

**STATE OF OHIO**  
**DEPARTMENT OF TRANSPORTATION**  
**SUPPLEMENTAL SPECIFICATION 800**  
**REVISIONS TO THE 2008 CONSTRUCTION & MATERIAL SPECIFICATIONS**  
**DATED 07-17-2009**

**104.02.D,**

On page 17, **Replace the section Significant Changes to the Character of the Work with the following:**

**D. Significant Changes in Character of the Work.** The Engineer may alter the Work as necessary to complete the Project. The Engineer will make appropriate adjustments according to 108.06 and 109.05, if such alterations significantly change the character of the Work.

If the Contractor disagrees as to whether an alteration constitutes a significant change, use the notification procedures specified in 104.02.G.

The term “significant change” is defined as follows:

1. when the character of the Work as altered differs materially in kind or nature from that involved or included in the original proposed construction; or
2. when the product of the quantity in excess of the estimated quantity of a contract item and the unit price exceeds the limits set forth in Table 104.02-1.

**TABLE 104.02-1**

<b>Contract Price</b>	<b>Contract Limits</b>
<b>Up to \$500,000</b>	<b>\$25,000</b>
<b>\$500,001 to \$2,000,000</b>	<b>5% of Total Contract Price</b>
<b>Over \$2,000,000</b>	<b>\$100,000</b>

If the decrease in quantity of any unit price Contract Item exceeds 25 percent of the estimated quantity, and the total of all such adjustments for all Contract Items is more than \$400, then after the determination of final quantities according to 109.12.C, the Engineer will adjust the unit prices for the affected Contract item by multiplying the bid unit price by the factor obtained from Table 104.02-2.

**TABLE 104.02-2**

<b>% Decrease</b>	<b>Factor</b>	<b>% Decrease</b>	<b>Factor</b>
25 to 28	1.02	61	1.14
29 to 32	1.03	62	1.15
33 to 35	1.04	63	1.16
36 to 38	1.05	64	1.17
39 to 41	1.06	65	1.18
42 to 44	1.07	66	1.19
45 to 47	1.08	67	1.20
48 to 50	1.09	68	1.21
51 to 53	1.10	69	1.22
54 to 56	1.11	70	1.23
57 to 59	1.12	71	1.24
60	1.13	72 and over	1.25

When the increase in quantity or decrease in quantity of any unit price contract item does not exceed the limits set forth in Tables 104.02-1 and 104.02-2, there is no significant change in the character of the work and the change is considered a minor change. Department will pay for minor changes in the Work at the unit bid price.

**104.02.H,**

On Page 19, **Replace** the second sentence with: This unilateral authority to pay by the Department does not preclude or limit the rights of the Department and the contractor to negotiate and agree to the amounts to be paid to the contractor.

**105.16,**

On page 25, After the second full paragraph (begins with "Perform all engineering"... ) **Add** the following sentence: Repairs to approved haul roads will be made in accordance with 105.13.

**105.16**

On page 25, **Delete** the 5<sup>th</sup> paragraph, begins with "Do not waste ..."

On page 26, **Delete** the first full paragraph, begins with "Cultural resource areas..."

On page 26, **Delete** the 6<sup>th</sup> and 7<sup>th</sup> paragraphs, beginning with "Ensure that any...", and "If the proposed..."

On page 27, after the last paragraph in the section, **Add** "Borrow and Waste Area shall adhere to CMS 107.10."

**105.16,**

On Page 26, **Delete** the following section and list:

If the Contract Documents require a cultural resource investigation, use an environmental consultant prequalified by the Department for cultural resource investigations to review and certify that the waste or borrow site:

- A. does not impact a cultural resource;
- B. is not a cultural resource;
- C. is not eligible for the National Register of Historic Places; or
- D. does not consist of historic or prehistoric human remains.

**106.05,**

On page 29, after the first paragraph, **Add** “Areas used to Store Materials shall adhere to CMS 107.10.”

**107.01,**

On Page 31, in the fourth paragraph **Replace** 4121:1-3 with 4123:1-3 and **Delete** the clause “effective November 1, 1979”

**107.10,**

On Page 33, last paragraph and continuing on Page 34, sentence one, **REVISE** to: “When specified in the plans, the Contractor will construct the Monument Assemblies with the iron pin and Reference Monuments with the iron pin and cap.”

On Page 34, third full paragraph, **DELETE** “The Engineer will provide the Contractor with a list of monuments and survey markers that the Contractor is to protect and preserve during the performance of the work and a list of monuments and survey markers that may be destroyed during the performance of the work. When specified in the plans, the contractor will construct the adjustable monument assemblies without the iron pin and cap.”

**107.10,**

On page 35, after the last paragraph in the section **Add** the following:

“Do not create staging areas, store materials and equipment, or borrow or waste materials in areas labeled as an environmental resources areas in the Contract Documents. All properties to be utilized by the Contractor outside the project right of way must be cleared for all environmental resource impacts prior to the beginning of work. Environmental resources include but may not be limited to:

1. Cultural Resources
  - a. Buildings, structures, objects, and sites eligible for or listed on the National Register of Historic Places
  - b. Historic or prehistoric human remains, cemeteries, and/or burial sites (prusuant with ORC 2909.05 and 2927.11)
2. Ecological Resources
  - a. Wetlands
  - b. Streams
  - c. Wooded areas with trees to be removed in excess of 8 inches diameter at breast height
3. Public Lands
  - a. Lands meeting the criteria of 49 U.S.C. 303, 23 CFR 771.I35: 4(f).
  - b. Lands meeting the criteria of 16 U.S.C. 4601-4, 36 CFR59.1: 6(f).

4. FEMA Mapped 100 year Floodplains
5. Hazardous Waste Areas

All areas proposed to be utilized by the Contractor outside the project construction limits shall be reviewed by environmental contractor(s) that are prequalified by the Department for each environmental resource. Have the consultant(s) certify that the proposed site to be utilized for the contractor will not impact:

- Cultural Resources
- Ecological Resources
- Public Lands
- FEMA Mapped 100 year Floodplains
- Hazardous Waste Areas

Provide all documentation and the consultant certification to the Department Office of Environmental Services.

Should the areas proposed for use by the Contractor outside the project right of way limits contain environmental resources the Contractor is responsible to the Department for all environmental clearances and permits prior to the beginning of work.”

**108.06.A,**

On page 47, **Replace** the second sentence in section **General** with the following:

The critical path is defined as; the longest path of activities in the project that determines the project schedule completion date. The activities that make-up the critical path of activities are the “Critical Activities.”

**108.07.E,**

On Page 50, throughout the 108.07.E section, **Replace** "Director” with "District Deputy Director".

**109.01,**

On page 52, **Add** the following to the end of the first paragraph: The accuracy of individual pay item estimate payments will be one decimal more accurate than the unit of measure denoted for the pay item.

**109.05,**

On page 57, **Replace** the title of the section from **Extra Work** to **Changes and Extra Work**

On page 57, **Revise** the first paragraph of section 109.05.A **General** with the following:

If the Department revises the Contract under: 104.02, 105.07, 105.10, 105.13, 107.10, 107.14, 107.15, 108.09, 109.06, or 109.07, the Department will pay for changes and Extra Work with a Change Order using the sequence specified in 109.05.B through 109.05.E.

On page 57, **Revise** the third paragraph of section 109.05.A **General** with the following:

Unless otherwise stated in 109.05, the compensation provided in 109.05.B through 109.05.E constitutes payment in full for all changes and Extra Work completed by original Contract Price, agreed unit price, agreed lump sum price, and for work performed on a force account basis, including:

On page 58, **Revise** the first paragraph of section 109.05.B **Negotiated Prices** with the following:

Negotiated prices for changes and Extra Work shall be comparable to prices that would have resulted from a competitive bid contract. The Engineer and Contractor will negotiate agreed unit or lump sum prices using one or more of the following methods:

On page 58, **Replace** the paragraph of section 109.05.B.1 with the following:

1. Original Contract prices for similar work but adjusted for:
  - a. increased or decreased material costs specified in 109.05.C.3.
  - b. increased or decreased labor costs specified in 109.05.C.2
  - c. increased or decreased equipment costs specified in 109.05.C.4Adjustments of these prices for inflation or mark up for subcontractor work is not allowed.

On page 58, **Revise** the second paragraph of section 109.05.B **Negotiated Prices** with the following:

Provide proposed pricing and cost justification for changes or Extra Work within 5 business days after the Department's request. The Department will respond within 5 business days after receipt of the Contractor's proposal. The Department and the Contractor can mutually agree to extend these 5-day time limits.

#### **109.5.C.7,**

On Page 67, **Replace** the section **Additional Bonding Premium and Fees** with the following:

**Final Adjustment to Premium for Contract Bonds:** The final bond premium amount for the payment and performance bonds will be computed based on the actual final contract value. For the purpose of computing a bond premium adjustment the actual final contract value is defined as the whole sum of money, excluding any bond premium adjustment, which is passed from the department to the contractor as a result of the completion of the Work. If the actual final contract value is different from the original contract value, the premium shall be adjusted accordingly; either by refund of part of the original bond premium by the contractor if the original contract value is larger than the actual final contract value; or by payment of additional bond premium by the department if the original contract value is smaller than the actual final contract value. Additional payment by the department or refund by the contractor will be based on the difference between the invoiced bond premium for the original contract value and the invoiced bond premium for the actual final contract value without any markup. A final bond

premium adjustment will not be made when the actual final contract value differs from the original contract value by less than \$ 40,000.00.

**109.05.C.10,**

On Page 68, **Replace** the change order web link to:

<HTTP://WWW.DOT.STATE.OH.US/DIVISIONS/CONSTRUCTIONMGT/ADMIN/PAGES/DEFAULT.ASPX>

**109.12.B,**

On Page 75, **Replace** the last sentence with: Failure of the Contractor to complete the punch list items by the stipulated time will result in the assessment of fifty percent of the Liquidated Damages according to 108.07 for each Calendar Day for every day beyond the stipulated time the punch list work remains incomplete and beyond the revised Completion Date.

**109.12.C.,**

On Page 75, **Add** the following after the existing first sentence. "The prescribed 30 Calendar Day period can be modified by mutual agreement of the Contractor and the District Construction Engineer."

**204.02,**

On page 99, Replace the third paragraph in the section with:

Do not use Granular Material Type D, E, or F in the location where underdrains are to be constructed.

**206.02,**

On page 107, Replace the fourth paragraph of 206.02 with the following:

For Curing Coat furnish rapid setting emulsified asphalt conforming to 702.04, or the curing materials specified in 451.02.

**208.06,**

On page 121, Replace the last two sentences in Paragraph D with:

Do not exceed 6 ¾ inches (170 mm) in diameter for the production blast holes. Delay the detonation sequence of the production holes toward a free face.

**301.04, Spreading and Finishing**

On page 154. **Replace** the last sentence in this section with the following sentences:

Ensure that the temperature of the mixture when delivered to the paver is a minimum of 250 °F (120 °C) if a hot mix asphalt and 230 °F (110°C) if a warm mix asphalt according to 402.09. Ensure the temperature of the mixture is sufficient for the roller coverage to be effective in compacting the mixture.

**302.02.A,**

On page 156, **Replace** the properties table in the fourth paragraph with the following table:

<b>Property</b>	<b>Acceptable Range of Values</b>	
	<b>minimum</b>	<b>maximum</b>
Binder Content, % of total mix	2.0 [Virgin]	6.0 [Total]
Stability, lb (N), 70 blow	3000 (13,345)	--
Flow, 0.25 mm, 70 blow	--	28
Voids in Mineral Aggregate, %	12.0	--

**302.04, Spreading and Finishing**

On page 157. **Replace** the last sentence in this section with the following sentences:

Ensure that the temperature of the mixture when delivered to the paver is a minimum of 250 °F (120 °C) if a hot mix asphalt and 230 °F (110°C) if a warm mix asphalt according to 402.09. Ensure the temperature of the mixture is sufficient for the roller coverage to be effective in compacting the mixture.

