	370	429	435	381	433	333	376	388	413	432	387	430	323	351	375	419	414	393	405
10 PM - 11 PM	291	311	321	361	367	312	331	296	300	318	373	377	340	317	257	268	291	334	355	346	289
11 PM - Midnight	246	263	256	296	302	263	243	243	248	241	278	346	259	241	200	188	227	266	271	275	203

Close 2 Lanes

Month	July							August							September						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	313	361	375	403	439	444	389	332	350	358	376	397	512	368	315	325	333	353	404	452	380
1 AM - 2 AM	233	261	268	298	321	295	242	257	264	260	293	288	312	303	210	252	248	280	296	334	240
2 AM - 3 AM	171	205	206	227	244	222	168	190	225	211	220	253	210	182	159	203	201	241	248	224	173
3 AM - 4 AM	180	177	205	230	264	197	129	168	198	214	242	250	214	136	154	190	210	224	239	185	131
4 AM - 5 AM	218	225	254	274	276	214	132	196	257	254	294	260	216	133	188	231	234	262	276	209	121
5 AM - 6 AM	372	382	407	437	457	290	174	344	394	405	409	427	272	175	365	395	404	438	437	279	151
6 AM - 7 AM	719	752	791	782	800	425	260	741	779	795	789	791	387	245	771	777	811	843	847	405	237
7 AM - 8 AM	1,167	1,196	1,283	1,257	1,158	566	382	1,201	1,253	1,285	1,302	1,184	569	394	1,288	1,335	1,356	1,401	1,292	589	394
8 AM - 9 AM	1,225	1,290	1,331	1,361	1,265	780	539	1,208	1,407	1,399	1,399	1,325	780	556	1,284	1,355	1,414	1,462	1,308	869	554
9 AM - 10 AM	1,110	1,170	1,188	1,306	1,245	992	830	1,138	1,222	1,192	1,242	1,214	1,041	839	1,136	1,154	1,183	1,285	1,232	998	843
10 AM - 11 AM	1,160	1,174	1,200	1,271	1,370	1,213	1,122	1,169	1,204	1,189	1,311	1,296	1,271	1,173	1,172	1,125	1,149	1,278	1,298	1,224	1,168
11 AM - 12 PM	1,266	1,269	1,304	1,353	1,496	1,542	1,469	1,294	1,236	1,247	1,359	1,490	1,491	1,606	1,194	1,215	1,158	1,328	1,437	1,394	1,515
12 PM - 1 PM	1,382	1,373	1,380	1,498	1,612	1,539	1,701	1,373	1,293	1,334	1,415	1,451	1,584	1,777	1,295	1,260	1,258	1,386	1,552	1,495	1,719
1 PM - 2 PM	1,424	1,423	1,400	1,532	1,695	1,599	1,782	1,474	1,365	1,391	1,543	1,628	1,621	1,926	1,360	1,266	1,308	1,467	1,589	1,436	1,727
2 PM - 3 PM	1,539	1,502	1,557	1,677	1,788	1,580	1,910	1,534	1,430	1,457	1,668	1,740	1,563	1,950	1,440	1,425	1,400	1,586	1,681	1,504	1,771
3 PM - 4 PM	1,601	1,646	1,581	1,716	1,919	1,610	1,760	1,639	1,570	1,651	1,784	1,817	1,592	2,029	1,617	1,567	1,578	1,738	1,832	1,379	1,668
4 PM - 5 PM	1,739	1,821	1,746	1,939	2,141	1,500	1,739	1,809	1,791	1,889	1,996	2,026	1,537	1,870	1,823	1,775	1,820	1,986	2,023	1,356	1,714
5 PM - 6 PM	1,755	1,839	1,901	2,080	2,043	1,344	1,741	1,811	1,866	1,953	2,011	1,909	1,411	1,699	1,766	1,732	1,860	1,950	2,053	1,332	1,797
6 PM - 7 PM	1,300	1,428	1,416	1,513	1,556	1,151	1,468	1,366	1,376	1,441	1,509	1,562	1,176	1,507	1,337	1,310	1,436	1,491	1,655	1,138	1,571
7 PM - 8 PM	1,022	1,027	1,057	1,183	1,201	1,013	1,219	998	1,000	1,058	1,139	1,218	1,011	1,305	939	974	991	1,146	1,250	921	1,292
8 PM - 9 PM	868	862	858	996	1,037	879	1,040	821	877	868	906	951	926	1,092	820	804	853	997	957	809	1,107
9 PM - 10 PM	732	766	740	858	871	762	865	666	751	776	826	864	774	861	645	701	750	837	827	786	810
10 PM - 11 PM	582	623	642	723	735	624	662	592	599	635	746	755	680	635	514	537	582	668	710	691	577
11 PM - Midnight	491	525	511	592	604	526	486	486	496	481	556	692	517	482	400	376	454	531	542	550	406

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

173 Cleveland

TO

180 Akron

Route	I-80
Direction	EB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Close 1 Lane