**304.04,**

On page 158, Replace Section 304.04 with the following:

**304.04 Spreading.** Spread the material on the prepared surface. Do not use frozen material and do not spread on frozen surfaces.

Do not exceed a compacted lift thickness of 8 inches (200 mm) when using vibratory rollers greater than 12 tons (11 metric tons). Do not exceed a compacted lift thickness of 6 inches (150 mm) when using 10 to 12-ton (9 to 11 metric tons) vibratory rollers. Do not exceed a maximum compacted lift thickness of 4 inches (100 mm) when these vibratory rollers are not used.

The Contractor may elect to use a lighter roller if the centrifugal force exceeds the minimum weight. In all cases, submit documentation proving the minimum weight requirements are met.

Place the material in two or more approximately equal lifts when the specified compacted thickness exceeds 8 inches (200 mm).

Place the material with self-propelled spreading machines capable of placing the material true to line and grade. Spreading machines such as spreader boxes or pavers are allowed. Do not use graders or dozers without spreader boxes to spread the material except for areas described in the next paragraph. Spread the material such that it minimizes segregation and requires minimal blading or manipulation. The Department may perform in place gradation testing in areas that are visually segregated according to Supplement 1090.

The Contractor may use hand-placing methods, dozers or graders when the total area of the material is 2000 square yards (1700 m<sup>2</sup>) or less or in small areas where self propelled spreading machines are impractical. Small areas include lane widths less than 12 feet (3.7 m) or lengths less than 1000 feet (305 m). The Department will not take in place gradation tests in these small areas.

The Department may test for in place gradation after spreading but before compaction testing according to Supplement 1090.

#### **401.04. Reclaimed Asphalt Concrete Pavement**

On page 167, **Replace** the entire section pages 167 thru 170 with the following new section 401.04:

##### **401.04 Reclaimed Asphalt Concrete Pavement.**

Provide reclaimed asphalt concrete pavement (RAP) per the following requirements when choosing to use it in a mix. Failure to follow these requirements will result in a rejection of the Contractor QCP (403.03); restriction of any RAP use at the facility; and/or a change to Unconditional Acceptance at the facility.

**Job Mix Formula.** The Contractor may use a blend of new materials in combination with RAP obtained from verifiable Department or Ohio Turnpike Commission projects. 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 Mix Design requirements and obtain District approval for use. Obtain Laboratory written approval for use of unusually large, old RAP stockpiles of unknown content and/or age. Include approved methods in the QCP for ongoing processing and testing of these piles. Ensure no foreign or deleterious material (703.04, 703.05) is present in RAP.

Ensure that the JMF falls within the quality, gradation and asphalt binder content limits of the required mix item. For Contractor designed mixes ensure the JMF submittal includes the percentages of RAP, virgin aggregates, and virgin asphalt binder required for the mix item. Report all RAP test results and an average in the JMF submittal. Identify the RAP in the JMF submittal as to project origin and mix type(s).

Determine RAP properties and uniformity as follows. Determine final RAP gradation and asphalt binder content on a minimum of four separate stockpile (or roadway for concurrent grinding) samples all agreeing within 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.

**RAP Usage Limits and Requirements.** Process and use RAP by one of the following two methods. Note on the JMF submittal RAP page which of Method 1 or Method 2 methods described below apply to the RAP.

**Method 1 Standard RAP** Include RAP in a JMF submittal per the Standard RAP Limits Table 401.04-1 unless specified differently in the applicable mix specification. For mixes that will contain up to 10 percent RAP the JMF submittal is not required to include the RAP except when a virgin polymer asphalt binder is used in a surface course. For surface JMFs having polymer asphalt binder only submit at 0 or 10% RAP. If greater than 20 percent RAP is used in a JMF submittal include an analysis of the recovered asphalt binder and blend per Level 3 Mix Design procedures to determine the grade of virgin asphalt binder to use.

**TABLE 401.04-1**

**Method 1-Standard RAP Limits**

<b>Asphalt Mix Application</b>	<b>Percent RAP by Dry Weight of Mix</b>	<b>Minimum Virgin Asphalt Binder Content</b>	<b>Comments</b>
Heavy Traffic Polymer Surface Course	10 max		For non-polymer virgin binder allow 20% max RAP
Medium Traffic Surface Course	20 max	5.0	Polymer or non-polymer virgin.
Light Traffic Surface Course		5.2	
Intermediate Course	35 max		Any mix type used as an intermediate course.
Base Course 301	50 max		The Laboratory will establish the asphalt binder content.
Base Course 302	40 (30) max		A lower limit of 30 percent will be required if poor production mixing or coating is evident.

**RAP Processing for Table 401.04-1 Method 1-Standard RAP.** For surface courses process RAP to less than 0.75 inch (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.

**Method 2 Extended RAP.** Include RAP in a JMF submittal per the Extended RAP Limits Table 401.04-2 unless specified differently in the applicable mix specification. Only use Method 2 with counter flow drum plants or mini-drum batch plant configurations meeting 402. For mixes that will contain up to 15 percent RAP the JMF submittal is not required to include the RAP unless a virgin polymer asphalt binder is used in a surface course. For JMFs having polymer asphalt binder do not submit at 1 thru 9% RAP.

If greater than 25 percent RAP is used in a JMF submittal include an analysis of the recovered asphalt binder and blend per Level 3 Mix Design procedures to determine the grade of virgin asphalt binder to use. If the blending shows a grade change is required use a PG64-28 for heavy intermediate courses or PG 58-28 or 64-28 for medium intermediate or base courses. No grade change is required with RAP at 26% to 40% if Warm Mix Asphalt (WMA) technology is used in a manner to maintain the mix temperature below 275 °F (135°C). Use WMA technology meeting 402.09. Other WMA technologies must be approved by the Laboratory. If desired, WMA may be used to control plant temperatures when producing mixes using RAP above 40% but a grade change is required if shown necessary by the blending index.

**TABLE 401.04-2  
Method 2-Extended RAP Limits**

<b>Asphalt Mix Application</b>	<b>Percent RAP by Dry Weight of Mix</b>	<b>Minimum Virgin Asphalt Binder Content</b>	<b>Comments</b>
Heavy Traffic Polymer Surface Course	15 max	5.0	For non-polymer binder allow 25% max RAP and 4.6 min virgin.
Medium Traffic Surface Course	25 max	4.8	Polymer or non-polymer virgin.
Light Traffic Surface Course		5.0	
Intermediate Course	40 max	3.0	Any mix type used as an intermediate course.
Base Course 301	55 max		The Laboratory will establish the asphalt binder content.
Base Course 302	45 (40) max	1.8	A lower limit of 40 percent will be required if poor coating is evident. The virgin requirement of 302.02 does not apply.

**RAP Processing for Table 401.04-2 Method 2-Extended RAP.** Process RAP by means of fractionation or by additional in line processing. Include in the QCP additional methods and procedures to dictate how this is to be accomplished at plants. Specify documentation method for RAP measurement. Fractionation is the process of creating separate piles of RAP from one pile when split over a specific sieve or sieves. 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 screen for base mixes. Do not use concurrent project RAP in a stream process.

**RAP QC and Management Requirements.** Always note on the daily quality control report how much RAP is actually being used. Apply a tolerance of +/-5.0% on the amount of RAP used if needed for a quality control adjustment but do not exceed the limits of Table 401.04-1 or Table 401.01-2, whichever applies. If this adjustment is not adequate for maintaining control of the mix submit a new JMF for approval.

Include in the QCP methods to be used to meet Method 1 and Method 2 requirements above and the following requirements:

Provide enough space for meeting all RAP handling requirements at a hot mix facility. Provide a clean, graded base for stockpiles that does not collect water. Test blended RAP stockpiles to assure uniform gradation and asphalt binder content. Ensure uniform stockpile properties match the JMF submitted RAP properties unless the uniform stockpile will be processed into the asphalt plant using plant cold feed in line processing.

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.

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. 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. Include in the QCP methods of validating RAP properties when using concurrent project RAP. 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 stockpiles. Give each stockpile a unique identification. Provide in the plant lab RAP 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. The DET may require RAP pile staking for failure to maintain the above. 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 DET 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 in a way not traceable thru the QCP records and methods. The Laboratory will resolve disputes over acceptability of RAP.

#### **401.05, Mixing Plants**

On page 170.

**Add as a** last sentence in this section the following sentence: Asphalt mixtures may be produced using the warm mix asphalt method according to 402.09 except as restricted by specification.

#### **401.08, Asphalt Binder**

On page 171, **Replace** the 2nd sentence in this section with the following sentence: Do not use asphalt binder while it is foaming in a storage tank.

#### **401.10, Mixing**

On page 171.

**Add** to the end of the 1st sentence in this section the following words: or per specification.

#### **401.19,**

On pages 178, **Replace** the third paragraph with the following:

Do not vary the surface of each completed intermediate or surface 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 S1058 and using ProVAL software. Equipment will be satisfactory to the Engineer.

Check the surface course for variations in slope or surface when directed by the Engineer.

## **402, Table of Contents**

On page 180, **Add** to the end of the table of contents the following new section title:

### **402.09 Water Injection System for Warm Mix Asphalt**

## **402.08, Polymer Binders**

On page 184, **Add** after the last paragraph in 402.08 the following new section:

### **402.09 Water Injection System for Warm Mix Asphalt.**

When allowed by specification use a Department approved water injection system for the purpose of foaming the asphalt binder and lowering the mixture temperature. Only use equipment that has been proven stable and effective thru project use on non-ODOT projects. Ensure equipment for water injection meets the following requirements:

- Injection equipment computer controls are in the plant control room and are tied to the plant computer metering.
- Injection equipment has variable water injection control controlled by the plant operation rate and the water injection can never exceed 1.8% by weight of asphalt binder.
- Water injection rate cannot be manually overridden by the plant operator once in the computer.
- Injection equipment stops water flow when a control or equipment failure in the injection system occurs.
- 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.
- Injection equipment includes water storage and pump control tied to the injection computer controls.
- Water storage low water alarm installed in the control room.
- 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.
- Provide a PG Binder sampling valve at the injection equipment to sample binder prior to spray.

## **403.03,**

On page 184 **Replace** the **second sentence** in the **First paragraph of 403.03** with the following sentence:

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.

## **403.03,**

On page 185 **Replace section 403.03.C** with the following:

C. Procedures for extra testing when tests are outside warning band limits of the QCP (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.

### **403.03, Quality Control Plan (QCP)**

On page 185. **Replace items** H thru L with the following sections:

H. All procedures to meet the processing, testing and documentation requirements for RAP in 401.04 including test forms, record keeping, technician responsibilities, etc..

I. 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.

J. Means to meet the handling and storage requirements of 402.08 and asphalt binder suppliers for all asphalt binders.

K. Means to meet delivered mixture uniformity/coating and hauling/trucking requirements.

L. Define the roles and responsibilities of the Field Quality Control Supervisors. List approved Field Quality Control Supervisors.

M. 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.

### **403.03,**

On page 185 **Add** the following section 403.03.N:

N. Specify in the QCP warning bands to be used by technicians for all tests and give specific instruction how they will be used for tests in concert with Table 441.10-1 specification requirements.

### **403.06.A,**

On page 188; in the first paragraph on that page; before the first full sentence that starts with the word "Split", **add** the following additional sentence:

For partial Lots of 1500 tons or less sample and test at least two subplot samples regardless of the tons produced.

### **403.06.B**

On page 188. **Reporting, Insert** in the first paragraph between the first and second sentences the following additional sentence: 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 402.09 or another approved method.

### **403.07,**

On page 192 **replace section A** with the following:

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.

**403.08,**

On page 193 replace **TABLE 403.08-1 Deviation from the JMF and Range Tolerances** with the following table:

**TABLE 403.08-1 DEVIATION FROM THE JMF AND RANGE TOLERANCES<sup>[1]</sup>**

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 mean of four Lot Acceptance tests.		

On page 194 replace **TABLE 403.08-2 448 ACCEPTANCE SCHEDULE** with the following table:

**TABLE 403.08-2 448 ACCEPTANCE SCHEDULE<sup>[1]</sup>**

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 mean 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.				

#### 409.02,

On page 198 **Replace** section **409.02 Materials** with the following:

**409.02 Materials.** Use joint sealant conforming to 705.04 and approved by the Laboratory before shipment to the project. Use a ½ in. (13mm) diameter closed cell foam backer rod that will form and maintain a reservoir of sealant as specified in 409.03.

#### 401.20,

Starting on page 178 **Replace 401.20 Asphalt Binder Price Adjustment** with the following new section:

**401.20 Asphalt Binder Price Adjustment.** A contract item is eligible for a price adjustment when the contract's proposal specifically includes an asphalt Binder Price Adjustment note and the contract item meets the quantity limitations of the proposal note.

#### 422.02, Materials

On page 210, **Replace** the 2<sup>nd</sup> paragraph in 422.02 on page 210 and the Table with the following paragraphs and table:

Provide cover aggregate for the Chip Seal Job Mix Formula (JMF) of washed limestone or dolomite meeting 703.05 and the following:

Stockpile the material to be used for the chip seal at the aggregate source.

Obtain five (5) samples from the stockpile and perform gradation testing on each sample and determine the percent passing for each sieve size listed in Table 422.02-1

1. Calculate the total range for the No. 8 (2.36 mm) sieve for all five samples. The range will not exceed 6%
2. Calculate the percent passing the No. 200 (75 µm) sieve for each sample. No single sample value will exceed 2.0 percent.
3. Calculate the average of each sieve for all five samples. Assure the average value for each sieve is less than the value in Table 422.02-1

Submit a letter to the Engineer and DET containing the Job Mix Formula (JMF) gradations and the calculations to show the cover aggregate meets requirements.

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 staging stockpile. Then obtain five (5) aggregate samples from the staging location stockpile and perform gradation testing on each sample to determine the percent passing for each sieve size listed in Table 422.02-1.

Evaluate the staging location aggregate samples the same as the aggregate source samples except allow an average for the No. 200 (75 µm) sieve not greater than 1.7 percent.

Submit the Job Mix Formula (JMF) gradations from the staged stockpile and the calculations to show the cover aggregate meets requirements in letter form to the Engineer and DET.

If the chip seal aggregates fail to meet requirements, either at the aggregate source or the staging location, re-wash and/or rework the aggregate materials and retest the new stockpiles.

TABLE 422.02-1

Sieve Size	Total Percent Passing
1/2 inch (12.5 mm)	100
3/8 inch (9.5 mm)	85 to 100
No. 4 (4.75 mm)	5 to 25
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5
No. 200 (75 µm)	1.5 max [1]
[1] Washed gradation value	

The District may obtain and test validation samples of the JMF aggregates at any time. If a single validation sample is either outside the values in TABLE 422.02-1 with the exception that the No. 200 (75 µm) value is not greater than 2.0 percent, the district will obtain five (5) samples and retest to determine if the aggregate JMF falls within the limits of TABLE 422.02-1. If the JMF verification test doesn't meet the source or staging location limits the stockpile is not acceptable.

**422.02,**

On pages 210, In the first sentence **Replace** bind with binder.

**422.05, Test Strip**

On page 211 and 212, **Replace** section 422.05 with the following section:

**422.05 Test Strip.** Construct a continuous 1000-foot (300 m) long by lane width test strip. Do not waive test strips regardless if the same materials have been used on another project.

Determine the initial binder application rates and aggregate application rates for the test strip. For a single chip seal, an initial target rate of 0.37 +/- 0.03 gallon per square yard (1.68 L/m<sup>2</sup>) is recommended for the test strip. For double chip seal, a target rate of 0.36 +/- 0.03 gallon per square yard (1.54 L/m<sup>2</sup>) for the first course and 0.33 +/- 0.05 gallon per square yard (1.68 L/m<sup>2</sup>) for the second course is recommended for the test strip . Notify the Engineer of the initial target rates.

Calibrate the aggregate spreader and verify the application rates with a one square yard (one square meter) piece of cardboard or other material to collect and weigh the aggregate. Do not over apply cover aggregate relying on vacuum and broom sweeping to pick up all excess. Amounts of loose aggregate that create a nuisance to the public will result in work stoppage. If work is stopped by the Engineer recalibrate the aggregate spreader determining a new application rate and

apply cover aggregate at the new rate. Verify the aggregate gradation during the test strip and give results to the Engineer.

The Engineer and Contractor will review the test strip the next workday for streaking, ridging, bleeding, aggregate loss or other problems. If the review shows the test strip meets the requirements of 422.11 and the application rate and quality control tests show all is in control compared to the JMF, then progress with the work. Should problems be noted, the Engineer may require another test strip.

#### **422.07 , Binder Application**

On page 211 and 212, **Replace** the first three paragraphs of 422.07 with the following paragraphs:

Before applying binder, ensure that sufficient cover aggregate is available for immediate application. Apply the binder at the target rate(s) established during the test strip.

Maintain the binder temperature from 150 to 185 °F (65 to 85 °C) during construction, including the start of each day. Reheat the binder at a rate of no more than 25 °F (14 °C) per hour, when the binder is allowed to cool below 150 °F (65 °C).

If the target application rates are not the optimum application rates to achieve proper stone embedment during the actual application, immediately notify the Engineer. Proper stone embedment is typically 1/2 to 2/3 of the stone chip height and can be checked by pulling out several chips by hand. Adjust and document the new application rate by stationing. Recheck stone embedment after adjustment and obtain the Engineers approval of the new rate.

Do not allow the binder to streak on the road surface. If the Engineer determines that streaking is occurring, cease operations until the Engineer is satisfied that streaking has been eliminated.

#### **422.08,**

On pages 212, Before the first sentence **Add** the following:

Verify the application rate with a one square yard (one square meter) piece of cardboard or other material to collect and weigh the aggregate before placing binder. Adjust if necessary and re-verify. Record final results and inform the Engineer.

#### **422.08,**

On pages 213, In the second full paragraph **Add** the following after the first sentence:

Do not over apply cover aggregate relying on vacuum and broom sweeping to pick up all excess. Nuisance to the public amounts of aggregate will result in work stoppage. If work is stopped by the Engineer recalibrate the aggregate spreader determining a new application rate and apply cover aggregate at the new rate.

#### **422.09,**

On pages 213, **Replace** the fourth paragraph with the following:

After the binder sets, and before placing a second course for double chip seals, and within 4 hours, sweep the pavement using a power broom or pickup sweeper as needed to remove all loose aggregate. If the pavement cannot be swept within the 4-hour period due to problems

associated with the stone moisture, binder, breaking, humidity, or other unknown, the Engineer may suspend the operation until the problem is resolved or more suitable conditions are obtained to maintain the 4-hour time frame for sweeping. Extend sweeping 1 foot (0.3 m) beyond the edge of the pavement to help prevent migration of loose aggregate back onto the pavement. Do not re-use aggregate from a chip seal that is swept from the pavement or that is already loose off the pavement edge.

**422.09,**

On page 213. **Replace** the sixth paragraph in 422.09 with the following paragraphs:

Wait at least 24 hours before placing the second course of a double chip seal. Ensure that the first course meets requirements of this specification and is cured, swept and capable of withstanding construction traffic without damage.

Correct damage to the underlying chip seal before placing the final chip seal.

**422.10.A,**

On pages 214, **Replace** the last sentence with the following:

The Department can obtain samples of materials at any time. Aggregate samples can be taken from sources, on-hand stockpiles or the aggregate spreader box. Work can be stopped and materials can be rejected on the basis of poor Department test results.

**422.10.C,**

On pages 214, **Replace** the first paragraph with the following:

At a minimum test one sample taken from the aggregate spreader box at production start and sample and test one sample from the aggregate spreader box randomly during the day. An aggregate spreader box sample may be taken by laying a piece of suitable material under the spreader as it moves forward. Include additional testing when directed to sample and test by the Engineer. Sample and test aggregate according to AASHTO T 2, AASHTO T 248, and Supplement 1004 (AASHTO T 11 where required). Use washed gradations for determining the No. 200 (75 µm) sieve. The Contractor may use additional tests. These may include dry gradations for control purposes but acceptance of on hand aggregate will be based on washed gradations only. Reject and do not use aggregate creating nuisance to the public dusting on the project.

**422.10.C,**

On pages 214, in the table **Replace** 2.5% with 2.05%

**422.10.D.7,**

On pages 215, **Replace** with:

7. Gradation, moisture content, and station (One sample from spreader box at production start, one random sample during the day and any other samples when directed by the Engineer).

**422.11, Acceptance**

On page 214, **Replace** item G with the following:

- G. Typical stone chip embedment is 1/2 to 2/3 of typical stone chip height.

**441.09,**

On pages 229 and 230 **replace** the last paragraph starting on page 229 that continues as the first paragraph on page 230 with the following paragraphs:

Perform more sampling and testing than the minimum specified at the start of production. 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 approved QCP. Immediately resolve problems indicated by any out of warning band test 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 approved QCP.

Should additional testing as required above not be performed the DET, after consultation with the Laboratory, will require the testing frequency be increased to all tests each two hours of production for the remainder of the project. If this occurs, the DET will request an opinion from the QCQC for action(s) against the technician and/or Contractor including but not limited to warning, removal and/or a change of the facility to Unconditional Acceptance.

Record the results of every test performed.

**441.09.A,**

On page 230 **replace** the first paragraph of 441.09.A Asphalt Binder Content with the following:

**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 solvent extraction methods for every QC sample according to Supplement 1038 and the AC Gauge Verification and Offset Record. 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.

**441.09.B,**

On page 230 **replace the first sentence in the first paragraph of 441.09.B Gradation** with the following:

Perform at least one gradation test each production day 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).

**441.09.C, Air Voids and MSG**

On page 231.

**Replace** the first paragraph in 441.09.C with the following paragraph:

**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. Use the MSG to calculate the

air voids of the compacted specimens. 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. For hot mix asphalt use the JMF lab compaction temperature. For warm mix asphalt according to 402.09 use a lab compaction temperature 30.0 °F (16.7 °C) less than the JMF lab compaction temperature for hot mix asphalt. Use a compaction temperature tolerance of +/- 5.0 °F (3.0 °C). 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 402.09 or another approved method.

#### **441.10,**

On pages 232 and 233 **replace the total section 441.10 Control Charts** with the following section:

**441.10 Control Charts.** Maintain up to date control charts showing each individual test result and also the moving accumulative range as follows:

- A. 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.
- B. Show the out of specification limits specified in Table 441.10-1 and QCP Warning Band Limits on the control charts.
- C. Label each control chart to identify the project, mix type and producer.
- D. 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. two tests per production day or night, 441.09 first paragraph) is performed do not include the result in accumulative range calculations.

**Stop production and immediately notify the Monitoring Team when either A or B occurs:**

- A. Any two tests in a row or any two tests in two days are outside the out of specification limits of Table 441.10-1.
- B. 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.

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 the DET. When production problems cannot be solved within one day after a plant shut down a Contractor's representative holding a 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.