Month	October							November							December						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	163	179	168	173	223	204	189	126	145	156	172	171	173	149	112	155	165	158	163	162	114
1 AM - 2 AM	107	132	122	131	168	157	148	101	122	123	115	139	128	122	78	121	124	113	137	118	82
2 AM - 3 AM	77	110	97	108	128	109	104	73	98	104	105	119	98	67	66	97	100	106	109	95	65
3 AM - 4 AM	73	104	100	112	125	94	75	69	97	109	107	110	93	55	63	98	104	107	108	82	53
4 AM - 5 AM	91	118	127	123	135	101	66	92	114	120	134	138	100	61	90	131	125	133	132	89	55
5 AM - 6 AM	181	205	219	217	214	125	76	190	206	219	223	214	138	73	162	195	212	212	212	117	69
6 AM - 7 AM	382	414	407	435	399	168	110	384	423	428	416	416	181	117	330	392	380	396	381	162	109
7 AM - 8 AM	636	694	695	688	620	256	168	649	679	675	684	643	273	176	551	599	604	634	588	224	144
8 AM - 9 AM	641	723	732	709	634	366	248	650	671	697	704	633	378	261	546	589	630	639	565	305	217
9 AM - 10 AM	570	618	612	609	623	497	374	558	556	571	622	569	482	419	484	522	542	554	531	406	335
10 AM - 11 AM	592	567	591	620	638	576	558	546	516	578	575	603	587	538	463	521	552	538	541	498	476
11 AM - 12 PM	636	604	592	642	700	680	718	573	552	584	628	641	669	679	507	564	571	565	584	583	626
12 PM - 1 PM	659	616	625	701	748	704	842	605	572	601	661	680	699	765	533	602	601	598	629	598	680
1 PM - 2 PM	651	633	658	720	760	714	864	621	610	619	678	719	702	784	536	617	629	615	633	605	724
2 PM - 3 PM	746	693	713	792	828	723	857	685	660	689	756	802	690	781	592	675	682	688	703	602	727
3 PM - 4 PM	841	785	786	881	908	692	868	790	747	752	829	853	688	787	671	767	750	760	784	606	710
4 PM - 5 PM	886	909	930	959	999	645	833	865	842	879	905	933	668	767	752	858	827	859	861	585	664
5 PM - 6 PM	876	894	961	991	981	607	797	840	857	886	939	949	627	754	748	845	816	857	830	533	630
6 PM - 7 PM	621	672	692	773	790	535	733	607	625	663	686	737	534	634	542	622	611	655	659	462	564
7 PM - 8 PM	454	478	501	556	558	458	617	434	448	464	503	533	441	489	405	454	445	499	473	378	458
8 PM - 9 PM	386	386	429	469	483	386	549	365	363	361	432	446	356	401	337	388	375	406	393	310	376
9 PM - 10 PM	330	319	356	393	405	356	410	320	282	319	361	378	302	304	324	319	358	342	345	277	285
10 PM - 11 PM	259	270	288	341	340	307	288	276	242	312	302	366	276	222	253	242	294	274	282	224	208
11 PM - Midnight	209	204	224	271	278	225	224	198	198	243	228	249	209	164	190	196	223	230	230	178	147

Close 2 Lanes

Month	October							November							December						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	325	357	336	347	447	408	378	251	291	312	344	341	345	298	223	309	329	315	327	324	228
1 AM - 2 AM	215	265	244	262	335	313	295	201	245	245	229	277	255	244	155	242	248	226	274	235	165
2 AM - 3 AM	153	219	194	217	256	218	208	146	197	208	209	238	196	134	132	194	201	212	217	190	131
3 AM - 4 AM	146	208	200	225	251	188	149	138	194	218	215	219	186	109	126	197	208	214	215	165	107
4 AM - 5 AM	182	237	254	246	270	201	132	183	229	240	267	276	201	121	180	262	251	265	264	179	111
5 AM - 6 AM	363	411	439	435	428	250	151	381	412	437	446	428	277	146	324	389	423	424	423	234	138
6 AM - 7 AM	764	829	815	870	799	336	220	768	845	855	831	833	363	234	660	783	759	791	762	323	219
7 AM - 8 AM	1,272	1,387	1,389	1,377	1,240	511	336	1,298	1,357	1,350	1,368	1,285	546	351	1,101	1,198	1,208	1,268	1,175	448	288
8 AM - 9 AM	1,282	1,447	1,464	1,418	1,269	732	496	1,300	1,343	1,393	1,407	1,266	755	522	1,092	1,177	1,260	1,277	1,130	611	434
9 AM - 10 AM	1,141	1,237	1,224	1,218	1,246	994	747	1,117	1,111	1,142	1,243	1,138	964	837	968	1,045	1,084	1,108	1,061	812	671
10 AM - 11 AM	1,184	1,133	1,183	1,239	1,276	1,152	1,115	1,092	1,032	1,157	1,150	1,205	1,175	1,077	926	1,043	1,105	1,076	1,081	996	953
11 AM - 12 PM	1,272	1,207	1,184	1,284	1,399	1,360	1,437	1,146	1,104	1,167	1,256	1,282	1,337	1,358	1,014	1,128	1,142	1,130	1,168	1,167	1,253
12 PM - 1 PM	1,318	1,233	1,250	1,401	1,495	1,409	1,683	1,211	1,145	1,201	1,321	1,359	1,397	1,529	1,065	1,205	1,203	1,195	1,258	1,196	1,360
1 PM - 2 PM	1,301	1,266	1,317	1,441	1,519	1,427	1,729	1,242	1,219	1,237	1,355	1,438	1,405	1,567	1,072	1,234	1,259	1,229	1,266	1,209	1,447
2 PM - 3 PM	1,492	1,385	1,426	1,585	1,655	1,446	1,714	1,370	1,320	1,378	1,511	1,603	1,380	1,562	1,184	1,350	1,365	1,376	1,406	1,204	1,454
3 PM - 4 PM	1,682	1,571	1,572	1,762	1,817	1,385	1,735	1,581	1,494	1,503	1,658	1,707	1,376	1,573	1,342	1,533	1,499	1,520	1,569	1,212	1,420
4 PM - 5 PM	1,773	1,818	1,859	1,917	1,998	1,291	1,666	1,729	1,684	1,758	1,810	1,865	1,336	1,533	1,504	1,716	1,655	1,717	1,722	1,170	1,327
5 PM - 6 PM	1,751	1,787	1,922	1,982	1,962	1,213	1,593	1,680	1,713	1,771	1,878	1,898	1,253	1,507	1,496	1,691	1,632	1,714	1,659	1,065	1,260
6 PM - 7 PM	1,241	1,343	1,383	1,545	1,579	1,070	1,467	1,213	1,251	1,325	1,371	1,473	1,069	1,268	1,084	1,243	1,223	1,309	1,317	924	1,128
7 PM - 8 PM	908	955	1,002	1,111	1,116	917	1,233	869	895	928	1,005	1,067	882	977	809	908	890	997	945	756	917
8 PM - 9 PM	772	773	858	939	967	772	1,098	730	727	721	863	892	712	801	674	775	750	812	785	620	752
9 PM - 10 PM	659	638	713	786	811	713	821	640	564	637	723	756	604	608	649	639	715	684	690	554	570
10 PM - 11 PM	519	540	576	682	679	614	575	552	485	624	604	732	552	444	507	485	588	548	564	448	416
11 PM - Midnight	418	408	447	542	555	450	448	397	396	486	456	499	417	328	381	392	446	459	459	356	294