**TABLE 441.10-1**

<b>Mix Characteristic</b>	<b>Out of Specification Limits</b>
Asphalt Binder Content <sup>[1]</sup>	-0.3% to 0.3%
1/2 inch (12.5 mm) sieve <sup>[1]</sup>	-6.0% to 6.0%
No. 4 (4.75 mm) sieve <sup>[1]</sup>	-5.0% to 5.0%
No. 8 (2.36 mm) sieve <sup>[1]</sup>	-4.0% to 4.0%
No. 200 (75 µm) sieve <sup>[1]</sup>	-2.0% to 2.0%
Air Voids <sup>[2]</sup>	2.5 to 4.5
Air Voids <sup>[3]</sup>	3.0 to 5.0
MSG <sup>[4]</sup>	-0.012 to 0.012

[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

**441.12,**

On pages 233 and 234 **replace the total section 441.12 Mixture Deficiencies** with the following section:

**441.12 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 texture uniformity, raveling, flushing, rutting, holes, debris etc.) within the Contractor’s control. Correct obvious pavement problems according to 401.15. If any suspicion that other mixture composition or pavement problems exist, the Monitoring Team will conduct an initial investigation thru review of data and 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 test investigation based on 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. The Laboratory will not approve any redesign it determines is unsatisfactory to provide acceptable mix performance. Submit this new design for approval according to 441.02 and at no additional cost to the Department.

When any out of specification material, based on quality control tests not within the limits of Table 441.01-1, is sent to the paving site the Engineer will determine disposition of the material according to the Department non specification material policy.

**442.01**

On page 234. **Description, Add** to the end of second paragraph in 442.01 the following sentence: Do not use the warm mix asphalt method for 12.5mm mixtures.

**443.01,**

On page 238. **Description, Add** to the end of second paragraph in 443.01 the following sentence: Do not use the warm mix asphalt method (402.09) for this item.

**446.05,**

On page 243, **Replace** the first paragraph with the following:

The requirements of 401.13 do not apply. However, rollers must fully and satisfactorily provide the required compaction, be mechanically sound, and meet Hot Mix Asphalt industry standards. The Department retains the right to reject the use of rollers which are not in good repair, or are not designed to do the work required. A three-wheel roller per 401.17 is not required.

**446.05,**

On page 246, **Replace** the table number with: **TABLE 446.05-2**

**448.03,**

On page 247, **Replace** the entire section 448.03 with the following:

**448.03 Density.** Conduct density gauge quality control testing on the asphalt mat according to Supplement 1055. Conduct density gauge testing on uniform surface courses of 0.75 inch (19mm) or more and uniform intermediate courses of 1.0 in (25mm) or more plan thickness. Conduct density gauge testing on projects of two adjacent lanes or more and with at least one continuous mile (1.6 kilometers) of paving (excepting bridges, intersections etc.).

When Supplement 1055 density gauge testing is required, the requirements of 401.16, except the last four paragraphs, are waived. The requirements of 401.13 do not apply. However, rollers must fully and satisfactorily provide the required compaction, be mechanically sound, and meet Hot Mix Asphalt industry standards. The Department retains the right to reject the use of rollers which are not in good repair, or are not designed to do the work required. A three-wheel roller per 401.17 is not required.

**448.03,**

On page 247, **Replace** the first paragraph with the following:

**448.03 Density.** Conduct density gauge quality control (QC) testing on the asphalt mat according to Supplement 1055 (S 1055). Conduct density gauge testing on uniform courses of 1.0 in (25mm) or more plan thickness. Conduct density gauge testing on projects of 2 adjacent lanes or more and with at least one continuous mile (1.6 kilometers) of paving (excepting bridges, intersections etc.).

**451.08, Joints**

On page 253 **Replace** the last three (3) paragraphs of 451.08 with the following:

Provide the completed file and the printout to the Engineer. When HIPERPAV predicts early age slab cracking will occur, whether due to standard construction practices, joint sawing methods, mix design or curing, either do not start construction until modifications have been made to eliminate HIPERPAV's predicted slab cracking or do not pave.

Perform a HIPERPAV analysis for each pour.

If software analysis determines joint sawing could exceed twenty four (24) hours, assure all joints are sawed by the 24<sup>th</sup> hour.

A HIPERPAV analysis showing paving can proceed does not eliminate the requirements of 451.16.A.

#### **451.08.A, Longitudinal Joint**

On page 254 **Replace** the first paragraph with the following:

When using early-entry (dry cut, light weight) saws to make the longitudinal joint between simultaneously placed lanes, 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 sawing after initial set and before final set. Saw the joint 1/8 inch (3 mm) wide and 2 1/4 to 2 1/2 inches (56 to 63 mm) deep.

#### **451.08.D, Contraction Joint**

On page 256 **Replace** the first and second paragraphs of 451.08.D with the following:

**D. Contraction Joint.** 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 assure the joint is  $1/4 \pm 1/16$  inch ( $6 \pm 1.6$  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.

#### **451.09, Finishing**

On page 257 **Replace** the first paragraph with the following:

Texture the surface in the longitudinal or transverse direction using a broom to produce a uniform, gritty, texture. Immediately following the broom drag texture, tine the pavement in the transverse direction using an approved device that produces a random pattern of grooves [0.05 inch (1.3 mm) to 0.08 inch (2.0 mm) deep and 0.10 inch (3 mm) wide] spaced at 3/8 to 1-3/4 inches (10 to 45 mm), with 50 percent of spacings less than 1 inch (25 mm).

Use longitudinal tining of pavement will only be approved by the Director and may require experimental feature designation. If longitudinal tining is authorized the tine spacing will be a uniform 3/4 inches wide (19 mm), 1/8 inch deep (3 mm) and 1/8 inch wide (3 mm). Do not tine within 3 inches (75 mm) of pavement edges or longitudinal joints. Only use equipment that will tine the full width of the pavement in one operation and uses stringline controls for line and grade to assure straight tining texture.

#### **451.16, Opening to Traffic**

On page 259 **Replace** the first paragraph full paragraph with the following:

**A Pavement Repairs before Department Acceptance.** Repair transverse or diagonally cracked full depth pavement; longitudinally cracked full depth pavement; spalled pavement surfaces and any portland cement concrete pavement panels with cement balls or mudballs; at no cost to the Department. Perform the repairs until the Department's Form C-85 (Report of Final Inspection and Acceptance) or partial C-85 is issued for the pavement. The issuance of a final C-85 will occur within 30 days after all of the pavement items, including all safety items, are completed and accepted, and the pavement is open to traffic. The issuance of a partial C-85 will occur within 30 days after the pavement is completed and accepted, and all safety items are in place to allow the pavement to be safely open to traffic during the winter months from December 1 to April 30.

#### **501.04,**

On page 278, in the sentence after the term **Shop Drawings**, after the phrase according to: **Add** the appropriate

#### **501.05,**

On page 280, **replace** the entire section with the following:

Design and perform all procedures as directed by the AASHTO STANDARD SPECIFICATIONS or the AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS except as modified herein: Perform daily inspections to ensure the work governed by the construction plan is functioning as designed. Report malfunctioning work to the Engineer immediately.

**A. Projects with Railroad Involvement.** Prepare and provide plans listed in this section as follows:

Have an Ohio Registered Engineer prepare, sign, seal and date each plan. Submit plans to all involved railway companies at least 50 days before construction begins. Obtain acceptance from all involved railroad companies. Furnish the Engineer copies of all correspondence with the railroad, documentation of railroad acceptance and the plans accepted by the railroad. Department acceptance is not required.

Perform all work in accordance with the accepted plans. Immediately cease all operations that deviate from the accepted plan. If a deviation is necessary, furnish the Engineer a copy of a revised plan including documentation of acceptance from all involved railroad companies as least 24 hours before construction on deviated work begins. The revised plan shall be sealed and dated by an Ohio Registered Engineer. Department acceptance of revised plans is not required. The Department will consider delays resulting from construction plan deviations as non-excusable in accordance with 108.06.E.

This section applies to construction plans for the following:

1. Sheeting and bracing of excavations adjacent to the railroad tracks. Perform work according to 501.05.B.1.

2. Demolition of structures over or within 14 feet of railroad tracks. Perform work according to 501.05.B.2.

3. Erection of structural members over or within 14 feet of railroad tracks. Perform work according to 501.05.B.4.

**B. Projects without Railroad Involvement.** Prepare and provide plans listed in this section as follows:

Have an Ohio Registered Engineer prepare, sign, seal and date each plan. Have a second Ohio Registered Engineer check, sign, seal and date each plan. The preparer and checker shall be two different Engineers.

Submit the plan to the Engineer at least 7 days before construction begins. Department acceptance is not required.

Perform all work in accordance with the prepared plans. Immediately cease all operations that deviate from the prepared plans. If a deviation is necessary, furnish the Engineer a copy of a revised plan at least 24 hours before construction on the deviated work begins. The revised plan shall be signed, sealed and dated by an Ohio Registered Engineer and checked, signed and sealed and dated by a Second Ohio Registered Engineer. Department acceptance of revised plans is not required. The Department will consider delays resulting from construction plan deviations as non-excusable in accordance with 108.06E.

This section applies to construction plans for the following:

1. Sheeting and bracing other than designs completely detailed in the contract plans adjacent to active traffic when required by contract. Perform all work as specified below:

- a. Locate sheeting and bracing per contract, if shown.
- b. Maintain temporary horizontal and vertical clearances per contract.
- c. Include the effects of AASHTO live and dead load surcharges as necessary.
- d. Design sheeting and bracing in accordance with the latest AASHTO Guide Design Specifications for Bridge Temporary Works, Section 4

2. Demolition of structures over or adjacent to active traffic. Perform all work as specified below:

a. Provide temporary devices or structures necessary to protect traffic during all demolition activities. Provide traffic protection when demolition is located less than 12' horizontally from active traffic on structures of less than 25' vertical clearance. Increase the 12' minimum horizontal distance 1 foot for each 2 feet of additional height greater than 25'.

b. Never lift the portions of structure being removed over active traffic. Before releasing traffic make the remaining structure stable.

c. Design traffic protection devices or structures for a minimum load of 50 pounds per square foot plus the weight of equipment, debris and any other load to be carried. Include any portion of the deck that cantilevers beyond the fascia beams or girders.

d. In lieu of temporary devices or structures required in "a" above, provide a vertical barrier. Design the vertical barrier with rigid or flexible materials specifically designed for demolition containment. Extend the enclosure up to the bottom of the deck and down to the ground. Maintain all materials free of tears, cuts and holes.

- e. Maintain temporary horizontal and vertical clearances per contract.
- f. Locate structural members to be reused before performing any removal operations.
- g. Do not damage structural members being reused during any removal operation.
- h. Perform work so that all members are stable during all operation and loading conditions.
- i. Perform work per 501.05.B.6.

3. Falsework for cast-in-place concrete slab superstructure. bridges . Perform all work per 508 and as specified below:

- a. Provide a camber table to account for the deflection of the falsework loaded with its self weight and the weight of wet concrete. Also include in the table, the specified camber to compensate for slab deflection after the falsework is released.
- b. Maintain temporary horizontal and vertical clearances per contract.
- c. As a minimum design falsework over waterways for a five year flood or with 75% of the effective waterway opening of the proposed structure. The Contractor is responsible for any damages caused by upstream flooding due to insufficient temporary structure size or the accumulation of debris or sediment in the channel.
- d. Support falsework foundations located within the ten year flood limits on rock, shale or piles driven to a minimum depth of 15 feet, and to sufficient penetration to carry superimposed loads or until refusal on rock.
- e. The incorporation of structural steel shapes, used as temporary support members, into a finished concrete slab superstructure is prohibited.
- f. Design falsework in accordance with the latest AASHTO Guide Design Specifications for Bridge Temporary Works, Section 2.

4. Erection of steel or precast concrete structural members as specified below:

- a. Never lift structural members over active traffic. Before releasing traffic make structural members stable.
- b. Supply any temporary supports or braces necessary to maintain structural stability and prevent lateral movement until completion of all construction activities.
- c. Perform work per 501.05.B.6, 513 or 515.
- d. Do not field weld temporary members to permanent steel members.
- e. Maintain temporary horizontal and vertical clearances per contract.
- f. Provide drawings with at least the following information:
  - i. Plan of the work area showing permanent support structures (piers and abutments); roads; railroad tracks; waterways; overhead and underground utilities; and other information pertinent to erection.
  - ii. Erection sequence for all members, noting any temporary support conditions, such as holding crane positions, temporary supports, falsework etc. Member reference marks, when reflected on the erection plans, should be the same used on the shop drawings.

- iii. Primary member delivery location and orientation.
  - iv. Maintenance of Traffic during erection operations.
  - v. Location of each crane for each primary member pick, showing radius and crane support (barges, mats, etc.).
  - vi. Capacity chart for each crane configuration and boom length used in the work.
  - vii. Center of gravity locations for primary member.
  - viii. Rigging weights, capacity and arrangement for primary member picks.
  - ix. Lifting weight of primary member picks, including all rigging and pre-attached elements.
  - x. Details of any temporary lifting devices to be bolted or welded to permanent members, including method and time (shop or field) of attachment; capacity; and method, time, and responsibility for removal.
  - xi. Blocking details for bridge bearings.
- g. Provide calculations for the following:
- i. Load capacity and stability of temporary supports and crane(s) for each pick and release.
  - ii. Structural adequacy and stability of members for each step of erection.
  - iii. Capacity of fabricated rigging, such as lift beams, welded lugs, spreader beams, beam clamps, etc. Submit manufacturers' certifications of catalog cuts for pre-engineered devices.

5. Jacking and support of existing structures as specified below:

- a. Support the structure on temporary supports and brace as necessary to maintain structural stability and prevent lateral movement until completion of the permanent supports. Do not use jacks alone to support the structure except during the actual jacking operation. Remove all temporary supports upon completion of the jacking procedure.
- b. Maintain a maximum differential jacking height of 1/4 inch between any adjacent beam lines.
- c. Maintain a maximum differential jacking height of 1 inch between any adjacent abutments or piers.
- d. Place jacks and any load plates at least 2 inches from the edges of any concrete substructure seats.
- e. Do not field weld temporary members to permanent steel members.
- f. Maintain temporary horizontal and vertical clearances per contract.

6. Placing or moving equipment having a gross weight in excess of 60,000 pounds (27,000 kg) on or across a structure as follows:

- a. Do not allow equipment having a gross weight in excess of the posted limit to be placed on or driven across a structure.

b. Do not allow erection and construction methods, or use or move erection or construction equipment on or across the uncompleted or completed structure, to subject any part of the structure to unit stresses that exceed by more than one-third the allowable unit stresses, as given in AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.

7. Structures for maintaining traffic in accordance with Item 502.

a. For structures located over or within 14 feet of railroad tracks, submit plans in accordance with 501.05.A.

b. Perform work per 501.05.B.6.

C. Welded Attachments. Prepare and provide a detailed request showing weld size, length, type and location for welding permanent or temporary attachments to main structural members not shown or permitted by contract. Submit request to the Office of Structural Engineering for acceptance at least 20 days before construction begins. Perform work per 501.05.B.6 and 513.

D. Corrective Work. Before performing corrective work on structure items, prepare a Corrective Work Plan (CWP) including supporting calculations. Submit three copies of the CWP to the Engineer for acceptance. Have an Ohio Registered Engineer prepare, sign, seal and date each CWP. The Engineer will submit the CWP to the Office of Structural Engineering for review. Obtain Department acceptance before beginning corrective work.

Perform all work in accordance with the accepted CWP. Immediately cease all operations that deviated from the accepted CWP. If a deviation is necessary, furnish the Engineer three copies of a revised CWP. The revised CWP shall be signed, sealed and dated by an Ohio Registered Engineer. Obtain Department acceptance of revised CWP prior to performing corrective work.

Perform all corrective work, including the preparation of the CWP and revisions at no expense to the Department. The Contractor shall reimburse the Department for all CWP review costs of the Designer of Record.

**503.03,**

On page 285, in the first sentence, after the word plan, **Add** the phrase: according to 501.05.

**503.04,**

On page 286, in the last sentence, of the first paragraph in this section, **Change** 503.09 to 503.08.

**503.10,**

On page 288, **Replace** the first sentence with, If an Item for Cofferdams, Cribs, and Sheeting is not included in the Contract for payment, perform work according to 503.03 and the Department will pay for cofferdams, cribs, and sheeting under the contract unit price for excavation.

**503.10,**

On page 289, **replace** the 3<sup>rd</sup> and 4<sup>th</sup> paragraphs of 503.10 with the following:

The Department will consider additional excavation to a maximum depth of 1 foot (0.3 m) within the lateral limits described in 503.09 as incidental to the lump sum price. Excavation

deeper than 1 foot (0.3 m) below plan elevation may be provided for as Extra Work, as described in 109.05.

If Cofferdams, Cribs, and Sheeting is a separate pay item, the lump sum price includes any extra cost involved for cofferdams for additional depth up to 3 feet (0.9 m) below plan elevation. Excavation deeper than 3 feet (0.9 m) below plan elevation and the additional cofferdams necessitated by this excavation may be provided for as Extra Work, as described in 109.05.

#### **508.02,**

On page 299, **Delete** the last sentence of the third paragraph, "If, due to vertical clearance or spanning an existing road or channel, unusual requirements exist, the Director may approve falsework with excessive deflection."

Also **Delete** the last sentence of the seventh paragraph, "If, due to vertical clearance or spanning an existing road or channel, unusual requirements exist, the Director may approve falsework with excessive deflection provided the concrete properly reforms."

On page 300, **Replace** the thirteenth paragraph of 508.02 with: Submit falsework plans for cast-in-place concrete slab superstructures according to 501.05.

#### **514.02,**

On page 358, **Replace** the third paragraph of 514.02 with the following:

For caulking, use a single pack moisture cured polyurethane based material, which will not shrink or sag, capable of filling voids greater than 1/8 inch (3mm) and up to 1 inch (25mm) wide. Only material that is listed on the OMM Qualified Product List website may be used.

#### **514.13,**

On page 369, **Replace** the thirteenth paragraph of Subsection **D.** with: Test composite samples for lead, chromium, cadmium and arsenic according to the U.S. EPA Publication SW 846 Method 1311 (TCLP). Provide the Chain of Custody and test results to the District Regulated Waste Engineer (DRWE) immediately after the test results are available. If the DRWE determines the blasting debris is hazardous, as defined below, provide the Engineer with the names of the hauler and treatment facility. Perform all sampling and testing required by the hauler, treatment facility, or disposal facility.

In the next paragraph, in the last sentence, **Delete** the phrase, (see bid proposal note, entitled "Safety").

On page 370, **Replace** the paragraph under bullet **2. Non-Hazardous Solid Waste.** with: For all waste that is determined to be a Non-Hazardous Solid Waste by the DRWE, the Contractor is required to:

- a. Haul and dispose of the waste to a facility licensed to accept non-hazardous solid waste.
- b. Before disposing of any material, provide the Engineer with documentation that the disposal facility is licensed by the EPA to accept non-hazardous solid waste.

- c. Obtain from the disposal facility and provide the Engineer with a receipt that documents disposal of waste material at the approved disposal facility.
- d. Properly dispose of all waste within 60 days after it is generated.

**516.03,**

On page 392, **replace** the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> paragraph of 516.03 with the following:  
Repair metallized coatings damaged during fabrication by removal of the damaged coating and reapplication as specified above. Repair metallized or galvanized coatings damaged during shipping, construction, or field welding according to 711.02.

**515.17,**

On page 389, in the table for Beam Sweep and Camber Tolerances, **replace** the Camber – Deviation from Design camber (DC)\* for I Beam with the following:

For member lengths ≤ 80 ft: ± 1/8” per 10 ft (1 mm/m) max ± 1/2” (13 mm)

For member lengths > 80 ft: ± 1/8” per 10 ft (1 mm/m) max ± 1” (25 mm)

In the table for Reinforcing Steel Tolerances, **replace** the Stirrup extension above top flange for I Beam with the following:

+1/4” (6mm) – 3/4” (19mm)

**523.03,**

On page 408, **Replace** the second sentence of 523.03 with the following:

Supply personnel with an Advanced, Master, or Expert Level Certification in High Strain Dynamic Pile Testing (HSDPT) from Foundation QC to operate this equipment.

**524.04,**

On page 411, replace the last two sentences of 524.04.C with the following text:

Extract casing at a slow, uniform rate with the pull in line with the shaft axis. Rotate, tap, push down, or vibrate the casing when necessary to extract it. Rotate the casing as little as possible to avoid deforming the reinforcing steel cage.

**602.03,**

On page 425, **Replace** the first paragraph of 602.03 D with the following:

D. Pre-cast structures are half height headwalls for conduits up to a maximum of 78 inches (1980 mm). These pre-approved pre-cast structure drawings are on file in the Office Material Management. With the submission of the TE-24 from an approved manufacturer furnish stamped, approved from the Office of Structural Engineering design drawing sheets. Pre-cast half-height headwalls for elliptical and pipe arch conduits may be constructed from templates of the actual conduit being supplied, up to a maximum 78 inch (1980 mm) (round equivalent) to the project to ensure the opening is OD plus one inch. Submit drawings to the Office of Structural Engineering for approval, on a project by project basis, of pre-cast half-height headwalls for elliptical and pipe arch conduit. Non-pre-approved drawings are required to be submitted to the Office of Structural Engineering for approval. Allow 4 weeks for approval. Failure to furnish the stamped, approved design drawing sheets will result in rejection of the pre-cast structure. The drawings will include the following:

**603.02,**

On page 417, after the Joint Wrap.... ASTM C877, **Add** the following:  
Buried Liner Waterproofing Membrane 711.22

**603.04,**

On page 433, **Replace** section H with the following:

H. If 706.051 or 706.052 is specifically itemized or specified in the Contract, on footers, the Contractor may substitute each one for the other upon structure approval for hydraulics and cover. The manufacturer shall submit shop drawings and hydraulic calculations by a Registered Engineer for review and approval before manufacture. If 706.051 or 706.052 is specifically itemized or specified in the Contract, on pedestal walls, the Contractor may substitute each one for the other upon structure approval for hydraulics, cover and pedestal wall design. 706.051 or 706.052 require different pedestal wall designs.

I. All 706.051 or 706.052 shop drawings require a Registered Engineer signature for design and check. The manufacturer shall submit shop drawings and hydraulic calculations to the Department for review and approval before manufacture.

J. For metal pipe 54 inch (1350 mm) diameter or larger and pipe-arch, ensure the manufacturer provides match marked ends and a layout drawing.

**603.08,**

On page 436, **add** the following before 603.08 A:

Install conduit so that match marks align and in accordance with the layout drawings supplied by the manufacturer.

**603.08,**

On page, 436 **delete** the following from 603.08 A.1:

Securely strut the end of each pipe section for pipe diameters 54 inches (1350 mm) or greater that have a wall thickness of less than 0.109 inch (2.77 mm). Install the ties or strapping in the first or second valley of the annular corrugations on each end of each piece of pipe. Install two struts per end such that they are perpendicular to one another and cross at their midpoints. Strut by using wire ties or other approved methods. Remove the strutting after securing the coupling bands.

**603.08.A.2,**

On page 436, **Revise** the heading from Concrete Pipe to Rigid Pipe.

**603.09,**

On page 438, **Replace** the entire first paragraph with the following:

Apply waterproofing to 707.03, 707.15, 707.23, and 707.25 conduits with less than eight feet of cover by one of the following methods.

A. Coat the exterior of the conduit above the limits of the bedding and within the limits of backfill. Ensure that all plate seams and bolts are thoroughly sealed. The coating material and

application shall conform to AASHTO M 243. Allow asphalt mastic material to dry 48 hours and tar base material to dry 28 hours before placing the conduit backfill. Rib stiffeners do not need to be coated.

B. Construct Buried Liner Waterproofing Membrane protection in the fill per the manufacturer's recommendations. The Buried Liner Waterproofing Membrane protection will be a seamless continuous sheet placed over the conduit and extend at least 10 feet (3.3m) outside of the paved shoulder and for the width of the trench.