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

180 Akron

TO

173 Cleveland

Route	I-80
Direction	WB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

Close 1 Lane

Month	January							February							March						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	80	143	158	161	153	141	90	98	165	168	162	129	143	107	119	177	175	177	172	148	104
1 AM - 2 AM	61	115	123	130	122	102	61	72	136	136	123	96	109	67	85	147	134	135	134	114	72
2 AM - 3 AM	50	112	101	108	110	88	45	65	122	118	107	95	79	47	64	116	118	117	115	88	57
3 AM - 4 AM	60	110	112	115	115	92	46	65	111	117	105	105	83	53	71	120	118	120	114	92	57
4 AM - 5 AM	77	117	128	134	140	98	51	94	143	143	128	111	99	60	116	145	142	143	153	105	65
5 AM - 6 AM	143	211	212	217	206	118	56	171	232	227	201	176	127	63	185	241	230	235	224	126	68
6 AM - 7 AM	267	358	393	378	356	142	72	346	426	412	352	304	153	90	352	434	425	433	394	168	85
7 AM - 8 AM	392	529	551	556	532	176	91	537	633	612	530	461	223	104	553	641	643	642	586	220	117
8 AM - 9 AM	384	553	570	582	546	248	126	542	632	625	520	482	280	159	537	654	630	644	585	297	159
9 AM - 10 AM	330	466	475	478	453	306	181	428	535	526	460	454	352	224	441	539	545	553	530	342	219
10 AM - 11 AM	316	450	441	444	456	390	255	421	482	464	435	456	451	334	411	489	494	521	527	472	334
11 AM - 12 PM	335	457	433	454	467	475	324	427	490	471	427	477	532	421	436	509	512	549	569	539	457
12 PM - 1 PM	357	486	462	494	508	499	395	446	505	488	444	528	562	476	455	521	529	582	622	605	546
1 PM - 2 PM	388	508	472	505	542	524	439	467	510	486	449	553	571	523	487	549	558	594	659	617	596
2 PM - 3 PM	434	566	525	557	577	524	482	508	561	534	492	589	555	545	528	598	596	651	733	599	632
3 PM - 4 PM	512	651	634	665	689	547	494	631	646	642	576	680	585	562	640	686	709	759	868	594	653
4 PM - 5 PM	628	749	727	788	781	517	495	733	787	769	676	759	563	580	758	812	854	917	947	589	687
5 PM - 6 PM	659	814	790	802	822	481	459	835	865	823	702	809	518	576	848	869	935	945	996	538	678
6 PM - 7 PM	481	547	563	580	611	415	434	557	592	536	488	612	444	503	600	634	646	686	736	464	628
7 PM - 8 PM	364	400	399	423	435	314	335	420	436	410	347	442	337	398	427	458	463	517	515	369	535
8 PM - 9 PM	303	337	338	343	329	251	275	358	353	318	292	345	272	324	379	378	388	400	423	302	412
9 PM - 10 PM	249	285	275	274	291	211	209	290	303	280	233	280	239	248	308	300	319	345	328	252	323
10 PM - 11 PM	212	232	245	228	213	168	149	255	254	220	195	225	187	187	262	268	274	278	281	203	229
11 PM - Midnight	179	187	191	191	175	130	108	203	189	195	141	179	146	143	212	217	212	219	210	153	165