**603.11.C,**

On page 440, **Replace** the entire section with the following:

C. For Structural Backfill Type 2, compact each lift of material according to 603.11.E using flood compaction or mechanical devices, hoe packs, jumping jacks, hand devices, vibrating plates, or other equipment that meets the restrictions in 603.10. Provide compaction equipment that compacts the material under the haunch of the pipe. If the compaction equipment cannot fully compact the material under the haunch, supplement the compaction equipment by using shovel slicing, spud bars, or mechanical spud bars to compact the material under the haunch of the pipe. Use shovel slicing and spud bars in conjunction with the compaction operations to compact the material and to manipulate the material under the haunch of the pipe.

**603.13,**

On page 441, **Replace** the last paragraph with the following:

Provide a paving that 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 rise. Provide galvanized reinforcing steel support chairs beneath the mesh where necessary. Give special care to the mesh during concrete placement. After placing the concrete, strike it off with a template to produce the proper radius, and finish with a float to produce a smooth finish. Cure the concrete according to 451.10.

**604.04.B.2,**

On page, 444 **replace** the term "approved adjusting device" with the term "acceptable adjusting device".

**613.02,**

On page 466, **Add** the following paragraph to the end of the section.

Furnish an air-entraining admixture that is designed for use in low strength mortar mixtures (also called controlled density fill or flowable fill).

**613.03,**

On page 467, In Note 2, **Replace** “(Approximately 5 percent)” with “(Approximately 25 percent)”.

**614.03,**

On Page 471, **Add** the following paragraph at the end of the section:

All temporary traffic control devices shall conform to the Quality Standards for Temporary Traffic Control Devices available at the following address:

<http://www.dot.state.oh.us/Divisions/HighwayOps/Traffic/publications2/qualityguidelines/Pages/default.aspx>

**614.03,**

On Page 470, **Add** the following to the end of the fifth paragraph: Use standard orange or fluorescent orange reflective sheeting for the orange portions of drums, barricades and vertical panels.

**614.03,**

On Page 470 - 471, **Replace** the sixth paragraph with the following: Furnish drums with reboundable reflective sheeting complying with the requirements of 730.191. Ensure that owner identification markings on construction drums are no more than 1 inch (25 mm) in character height and are located at least 2 inches (50 mm) below the reflectorized bands or on the top or bottom horizontal surfaces of the drum. Ballast the drums according to the manufacturer’s recommendations.

**614.11,**

On Page 475, In Table 614.11-2, in the Arrows, Symbols, and Words row, **Replace** the “.075” with “.75”.

**614.11.B**

On page 474, **Replace** the second paragraph with:

Unless otherwise shown on the plans, the Contractor may use 740.02 Type 1 paint or 740.06 Type I or Type II preformed material for work zone pavement markings. Furnish painted markings according to Item 642 except that:

**614.11.G.1**

On page 476, in section 614.11.G.1, **Replace** the section with the following:

**1. Removal and Covering of Markings.**

**a. Removal Methods.** Remove the 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. Remove the markings by using methods specified in the below table:

Type of Pavement		Removal Method	
		grinder <sup>[1]</sup>	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			

**b. Covering Conflicting Markings.** With the Engineer’s approval, use removable, nonreflective, preformed blackout tape according to Supplement 1187 to cover conflicting markings. Remove or replace the blackout tape within 15 days of installation. Furnish products according to the Departments Qualified Products List (QPL).

**614.16,**

On page 482, **Add** the following paragraph before the first paragraph:

The Department will make partial payments according to 109.09 and as modified by the following schedule:

If the project duration from first day of physical work to original completion date is greater than or equal to 45 calendar days,

A. The Department will pay 30 percent of the lump sum amount bid for Maintaining Traffic with the first estimate, but not sooner than 15 days after the start of work at the project site.

B. The Department will pay the remaining 70 percent of the lump sum amount bid for Maintaining Traffic according to 109.09.

**614.16,**

On page 484, **Revise** the following pay unit for Portable Changeable Message Sign from Each, Sign Month to Day

**619.02,**

On page 492, **Revise** the Table 619.02-1 Field Office as follows:

**Revise** the All weather parking spaces to:

All-weather parking spaces	8	16	20
----------------------------	---	----	----

**Revise** the Copy Machine to:

Copying machine capable of scanning documents to a computer <sup>[2]</sup>	1, 11x17	1, 11x17	1, 11x17
--	----------	----------	----------

### 625.12

On page 507 **add** the following sentence after the first paragraph:

When not otherwise specified, all conduit and fittings on an individual run of conduit shall be of the same material except for approved manufactured transition fittings required at end of the run when the item into which the conduit terminates is not of the same material as the conduit.

On page 508, **revise** the eleventh paragraph to read

After installation of the conduit and prior to installing the cables, run a mandrel whose diameter is at least 90% of the interior diameter of the conduit through the conduit.

### 625.14

On page 509 **revise** Section 625.14 to read as follows:

**625.14 Jacking and Boring.** In addition to the requirements of 625.12 to furnish and install conduit, use jacking or horizontal boring when the plan calls for such methods to be used. Use these methods in lieu of trenching only with the approval of the Engineer.

Jack only rigid galvanized steel conduit. Use only a machine designed for jacking conduit not the bucket or blade of a machine designed for earthwork.

Horizontal boring may be used to install any conduit or duct which has the adequate strength, flexibility and joints to withstand the process. Make the diameter of the bore no more than 5 percent larger than the outside diameter of the conduit or duct being installed.

### 630.12,

On page 528, **Replace** in the last sentence of the second paragraph “603.10” with “603.12”.

### 632.03,

On page 538, in Section 632.03 **Add** the following to the list in the fourth paragraph:

Tether Wire.....732.185

### 632.03,

On page 538, **Replace** in the 4th paragraph “725.04, 725.05” with “725.04, 725.051, 725.052”.

### 632.225

On page 544, **Add** the following after the 632.22 section:

**632.225 Tether Wire.** Arrange tether wire with accessories to stabilize signal heads and prevent excessive swinging. Accessories included with tether wire include anchor shackles, S-hooks yielding element, thimbles, turnbuckles, guy grips, wire rope clips, lock wire, safety tie wire, lead sheet, and signal head tether anchors and extenders.

Adjust the tether span to be horizontal on simple spans. On complex spans, the tether span shall be essentially parallel to the overlying messenger span. Bull Rings will be used at all

internal corners of the tether span. Safety ties shall be installed at all yielding (S-hook) locations to prevent the span end from dropping into the roadway if the S-hook opens. No electrical or communication cables of any kind shall be attached to the tether wire. No signs or other devices shall be suspended from or attached to the tether wire.

**632.29,**

On page 549, In Section 632.29, **Add** the following after the fourth paragraph:

The Department will measure tether wire by the number of feet (meters) in place, and will include all necessary accessories such as anchor shackles, S-hooks yielding element, thimbles, turnbuckles, guy grips, wire rope clips, lock wire, safety tie wire, lead sheet, and signal head tether anchors and extenders. The Department will measure from pole center to pole center, or pole center to bullring, or bullring to bullring. The Department will not measure any length of tether wire for attachment to poles or bullrings by bending, lapping or wrapping.

**632.30,**

On page 550, In Section 632.30, **Add** the following:

632	Foot (Meter)	Tether Wire, with Accessories
-----	--------------	-------------------------------

**633.03,**

On page 552, **Replace** in the 4th paragraph “725.04, 725.05” with “725.04, 725.051, 725.052”.

**641.02,**

On page 573, **Add** the following after the fourth paragraph:

Any materials delivered without a TE-24 and applied without laboratory approval will be removed. Laboratory tested materials not meeting specifications will be removed from the project site.

**641.06,**

On page 576, **Revise** the second sentence in the first paragraph to the following:

Do not start marking operations until the Engineer or the Engineer’s representative has approved the layout and premarking lines.

**641.07**

On Page 576, In Section 641.07, **Replace** the second sentence with the following: The Engineer will not allow any deviation greater than 3 inches (75 mm).

**641.08.A**

On Page 577, In section 641.08.A, in the second sentence, **Delete** "a minimum of".

642,

Replace the existing section with the following:

**ITEM 642 TRAFFIC PAINT**

**642.01 Description**

**642.02 Materials**

**642.03 Equipment**

**642.04 Application**

**642.05 Basis of Payment**

**642.01 Description.** This work consists of furnishing and applying fast dry water-based traffic paint or fast dry water-based traffic paint for cold weather applications according to Item 641, 740.01, 740.02, 740.09, and the additional requirements specified below.

**642.02 Materials.** Furnish materials from the Department’s Approved List conforming to:

Traffic Paint .....	740.02
Glass Beads, Type A.....	740.09

The Engineer may obtain random samples from the application equipment. Furnish the manufacturer’s identification information for the sampled liquid materials. The Department will test the quality assurance sample for conformance to the manufacturer’s production ranges. Samples not meeting the manufacturer’s production ranges will require the Contactor to re-apply, at his expense, any markings using that sample. All other untested batches will become not approved and will either require testing or re-application.

Do not apply paints that have exceeded the manufacturer’s shelf life. Do not use glass beads that are wet.

**642.03 Equipment.** Use equipment capable of applying the traffic paint as recommended by the manufacturer and applying glass beads at the time of line placement. Furnish a calibrated measuring device acceptable to the Engineer to measure the traffic paint in the striper tanks.

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 miles (0.8 km) of continuous line equivalent.

Furnish written documentation to the Engineer for the equipment’s operational capabilities from the equipment manufacturer.

**642.04 Application.** Apply pavement markings only when the surface is clean and dry in accordance with the paint manufacturer’s written application instructions.

If application is required when air and pavement temperatures are between 35 °F (2 °C) and 50 °F (10 °C) obtain approval from the Engineer and apply only pre-qualified Type 1A cold weather traffic paint materials. Apply traffic paint per manufacturer’s recommendations and protect line from tracking..

Keep the paint thoroughly mixed during application.

Apply 20 mil (0.51 mm) thick traffic paint Type 1 at the following rates:

20 Mil Thickness	Line Width (inch)				24
	4	6	8	12	
<b>Gallon per Mile of Line</b>					
Solid Line	22	33	44	66	132
Broken Line	5.5	8.25	11	16.5	33
Dotted Line	5.5	8.25	11	16.5	33
Areas, Symbols, Words	1.25 gallon per 100 square feet				

0.51 mm Thickness	Line Width (mm)				600
	100	150	200	300	
<b>Liter per Kilometer of Line</b>					
Solid Line	50	75	100	150	300
Broken Line	12.5	19	25	38	75
Dotted Line	12.5	19	25	38	75
Areas, Symbols, Words	0.51 L/m <sup>2</sup>				

Apply 15 mil (0.38 mm) thick traffic paint Type 1A at the following rates:

15 Mil Thickness	Line Width (inch)				24
	4	6	8	12	
<b>Gallon per Mile of Line</b>					
Solid Line	16	24	32	48	96
Broken Line	4	6	8	12	24
Dotted Line	4	6	8	12	24
Areas, Symbols, Words	0.94 gallon per 100 square feet				

0.38 mm Thickness	Line Width (mm)				600
	100	150	200	300	
<b>Liter per Kilometer of Line</b>					
Solid Line	37	56	74	111	222
Broken Line	9.3	14	18.6	28	56
Dotted Line	9.3	14	18.6	28	56
Areas, Symbols, Words	0.38 L/m <sup>2</sup>				

Do not dilute the paint. However, the Contractor may add spent traffic paint solvents, generated during performance of this work, to virgin traffic paint. If adding spent solvents, add them in a maximum ratio of 1:50 of spent solvents to virgin paint. Ensure that the maximum concentration of spent solvents in the striping equipment tanks is maximum 2 percent. Add spent solvents during the loading of the striping equipment.

Apply glass beads to the wet paint so that the beads are embedded and retained in the paint and provide uniform retroreflectivity in the paint surface. Apply glass beads at a minimum rate of 15 pounds per 100 square feet (7.3 kg per 10 m<sup>2</sup>) for Type 1 traffic paint. Apply glass beads at a minimum rate of 8.0 pounds per 100 square feet (3.9 kg per 10 m<sup>2</sup>) for Type 1A traffic paint.

Ensure temperature of the paint at the discharge point is within the range recommended by paint manufacturer.

Replace unsatisfactory markings as per 641.11.

Furnish the Engineer daily, biweekly and final DLS reports as per 641.04..

Perform traffic control operations for all 642 pavement markings according to 614.12 and MT-99.20M, but provide for center line, edge line, lane line and channelizing line traffic control equipment according to MT-99.20M equipment requirements for center line, longer than 2 minute dry.

Payment for this work shall be included in the 642 price per mile for Center Line, Edge Line and Lane Line and the 642 price per foot for channelizing Line.

**642.05 Basis of Payment.** The Department will pay for accepted quantities at the contract prices, or prices adjusted according to 641.11, measured according to 641.12, with the provisions specified in 641.13, and as follows:

Item	Unit	Description
642	Mile (Kilometer)	Edge Line, Type ____
642	Mile (Kilometer)	Lane Line, Type ____
642	Mile (Kilometer)	Center Line, Type ____
642	Foot (Meter)	Channelizing Line, Type ____
642	Foot (Meter)	Stop Line, Type ____
642	Foot (Meter)	Crosswalk Line, Type ____
642	Foot (Meter)	Transverse/Diagonal Line, Type ____
642	Foot (Meter)	Curb Marking, Type ____
642	Square Foot (Square Meter)	Island Marking, Type ____
642	Each	Handicap Symbol Marking, Type ____
642	Each	Railroad Symbol Marking, Type ____
642	Each	School Symbol Marking, ____ inch (____ mm), Type ____
642	Foot (Meter)	Parking Lot Stall Marking, Type ____
642	Each	Lane Arrow, Type ____
642	Each	Word on Pavement, ____ inch (____ mm), Type ____
642	Foot (Meter)	Dotted Line, ____ inch (____ mm), Type ____
642	Foot or Square Foot (Meter or Square Meter), or Each	Removal of Pavement Marking
642	Lump Sum	Two-Way Radio Equipment

**642.04**

On page 579, **delete** the following:

If any project safety requirements require application below 50 °F (10 °C), obtain approval from the Engineer and apply only pre-qualified alkyd type materials. Apply paint and block from traffic tracking per alkyd paint manufacturer’s recommendations.

**643,**

**Replace** the existing specification with the following:

**ITEM 643 POLYESTER PAVEMENT MARKING**

- 643.01 Description
- 643.02 Materials
- 643.03 Equipment
- 643.04 Application
- 643.05 Basis of Payment

**643.01 Description.** This work consists of furnishing and applying polyester pavement markings according to Item 641, 740.01, 740.03, 740.09, and the additional requirements specified below.

**643.02 Materials.** Furnish materials from the Department’s Approved List conforming to:

- Polyester Pavement Marking..... 740.03
- Glass Beads, Type B..... 740.09

The Engineer may obtain random samples from the application equipment. Furnish the manufacturer’s identification information for the sampled liquid materials. The Department will test the quality assurance sample for conformance to the manufacturer’s production ranges. Samples not meeting the manufacturer’s production ranges will require the Contractor to re-apply, at his expense, any markings using that sample. All other untested batches will become not approved materials and will either require testing or re-application.

Do not apply material that have exceeded the manufacturer’s shelf life. Do not use glass beads that are wet.

**643.03 Equipment.** Use application equipment capable of mixing the polyester components in proportions recommended by the manufacturer and applying glass beads at the time of marking placement. Use equipment (striper) capable of applying polyester long-lines at the thickness specified for solid and broken lines while moving on the highway at a speed of not less than 7 miles per hour (11 km/h). Furnish a calibrated measuring device acceptable to the Engineer to measure the polyester resin in the striper tanks.

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 miles (0.8 km) of continuous line equivalent. The DLS shall measure the polyester resin material component and glass beads only. Catalyst will be calculated as 2 percent of the resin used.

Furnish written documentation to the Engineer for the equipment’s operational capabilities from the equipment manufacturer.

Furnish written documentation for the equipment's operational capabilities from the equipment manufacturer.

**643.04 Application.** Apply polyester only when the pavement surface is clean and dry and the pavement and air temperature are above 50 °F (10 °C).

If project safety requirements require marking application below 50°F (10°C), obtain approval from the Engineer and apply cold weather traffic paint, Type 1A, as per Item 642 instead of the polyester.

After sampling of resin is completed, transfer the entire contents of each material container to the striper tanks. Ensure that the polyester is thoroughly mixed at all times during application. Apply polyester (catalyst plus resin) uniformly to the pavement at the following rates:

15 Mil Thickness	Line Width (inch)				
	4	6	8	12	24
	<b>Gallon per Mile of Line</b>				
Solid Line	16	24	32	48	96
Broken Line	4	6	8	12	24
Dotted Line	4	6	8	12	24
Areas, Symbols, Words	0.94 gallon per 100 square feet				

0.38 mm Thickness	Line Width (mm)				
	100	150	200	300	600
	<b>Liter per Kilometer of Line</b>				
Solid Line	37	56	74	111	222
Broken Line	9.3	14	18.6	28	56
Dotted Line	9.3	14	18.6	28	56
Areas, Symbols, Words	0.38 L/m <sup>2</sup>				

Do not dilute the material.

Apply glass beads to the uncured polyester in sufficient quantity so that the beads completely fill the polyester film from the film-pavement interface to the top surface of the film to the extent that there are loose beads on the surface of the uncured line. Apply glass beads at a minimum rate of 16.5 pounds per 100 square feet (8 kg per 10 m<sup>2</sup>) of polyester applied in a manner that provides uniformly retroreflective lines.

If the applied polyester becomes tacky and causes marking discoloration and darkening, cease marking application until the Inspector agrees that the problem is corrected.

If any marking is in a tracking condition 45 minutes after application, cease marking application until the Inspector agrees that the problem is corrected.

Do not apply polyester pavement markings to new asphalt concrete until at least 2 weeks after the pavement is placed. Assure curing compound is removed from portland cement concrete pavements.

Replace unsatisfactory markings as per 641.11.

Furnish the Engineer daily, biweekly and final DLS reports as per 641.04.

**643.05 Basis of Payment.** The Department will pay for accepted quantities at the contract prices, or prices adjusted according to 641.11, measured according to 641.12, with the provisions specified in 641.13, and as follows:

Item	Unit	Description
643	Mile (Kilometer)	Edge Line
643	Mile (Kilometer)	Lane Line
643	Mile (Kilometer)	Center Line
643	Foot (Meter)	Channelizing Line
643	Foot (Meter)	Stop Line
643	Foot (Meter)	Crosswalk Line
643	Foot (Meter)	Transverse/Diagonal Line
643	Foot (Meter)	Curb Marking
643	Square Foot	Island Marking (Square Meter)
643	Each	Handicap Symbol Marking
643	Each	Railroad Symbol Marking
643	Each	School Symbol Marking, ___ inch (___ mm)
643	Foot (Meter)	Parking Lot Stall Marking
643	Each	Lane Arrow
643	Each	Word on Pavement, ___ inch (___ mm)
643	Foot (Meter)	Dotted Line, ___ inch (___ mm)
643	Foot or Square Foot	Removal of Pavement Marking (Meter or Square Meter), or Each
643	Lump Sum	Two-Way Radio Equipment

**643.04,**

On page 583, **delete** the following:

If project safety requirements require marking application below 50°F (10°C), obtain approval from the Engineer and apply alkyd traffic paint type 2 as per Item 642 instead of the polyester.

**701.09, Slag Modified Portland Cement.**

On Page 668 **Replace** 701.09 with the following:

**701.09 Slag Modified Portland Cement** Provide slag modified portland cement according to ASTM C 595, Type IS (< 25).

**703.01.E,**

On page 680, **Replace** Section 703.01.E with the following:

**E. Steel Slag Aggregate.** Provide open-hearth (OH), basic oxygen furnace (BOF,) and electric arc furnace (EAF) steel slag aggregate (known as steel slag) according to the following requirements when 703.04 aggregate for asphalt concrete base or 703.05 aggregate for asphalt intermediate course is specified. Do not use OH, BOF, or EAF slag as the fine or coarse aggregate (virgin or recycled) for asphalt surface courses.

Supply all steel slag from sources according to Supplement 1071. Furnish steel slag to a size meeting the specified grading requirements. Provide steel slag aggregate meeting the specified coarse or fine aggregate quality requirements. Ensure that measurements of soft pieces includes soft lime, lime oxide, or magnesia agglomerations or any foreign materials prone to rapid

disintegration under construction processing and weathering conditions. Ensure that additional testing beyond those listed are performed or required any time poor quality steel slag is suspected due to visual inspection, testing, or field performance problems.

Provide a letter of certification to the Engineer from the steel slag processor for every shipment of steel slag to the Contractor. In addition the steel slag processor must provide the Engineer with the following:

Quality control records (created in accordance with Supplement 1071).

Documentation of the steel slag production, processing, and stockpile retrieval

Failure to follow the processor QC plan or continued problems with performance recognized by the Laboratory attributable to steel slag is cause for limiting steel slag use from that processor.

**703.02.A,**

On page 684, **Delete** the last sentence in 703.02.A.1 that begins “Natural sand is required...”

**703.10,**

On page 689, **Replace** the words “air-cooled slag” with “ACBFS” in Section 703.10.A.

**703.11,**

On page 689, **Replace** the word “limestone” with “CCS” in the first sentence of Section 703.11.

**703.15,**

On page 694, **Replace** Section 703.15 with the following:

**703.15 Open-Hearth, Electric Arc Furnace, and Basic Oxygen Furnace Steel Slag Aggregate** Used for Items 410, 411, and 617.

A. Non-confined Applications. When using OH, EAF, and BOF slag in applications where the steel slag will not be confined, ensure that the slag meets the requirements in 703.14.A (deleterious substances and crushing), and in 703.14.D (aging and stockpiling requirements). Recycled OH, EAF, or BOF slag from Department or non-Department projects may be used in applications where the recycled steel slag will not be confined.

B. Confined Applications. When using 410, 411, or 617 in applications where OH slag will be confined, ensure the OH slag meets all requirements of 703.14. Do not use BOF and EAF slag for 410, 411, or 617 where the BOF and EAF slag will be confined. However, BOF and EAF slag may be used for embankment material when blended in accordance with 703.16.

**706.14,**

On page 741, **Replace** Section 706.14 with the following.

**706.14 Preformed Flexible Joint Sealant.** Provide preformed flexible joint sealant for concrete conduit according to ASTM C 990.

Furnish materials according to the Department's Qualified Product List (QPL).

**707.01,**

On page 742, in the minimum wall thickness table, **delete** the 0.079 Wall Thickness (in) value for 54 inch diameter pipe, and replace it with 0.109. Delete the 2.01 Wall Thickness (mm) value for 1350 mm diameter pipe, and replace it with 2.77.