Close 2 Lanes

Month	January							February							March						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	160	287	317	321	307	282	180	196	330	335	323	258	287	215	238	353	349	354	344	296	209
1 AM - 2 AM	121	229	245	259	244	204	121	145	272	272	247	192	217	134	171	293	268	270	268	229	144
2 AM - 3 AM	100	225	201	215	219	175	91	130	243	235	214	190	158	94	129	233	236	234	231	176	114
3 AM - 4 AM	119	219	225	230	230	184	91	130	222	235	210	210	167	105	143	240	235	239	228	184	114
4 AM - 5 AM	153	234	256	267	281	197	103	188	287	286	256	222	198	119	231	290	285	286	306	210	129
5 AM - 6 AM	285	422	424	433	413	237	113	343	463	455	401	351	253	126	370	482	459	471	447	252	136
6 AM - 7 AM	534	715	785	757	712	285	144	692	853	825	703	607	306	180	704	867	851	866	789	337	170
7 AM - 8 AM	785	1,059	1,102	1,112	1,065	353	183	1,074	1,267	1,224	1,060	923	445	208	1,106	1,282	1,286	1,283	1,171	441	235
8 AM - 9 AM	767	1,106	1,140	1,164	1,093	497	251	1,085	1,265	1,251	1,040	963	559	317	1,073	1,307	1,261	1,289	1,171	594	319
9 AM - 10 AM	661	932	949	957	905	612	362	856	1,070	1,051	920	908	703	449	882	1,077	1,089	1,106	1,059	684	439
10 AM - 11 AM	633	899	882	887	912	780	510	842	965	929	869	912	902	668	822	977	988	1,041	1,055	945	668
11 AM - 12 PM	669	915	865	907	935	950	648	854	979	942	854	954	1,064	841	873	1,018	1,025	1,097	1,137	1,078	915
12 PM - 1 PM	713	973	924	988	1,016	998	791	893	1,010	975	888	1,056	1,124	952	911	1,043	1,058	1,164	1,245	1,210	1,093
1 PM - 2 PM	777	1,016	944	1,010	1,085	1,047	877	934	1,019	972	899	1,106	1,142	1,046	975	1,098	1,115	1,189	1,319	1,233	1,193
2 PM - 3 PM	867	1,132	1,049	1,115	1,153	1,047	965	1,017	1,121	1,068	984	1,178	1,110	1,089	1,056	1,196	1,191	1,301	1,466	1,199	1,264
3 PM - 4 PM	1,024	1,301	1,269	1,330	1,377	1,093	987	1,262	1,292	1,283	1,151	1,360	1,169	1,123	1,281	1,372	1,418	1,517	1,735	1,187	1,306
4 PM - 5 PM	1,256	1,498	1,454	1,576	1,562	1,033	990	1,465	1,573	1,538	1,352	1,517	1,126	1,161	1,516	1,623	1,708	1,834	1,895	1,178	1,375
5 PM - 6 PM	1,318	1,628	1,580	1,603	1,645	962	917	1,671	1,730	1,646	1,404	1,618	1,035	1,152	1,696	1,739	1,870	1,890	1,993	1,076	1,356
6 PM - 7 PM	963	1,093	1,127	1,160	1,222	830	869	1,113	1,184	1,072	976	1,225	888	1,006	1,200	1,268	1,292	1,372	1,471	928	1,256
7 PM - 8 PM	727	801	798	846	869	628	671	839	871	820	695	884	674	797	854	916	927	1,033	1,031	739	1,071
8 PM - 9 PM	606	673	675	687	657	503	549	715	706	636	584	691	544	647	757	756	776	799	846	603	824
9 PM - 10 PM	497	569	551	548	582	423	419	580	606	561	466	561	478	497	617	601	638	690	656	504	646
10 PM - 11 PM	423	465	489	456	426	335	299	510	508	440	390	450	374	374	523	536	549	557	562	405	457
11 PM - Midnight	357	374	382	381	349	259	217	406	378	390	282	358	293	285	423	434	425	437	420	306	330

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

180 Akron

TO

173 Cleveland

Route	I-80
Direction	WB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Close 1 Lane

Month	April							May							June						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	119	192	190	192	193	178	131	124	175	176	191	202	193	136	138	198	206	210	239	227	161
1 AM - 2 AM	85	147	149	145	148	132	78	88	142	143	150	165	136	85	100	158	157	165	178	169	102
2 AM - 3 AM	61	128	123	128	134	103	68	71	115	132	124	133	108	66	75	129	134	146	149	133	79
3 AM - 4 AM	96	130	122	123	133	106	58	83	110	124	130	144	101	66	82	131	135	148	142	115	67
4 AM - 5 AM	108	168	156	156	156	116	68	119	139	165	159	165	126	76	117	157	168	170	167	133	80
5 AM - 6 AM	187	234	241	236	223	150	69	199	218	242	237	227	146	78	197	251	254	256	241	158	78
6 AM - 7 AM	386	449	445	439	409	196	100	396	401	473	477	451	200	98	371	444	466	457	438	213	117
7 AM - 8 AM	624	706	698	676	594	263	136	619	633	740	710	613	281	142	597	705	720	689	625	295	154
8 AM - 9 AM	621	703	694	731	605	342	188	626	646	726	728	666	383	207	618	727	725	732	674	410	255
9 AM - 10 AM	460	562	572	579	536	449	279	521	551	593	637	628	492	312	545	643	651	642	652	553	367
10 AM - 11 AM	439	530	531	565	550	551	395	484	521	566	577	628	596	433	509	579	584	617	667	616	495
11 AM - 12 PM	471	538	530	586	625	610	511	490	534	587	596	671	653	539	567	619	602	685	751	718	631
12 PM - 1 PM	494	560	553	613	685	679	616	545	599	615	668	741	710	676	588	647	660	719	810	776	717
1 PM - 2 PM	511	565	587	648	740	683	702	575	653	624	694	791	725	707	637	650	677	755	848	819	797
2 PM - 3 PM	558	630	632	709	805	685	733	633	707	694	748	847	733	746	684	712	743	819	901	815	852
3 PM - 4 PM	730	746	759	841	929	707	750	761	804	835	891	1,024	734	771	809	804	869	930	1,030	809	849
4 PM - 5 PM	853	887	915	958	1,022	707	804	891	924	989	1,019	1,153	669	783	912	945	974	1,040	1,109	803	865
5 PM - 6 PM	880	966	952	1,034	1,024	638	775	928	969	1,033	1,051	1,110	609	759	969	1,015	1,023	1,147	1,108	716	830
6 PM - 7 PM	615	663	680	735	766	563	685	654	708	734	743	852	572	678	711	705	743	812	869	629	744
7 PM - 8 PM	455	490	514	540	585	444	581	493	535	512	558	645	468	589	512	516	530	624	663	530	641
8 PM - 9 PM	376	400	394	450	458	370	465	419	439	422	461	525	363	481	427	431	443	508	550	450	526
9 PM - 10 PM	307	332	338	380	382	299	359	331	346	326	390	405	311	382	347	344	350	425	476	369	405
10 PM - 11 PM	250	272	271	305	310	260	275	276	280	272	311	326	257	256	278	286	297	325	356	295	312
11 PM - Midnight	201	222	230	247	222	180	177	222	225	236	257	265	187	191	235	239	264	302	292	228	222

Close 2 Lanes

Month	April							May							June						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	238	384	381	384	386	356	262	248	350	353	383	404	387	271	275	396	412	421	478	454	322
1 AM - 2 AM	169	295	297	289	296	263	156	175	284	285	300	329	271	170	199	317	314	330	357	337	203
2 AM - 3 AM	121	257	246	256	268	207	136	141	231	263	249	265	216	132	151	258	267	293	298	267	159
3 AM - 4 AM	192	259	245	247	265	212	115	166	219	248	259	289	202	133	165	262	269	295	285	230	133
4 AM - 5 AM	216	335	312	311	311	232	135	238	278	331	317	329	251	151	234	314	336	339	334	266	161
5 AM - 6 AM	374	467	482	471	446	300	137	397	436	484	473	454	292	156	394	502	508	512	483	316	157
6 AM - 7 AM	772	898	891	879	817	391	201	792	802	947	955	901	400	197	741	887	933	915	877	426	234
7 AM - 8 AM	1,247	1,413	1,395	1,352	1,187	527	272	1,239	1,266	1,479	1,420	1,227	562	283	1,193	1,410	1,440	1,378	1,249	589	309
8 AM - 9 AM	1,241	1,406	1,388	1,462	1,210	683	375	1,252	1,292	1,452	1,457	1,332	766	415	1,235	1,455	1,450	1,464	1,349	819	510
9 AM - 10 AM	920	1,123	1,144	1,158	1,071	897	558	1,041	1,102	1,186	1,274	1,255	984	623	1,089	1,285	1,303	1,283	1,304	1,105	734
10 AM - 11 AM	878	1,061	1,061	1,130	1,099	1,101	790	969	1,041	1,131	1,153	1,255	1,192	865	1,017	1,159	1,168	1,234	1,334	1,231	989
11 AM - 12 PM	942	1,075	1,060	1,172	1,250	1,219	1,022	980	1,067	1,175	1,192	1,341	1,307	1,079	1,134	1,237	1,204	1,370	1,502	1,436	1,263
12 PM - 1 PM	989	1,120	1,106	1,226	1,370	1,359	1,231	1,091	1,197	1,230	1,335	1,481	1,420	1,351	1,176	1,293	1,319	1,438	1,621	1,551	1,433
1 PM - 2 PM	1,022	1,129	1,174	1,295	1,480	1,367	1,404	1,150	1,306	1,249	1,387	1,581	1,450	1,414	1,273	1,299	1,353	1,510	1,696	1,637	1,594
2 PM - 3 PM	1,117	1,260	1,263	1,418	1,609	1,371	1,465	1,267	1,413	1,388	1,496	1,693	1,466	1,492	1,368	1,425	1,486	1,638	1,801	1,629	1,705
3 PM - 4 PM	1,460	1,491	1,517	1,682	1,858	1,414	1,499	1,521	1,608	1,670	1,782	2,048	1,468	1,542	1,619	1,607	1,738	1,860	2,060	1,617	1,699
4 PM - 5 PM	1,706	1,775	1,830	1,917	2,044	1,414	1,609	1,783	1,848	1,978	2,038	2,307	1,337	1,567	1,823	1,890	1,948	2,079	2,219	1,605	1,730
5 PM - 6 PM	1,759	1,931	1,904	2,068	2,047	1,276	1,549	1,856	1,938	2,067	2,101	2,219	1,218	1,519	1,937	2,031	2,046	2,294	2,217	1,433	1,659
6 PM - 7 PM	1,231	1,327	1,360	1,471	1,532	1,125	1,369	1,309	1,417	1,468	1,486	1,703	1,144	1,357	1,423	1,410	1,486	1,624	1,738	1,258	1,488
7 PM - 8 PM	910	980	1,029	1,079	1,170	888	1,162	986	1,070	1,024	1,117	1,291	935	1,177	1,024	1,032	1,061	1,247	1,326	1,060	1,281
8 PM - 9 PM	752	800	789	901	916	740	930	837	878	844	922	1,050	726	963	855	863	886	1,016	1,101	901	1,052
9 PM - 10 PM	614	664	675	760	764	598	718	662	692	652	781	809	622	763	695	688	700	849	951	738	811
10 PM - 11 PM	499	543	541	609	620	520	550	551	560	544	621	651	513	512	556	573	594	650	711	590	623
11 PM - Midnight	403	443	461	495	443	360	353	443	449	471	514	529	375	382	469	477	527	604	585	456	444

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

180 Akron

TO

173 Cleveland

Route	I-80
Direction	WB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

Close 1 Lane

Month	July							August							September						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	136	167	210	219	234	228	168	158	207	212	212	217	226	148	135	195	195	212	203	226	148
1 AM - 2 AM	104	134	156	170	167	158	102	112	161	167	159	161	157	98	92	143	154	160	147	151	92
2 AM - 3 AM	75	109	140	144	142	120	72	89	137	128	142	132	118	72	80	108	132	129	128	124	67
3 AM - 4 AM	83	117	123	131	138	112	71	87	140	124	142	127	108	64	79	111	115	128	130	112	63
4 AM - 5 AM	113	138	166	157	164	126	72	110	157	160	165	156	126	72	113	144	151	152	166	129	62
5 AM - 6 AM	199	216	247	255	232	159	84	188	238	226	237	239	144	78	196	236	233	246	246	134	81
6 AM - 7 AM	371	404	426	427	399	215	111	360	438	430	430	409	194	96	409	451	451	475	431	192	109
7 AM - 8 AM	567	640	665	665	607	275	148	582	699	688	680	605	255	136	593	642	659	675	638	279	152
8 AM - 9 AM	593	680	715	736	638	387	231	587	751	721	724	646	375	219	610	663	694	713	640	397	235
9 AM - 10 AM	519	599	635	642	629	524	351	512	650	621	643	630	510	344	500	568	605	627	603	550	361
10 AM - 11 AM	536	545	588	629	670	620	463	506	607	596	624	652	635	459	484	526	552	588	600	663	484
11 AM - 12 PM	564	601	615	681	732	719	612	557	630	643	680	723	728	650	524	553	566	607	695	766	590
12 PM - 1 PM	612	646	648	741	810	803	716	609	639	657	729	792	823	746	572	577	573	644	736	791	683
1 PM - 2 PM	642	657	706	785	842	812	817	647	672	693	774	885	839	792	582	611	624	687	816	794	667
2 PM - 3 PM	675	709	739	841	920	825	848	715	726	739	825	939	832	839	655	668	690	751	909	778	719
3 PM - 4 PM	786	813	873	973	1,016	842	880	812	832	885	965	1,095	813	836	757	761	807	895	1,044	816	771
4 PM - 5 PM	926	956	981	1,049	1,106	796	905	929	959	1,040	1,078	1,144	849	866	879	903	969	1,052	1,204	753	766
5 PM - 6 PM	945	1,001	1,037	1,138	1,094	734	872	981	1,041	1,079	1,126	1,149	793	867	943	992	1,001	1,143	1,253	704	744
6 PM - 7 PM	700	709	760	811	857	658	768	725	719	772	834	915	667	798	673	704	712	828	1,035	614	697
7 PM - 8 PM	531	534	556	617	683	530	659	526	541	573	642	693	571	677	509	515	518	591	731	481	614
8 PM - 9 PM	455	433	443	513	535	457	549	434	438	479	534	504	458	535	399	434	418	506	517	411	548
9 PM - 10 PM	358	370	363	448	458	373	419	341	349	395	433	427	385	405	337	341	341	413	437	350	433
10 PM - 11 PM	299	307	307	339	363	309	311	286	293	308	331	367	302	306	284	283	281	343	382	282	297
11 PM - Midnight	241	262	254	299	312	234	223	237	250	259	270	280	220	219	253	229	244	267	292	221	209

Close 2 Lanes

Month	July							August							September						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	271	335	419	439	467	455	335	316	414	423	423	434	452	296	269	391	389	424	405	452	296
1 AM - 2 AM	207	268	312	339	334	316	205	224	322	333	317	321	313	197	184	285	307	320	293	302	184
2 AM - 3 AM	150	218	279	288	284	240	145	178	274	257	284	263	236	143	159	216	264	258	255	247	133
3 AM - 4 AM	165	234	246	262	276	223	143	174	280	248	283	253	215	129	158	223	231	255	260	225	126
4 AM - 5 AM	226	277	331	314	327	251	144	220	314	320	330	312	252	144	227	288	302	304	333	259	124
5 AM - 6 AM	398	432	494	511	463	318	168	376	476	453	475	478	289	155	391	472	467	492	492	268	162
6 AM - 7 AM	741	809	851	854	799	429	222	719	876	861	860	817	388	193	817	902	901	949	862	383	218
7 AM - 8 AM	1,134	1,280	1,329	1,330	1,215	551	296	1,164	1,398	1,376	1,360	1,210	511	272	1,185	1,284	1,318	1,350	1,276	557	304
8 AM - 9 AM	1,186	1,359	1,431	1,473	1,277	773	462	1,173	1,503	1,441	1,448	1,291	751	438	1,219	1,327	1,389	1,426	1,280	794	470
9 AM - 10 AM	1,037	1,198	1,270	1,284	1,258	1,049	703	1,024	1,300	1,242	1,285	1,261	1,020	687	999	1,137	1,209	1,254	1,206	1,099	721
10 AM - 11 AM	1,072	1,090	1,175	1,257	1,339	1,239	926	1,013	1,213	1,193	1,249	1,305	1,271	917	967	1,052	1,104	1,176	1,200	1,325	968
11 AM - 12 PM	1,128	1,201	1,230	1,363	1,463	1,438	1,224	1,113	1,259	1,287	1,359	1,445	1,455	1,300	1,049	1,105	1,132	1,213	1,390	1,533	1,179
12 PM - 1 PM	1,223	1,292	1,297	1,482	1,620	1,606	1,433	1,219	1,277	1,315	1,459	1,584	1,646	1,493	1,144	1,154	1,146	1,288	1,471	1,582	1,365
1 PM - 2 PM	1,283	1,315	1,412	1,570	1,684	1,624	1,635	1,294	1,344	1,385	1,548	1,770	1,678	1,584	1,164	1,223	1,248	1,374	1,632	1,587	1,334
2 PM - 3 PM	1,350	1,418	1,478	1,681	1,840	1,650	1,696	1,430	1,453	1,478	1,649	1,879	1,664	1,678	1,309	1,335	1,379	1,502	1,817	1,557	1,438
3 PM - 4 PM	1,573	1,625	1,747	1,945	2,031	1,683	1,760	1,624	1,664	1,769	1,930	2,190	1,626	1,672	1,514	1,523	1,615	1,790	2,087	1,632	1,541
4 PM - 5 PM	1,851	1,913	1,962	2,098	2,212	1,593	1,810	1,858	1,919	2,080	2,156	2,287	1,698	1,732	1,758	1,806	1,938	2,104	2,408	1,505	1,532
5 PM - 6 PM	1,889	2,002	2,074	2,277	2,187	1,468	1,743	1,962	2,082	2,158	2,252	2,299	1,586	1,735	1,885	1,983	2,002	2,286	2,507	1,407	1,488
6 PM - 7 PM	1,399	1,418	1,519	1,623	1,713	1,315	1,536	1,450	1,439	1,544	1,669	1,831	1,335	1,596	1,346	1,409	1,424	1,656	2,070	1,227	1,393
7 PM - 8 PM	1,062	1,069	1,111	1,235	1,367	1,059	1,318	1,053	1,082	1,147	1,285	1,385	1,142	1,353	1,019	1,030	1,036	1,182	1,462	962	1,229
8 PM - 9 PM	911	865	885	1,026	1,069	914	1,098	868	877	957	1,067	1,009	916	1,069	799	869	837	1,013	1,034	822	1,096
9 PM - 10 PM	716	741	725	896	915	746	838	683	697	791	867	853	769	810	675	682	682	827	873	700	866
10 PM - 11 PM	599	614	614	677	726	618	622	573	586	616	662	734	604	611	568	565	563	686	765	563	594
11 PM - Midnight	482	524	509	598	624	468	447	474	500	519	540	560	441	439	505	459	488	535	584	443	418

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Ohio Turnpike and Infrastructure Commission Permitted Lane Closures

180 Akron

TO

173 Cleveland

Route	I-80
Direction	WB

Terrain	Rolling
Lanes Per Direction	3

The traffic volumes shown are the average traffic volumes for each day of the week for the entire month; therefore, actual traffic volume may be higher or lower than the volume shown.

XXX Lane Closure Not Permitted

XXX Blocks highlighted this color are close enough to Capacity that a backup may result from a lane closure.

NOTES:

1. Refer to SP 104 for lane closure restrictions.
2. If the first arrow board will be within two (2) miles of the beginning of this section, then the previous section must also be checked for permission.
3. If a Lane Closure will involve multiple sections, implementation of the lane closure (i.e. set-up operations) may not occur prior to the **LATEST** Permitted Lane Closure Time and lane closures must be removed (i.e. tear down operations) prior to the **EARLIEST** Prohibited Lane Closure Time.

Close 1 Lane

Month	October							November							December						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	124	191	183	185	208	210	145	114	178	176	175	181	181	116	104	182	175	170	167	163	102
1 AM - 2 AM	92	156	148	150	152	144	100	79	145	148	142	148	131	105	77	138	155	137	139	124	75
2 AM - 3 AM	76	129	140	135	140	113	76	64	127	121	125	124	107	56	63	124	114	115	117	100	48
3 AM - 4 AM	81	128	134	134	134	105	60	78	130	124	133	123	104	55	69	126	122	124	128	110	54
4 AM - 5 AM	117	159	155	163	167	124	65	114	163	156	164	162	123	60	104	155	153	149	154	103	65
5 AM - 6 AM	184	249	235	243	228	138	78	191	245	253	253	230	140	73	171	239	238	243	225	135	75
6 AM - 7 AM	387	451	463	450	426	185	102	389	461	449	472	432	195	104	345	431	442	440	413	174	95
7 AM - 8 AM	570	680	665	668	605	252	133	602	684	681	657	615	267	133	523	606	603	619	577	230	111
8 AM - 9 AM	588	714	674	691	643	371	222	606	690	710	690	643	352	190	504	649	626	660	596	300	167
9 AM - 10 AM	488	616	618	616	612	510	335	506	600	599	598	582	453	295	428	554	561	568	531	382	244
10 AM - 11 AM	470	544	561	550	614	626	466	474	543	543	567	562	539	405	416	517	536	531	535	458	361
11 AM - 12 PM	522	578	559	611	675	684	577	490	574	548	567	651	632	507	455	536	543	542	585	585	472
12 PM - 1 PM	570	597	589	659	748	727	681	542	599	567	623	710	701	611	469	572	576	598	630	606	579
1 PM - 2 PM	598	622	612	692	815	727	710	562	630	599	647	728	670	622	500	591	619	634	651	648	621
2 PM - 3 PM	636	664	667	775	887	721	739	604	676	636	719	821	716	598	557	659	651	656	723	652	655
3 PM - 4 PM	773	792	821	939	1,006	733	792	720	763	771	858	965	698	684	678	747	772	759	848	665	682
4 PM - 5 PM	880	896	954	1,097	1,099	699	782	870	866	919	1,023	1,050	703	729	787	888	894	865	881	662	690
5 PM - 6 PM	996	1,014	1,049	1,217	1,137	662	754	927	952	995	1,055	1,105	625	692	813	883	921	862	918	621	652
6 PM - 7 PM	686	705	738	855	892	596	670	647	665	680	734	859	551	585	551	646	668	615	705	515	546
7 PM - 8 PM	506	504	518	580	630	476	578	449	474	492	522	603	409	520	405	463	491	450	495	396	475
8 PM - 9 PM	422	419	417	493	488	408	465	369	367	395	439	468	342	438	337	376	406	385	405	300	382
9 PM - 10 PM	328	338	341	394	392	345	371	307	309	318	373	380	294	352	298	325	330	336	346	254	298
10 PM - 11 PM	271	267	281	322	337	276	253	256	264	247	287	327	250	250	256	277	279	273	281	217	210
11 PM - Midnight	231	231	236	264	272	217	181	210	217	218	234	244	179	160	203	226	223	223	240	161	153

Close 2 Lanes

Month	October							November							December						
Day	Weekday				Weekend			Weekday				Weekend			Weekday				Weekend		
Day of the Week	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
Hour	Traffic Volume per Open Lane							Traffic Volume per Open Lane							Traffic Volume per Open Lane						
Midnight-1AM	249	383	365	371	416	420	291	228	355	352	349	363	363	231	208	363	350	340	334	326	205
1 AM - 2 AM	185	312	296	301	305	287	200	158	291	296	284	295	263	209	153	276	310	274	277	248	151
2 AM - 3 AM	151	258	280	269	279	225	153	129	255	241	249	248	215	112	125	248	228	229	233	199	96
3 AM - 4 AM	161	256	269	267	267	211	120	157	260	247	266	245	208	111	138	251	243	249	257	220	109
4 AM - 5 AM	234	317	310	326	335	247	129	229	326	312	329	324	246	121	208	311	306	298	307	206	129
5 AM - 6 AM	368	498	471	486	455	276	156	382	491	505	506	460	280	147	341	477	476	485	449	271	149
6 AM - 7 AM	774	902	926	900	852	369	204	778	923	898	943	864	390	208	690	862	884	879	827	348	189
7 AM - 8 AM	1,140	1,360	1,330	1,335	1,209	504	266	1,203	1,368	1,363	1,313	1,231	535	265	1,045	1,212	1,207	1,238	1,153	460	221
8 AM - 9 AM	1,176	1,428	1,347	1,382	1,287	741	443	1,212	1,380	1,420	1,379	1,286	703	381	1,008	1,298	1,251	1,320	1,192	600	334
9 AM - 10 AM	976	1,231	1,236	1,231	1,224	1,020	669	1,012	1,199	1,198	1,196	1,164	906	591	856	1,107	1,122	1,135	1,062	764	488
10 AM - 11 AM	940	1,088	1,122	1,099	1,228	1,251	932	947	1,086	1,086	1,134	1,124	1,078	810	832	1,035	1,071	1,061	1,070	916	722
11 AM - 12 PM	1,045	1,157	1,118	1,222	1,350	1,369	1,154	981	1,147	1,096	1,134	1,301	1,264	1,015	910	1,073	1,086	1,083	1,169	1,170	944
12 PM - 1 PM	1,139	1,195	1,179	1,317	1,496	1,454	1,361	1,084	1,199	1,133	1,246	1,419	1,402	1,221	938	1,143	1,152	1,197	1,260	1,211	1,159
1 PM - 2 PM	1,197	1,244	1,224	1,383	1,629	1,453	1,420	1,123	1,260	1,198	1,293	1,457	1,340	1,244	1,001	1,182	1,237	1,267	1,302	1,296	1,243
2 PM - 3 PM	1,271	1,328	1,335	1,551	1,775	1,441	1,477	1,208	1,353	1,272	1,438	1,642	1,431	1,196	1,114	1,317	1,302	1,311	1,446	1,305	1,310
3 PM - 4 PM	1,545	1,584	1,643	1,878	2,013	1,466	1,583	1,440	1,527	1,542	1,715	1,929	1,395	1,368	1,355	1,493	1,543	1,519	1,695	1,329	1,365
4 PM - 5 PM	1,760	1,791	1,909	2,194	2,197	1,399	1,565	1,740	1,733	1,838	2,046	2,100	1,405	1,458	1,574	1,777	1,788	1,729	1,763	1,323	1,380
5 PM - 6 PM	1,991	2,029	2,097	2,434	2,273	1,324	1,509	1,854	1,905	1,989	2,110	2,209	1,251	1,384	1,626	1,766	1,843	1,725	1,836	1,242	1,303
6 PM - 7 PM	1,373	1,410	1,477	1,709	1,783	1,191	1,339	1,294	1,329	1,361	1,467	1,719	1,102	1,170	1,102	1,292	1,337	1,229	1,410	1,030	1,093
7 PM - 8 PM	1,013	1,009	1,036	1,160	1,261	952	1,156	899	948	985	1,044	1,206	817	1,041	809	926	983	901	989	792	950
8 PM - 9 PM	843	838	835	986	976	816	930	738	735	790	878	936	685	875	675	751	812	770	811	600	764
9 PM - 10 PM	656	676	681	789	784	691	742	614	618	636	746	760	587	704	597	650	661	673	692	508	597
10 PM - 11 PM	543	534	563	644	675	553	506	511	527	494	575	654	500	500	512	555	557	547	561	434	419
11 PM - Midnight	462	463	471	527	544	434	362	421	434	437	469	487	359	319	407	451	447	445	480	321	306