**707.02,**

On page 744, in the minimum wall thickness table, **replace** the wall thickness values for pipe 54 inches to 108 inches with the following:

Diameter (in)	Wall Thickness (in)
54	.079
60	.079
66	.109
72	.109
78	.109
84	.109
90	.109
96	.109
102	.109
108	.109

On page 745, in the minimum wall thickness table, **replace** the wall thickness values for pipe 1350 mm to 2550 mm with the following:

Diameter (mm)	Wall Thickness (mm)
1350	2.01
1500	2.01
1650	2.77
1800	2.77
1950	2.77
2100	2.77
2250	2.77
2400	2.77
2550	2.77

**707.12,**

On page 747 in the minimum wall thickness table, **replace** the wall thickness values for 54 inch and 60 inch pipe diameters with the following:

Diameter (in)	Wall Thickness (in)
54	.109
60	.109

On page 747 in the minimum wall thickness table, **replace** the wall thickness values for 1350 mm and 1500 mm pipe diameters with the following:

Diameter (mm)	Wall Thickness (mm)
1350	2.77
1500	2.77

**707.22,**

On page 751, in the minimum wall thickness table, **replace** the wall thickness values for 54 inch through 78 inch pipe diameters with the following:

Diameter (in)	Wall Thickness (in)
54	.075
60	.105
66	.105
72	.105
78	.105

On page 751, in the minimum wall thickness table, **replace** the wall thickness values for 1350 mm through 1950 mm pipe diameters with the following:

Diameter (mm)	Wall Thickness (mm)
1350	1.91
1500	2.67
1650	2.67
1800	2.67
1950	2.67

**707.31,**

On page 753, **Replace** the first sentence of 707.31 with the following:

Provide corrugated polyethylene drainage tubing according to AASHTO M 252 Type C and CP.

**707.33,**

On page 753, **Replace** the first paragraph of 707.33 with the following:

This specification covers smooth lined corrugated polyethylene pipe, closed profile polyethylene pipe, couplings, and fittings which shall conform to AASHTO M 252 or AASHTO M 294, Type S, SP, or D, with the following modifications to AASHTO M 294:

**711.02,**

On page 771, **Replace** the first paragraph of 711.02 with the following:

Furnish galvanize steel according to ASTM A 123 after cutting, bending, and welding. At the discretion of the Engineer, replace, re-galvanize, or repair damaged galvanized material. If a

repair is authorized, perform work according to ASTM A 780 except the Department will not allow aerosol spray applications of paints containing zinc dust.

**725,**

On page 789, **Replace** “725.05 Polyvinyl Chloride Conduits and Fittings” with “725.051 Polyvinyl Chloride Conduits and Fittings

On page 789, **Add** “725.052 Polyethylene Conduits and Fittings”

On page 791, Replace 725.05 with the following

**725.051 Polyvinyl Chloride Conduits and Fittings.** Furnish polyvinyl chloride conduit EPC-40-PVC conforming with NEMA Standard TC-2 for normal above ground or below ground, either concrete encased or direct burial. Use fittings conforming to NEMA Standard TC-2 references.

Furnish materials according to the Department’s Qualified Products List (QPL).

On page 791 **Add** the following:

**725.052 Polyethylene Conduits and Fittings.** Furnish polyethylene conduit EPEC-40-HDPE conforming with NEMA Standard TC-7 for below ground only, whether concrete encased or direct burial. Use fittings conforming to ASTM D3350.

Furnish materials according to the Department’s Qualified Products List (QPL).

**730.04,**

On page 810, Replace entire section with the following:

**730.04 Base and Arm Plates.** Furnish support or pole anchor bases and arm attachment plates fabricated from steel plate according to ASTM A 36 (A 36M) or ASTM A 572 (A 572M), Grade 42. Weld plates to supports, poles, or arms both inside and outside with fillet or full penetration welds equal to the wall thickness, or by AWS prequalified welding joints TC U4a-S or TC U4c-GF. The Contractor may use a cast steel base of equivalent strength.

Furnish certified material according to Supplement 1093.

**730.191,**

On Page 812, **Replace** the title with the following: **730.191 Reflective Sheeting Reboundable.**

**730.191,**

On Page 812, **Replace** the first paragraph with the following: Furnish reboundable reflective sheeting according to Supplement 1049, and according to ASTM D 4956, Type III, IV, VII, VIII, IX or X, including supplemental requirements S1 and S2, with watermarks or other identification marks inconspicuously incorporated into the face of the sheeting on a repeating pattern if necessary to distinguish the sheeting from other similarly appearing sheetings.

**732.02,**

On page 818, In Section 732.02, **Delete** the third paragraph (begins with “Ensure that the housing...”).

**732.04,**

On page 825, **Replace** in the last line of paragraph b, “120 \*\* 3 volts RMS” with "120 ± 3 volts RMS".

**732.04.C.1.i,**

On Page 822, **Replace** this section with the following:

If red or yellow lenses are tinted, they shall match the wavelength (chromaticity) of the LED. Do not furnish green tinted lenses.

**732.07.A,**

On page 830, **Add** the following paragraph between the third and fourth paragraphs:

Furnish loop detector unit with an LED or LCD display indication of call strength ( $\Delta L/L$  or equivalent). This display shall be a bar graph or numerical display with at least eight (8) discrete levels indicated.

**732.07.B,**

On page 830, **Add** the following paragraph between the first and second paragraph:

Furnish loop detector unit with an LED or LCD display indication of call strength ( $\Delta L/L$  or equivalent). This display shall be a bar graph or numerical display with at least eight (8) discrete levels indicated.

**732.08,**

On page 830, **Add** the following paragraph between the first and second paragraph:

Furnish loop detector unit with an LED or LCD display indication of call strength ( $\Delta L/L$  or equivalent). This display shall be a bar graph or numerical display with at least eight (8) discrete levels indicated.

**732.185,**

On page 833, **Add** the following section after section 732.18:

**732.185 Tether Wire.** Furnish Utilities Grade tether wire, 1/4-inch (6 mm), twisted strand galvanized steel according to ASTM A475, Class B, with the exception that tags according to Section 19.2 are not required on lengths less than 1000 feet (300 m). Ensure that all accessories except S-hooks have rated load strength equal to or greater than the tether wire minimum breaking strength. S-hooks shall be made of mild low-carbon galvanized steel and of the wire size indicated on the plans; larger wire sizes and higher-strength steel S-hooks shall not be substituted. Safety tie wire shall be 304 or 316 stainless steel, 1x19 stranded, 1/8-inch (3 mm) with stainless steel wire rope clips. Lead sheet to wrap tether wire in breakaway anchors shall be commercially pure lead of thickness 0.030 to 0.042 inches (0.75 to 1.0 mm).

**732.19,**

On Page 835, Replace the existing table 732.19-1 with the following table:

<b>TABLE 732.19-1 CABLE AND WIRE</b>					
<b>Cable or Wire</b>	<b>Number of Conductors</b>	<b>Wire Gage</b>	<b>Specification or type</b>	<b>Conductor Type</b>	<b>Notes</b>
Signal Cable	As specified	As specified	IMSA 19-1 IMSA 20-1	Copper, color coded, stranded	
Interconnect cable	As specified	As specified	IMSA 19-1 IMSA 20-1	Copper, color coded, stranded	
	Twisted pairs as specified	As specified	RUS PE-39 IMSA 19-2 IMSA 20-2	Copper, color coded, solid	
Interconnect cable, integral, messenger type	As specified	As specified	IMSA 19-3 IMSA 20-3	Copper, color coded, stranded	
	Twisted pairs as specified	As specified	IMSA 19-4 IMSA 20-4	Copper, color coded, solid	ANSI/ICEA Cable shall have: 1) Solid insulations 2) Full count color coding 3) 8-mil shield 4) 772 kHz attenuation compliance All other specifications are manufacturers option unless specified.
Loop detector wire	Single conductor	14 AWG	IMSA 51-5	Copper, stranded	
Loop detector lead-in cable	Two conductor	14 AWG	IMSA 50-2	Copper, twisted pair, stranded, shielded	
Magnetometer lead-in cable	Four conductor	18 AWG	Heavy duty, direct burial type	Copper, color coded, solid	Jacket : High density polyethylene, Thickness 0.026 in(0.66 mm)(min.) Low conductor to conductor capacitance [2]
Power cable	Two conductor	As specified	UL: RHH/RHW/USE or XHHW, cross linked polyethylene w. an insulation thickness of 0.045 in(1.14 mm) (min.)	Copper, stranded	Three-conductor cable may be specified. Permitted substitution: 2 (or 3) single conductor cable
Service cable	Two conductor (duplex)	As specified		Aluminum, [1] twisted, stranded	
Ground Wire	Single conductor		UL: RHH/RHW/USE or XHHW, cross linked polyethylene	Copper, stranded	Minimum size is equal to the power or service cable, whichever is larger.
Loop detector lead-in cable, direct burial	As specified	12 or 14 AWG, or as specified	IMSA 19-6 IMSA 20-6	Copper, stranded	
Loop detector lead-in cable, Integral messenger type	As specified	12 or 14 AWG, or as specified	IMSA 19-4 IMSA 20-4	Copper, stranded	
[1] Copper Conductors may be substituted					
[2] 18 picofarads per foot (59 pF/m), 15 picofarads per foot (49 pF/m)					

**733.02.B,**

On Page 840, **Replace** the paragraph that begins with “Furnish controllers with 24 month warranties or for the manufacturers...” with the following:

Furnish 60-month warranties or for the manufacturers’ standard warranty, whichever is greater for the following equipment:

1. NEMA Controller Equipment
  - a. TS-2 Controller Units
  - b. Bus Interface Units
  - c. Malfunction Management Units
  - d. TS-1 Conflict Monitors
2. CalTrans Controller Equipment
  - a. Model 2010 Conflict Monitor Units
  - b. 170E Controller Units including the following subassembly item:
    - (1)CPU Board
  - c. 2070L and 2070LC Controller Units including the following subassembly units:
    - (1)2070-1B CPU Board
    - (2)2070-2A Field I/O Module
    - (3)2070-3B Front Panel.

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.

**733.02.D,**

On page 842, In Section 733.02.D. **Add** the following to the first paragraph:

3. Furnish a serial communication cable to be used to establish periodic automatic time sync between the 2070 controller software and the conflict monitor. The cable shall consist of six feet (2 m) of unshielded 4- conductor cable, minimum 24 gauge stranded conductors with protective jacket. End connectors shall be 9-pin D-subminiature with backshell, male and female, with pin assignments shown in the table below.

9-pin Male	9-pin Female
3	3
5	5
2	2
1	4
8	4

**733.03.A.2.m,**

On page 848, **Add** the following at the end of the first paragraph:

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).

**733.03.A.2.p,**

On page 849, **Add** the following:

(7) Furnish loop detector unit with an LED or LCD display indication of call strength ( $\Delta L/L$  or equivalent). This display shall be a bar graph or numerical display with at least eight (8) discrete levels indicated.

**733.03.B.3,**

On page 850, **Add** the following paragraph:

Furnish loop detector unit with an LED or LCD display indication of call strength ( $\Delta L/L$  or equivalent). This display shall be a bar graph or numerical display with at least eight (8) discrete levels indicated.

**733.09.E,**

On Page 870, **Add** the following sentence at the end of the section:

Furnish materials according to the Department's Qualified Products List (QPL).

**740.02,**

**Replace** the existing section 740.02 with the following:

**740.02 Traffic Paint.** Furnish white and yellow ready-mixed traffic paint suitable for marking various types of pavement. Prequalify materials according to Supplement 1047. Use materials certified according to Supplement 1089. Furnish paint that is a suitable binder for glass beads, 740.09 Type A, on pavement exposed to traffic. Furnish 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 paint that does not bleed or discolor when sprayed on asphalt concrete surfaces.

Type 1 paint is the fast dry, water-based, 100 percent acrylic type.

Type 1A paint is fast dry, water-based, 100 percent acrylic type, used for cold weather applications.

Ensure that Type 1A paint conforms to the following requirements:

Property	Test Method	Requirements (Applies to both White and Yellow, unless noted))
Total Solids	ASTM D2369	70% minimum by weight
		58% minimum by volume
Titanium Dioxide, rutile type II	ASTM D1394	1 lb/gal (120 g/l) minimum, White 0.2 lb/gal (24 g/l) minimum, Yellow
Pigment % by Weight	ASTM D3723	+/- 2% of qualifying sample
Weight per Gallon	ASTM D1475	+/- 0.3 lb/gal (36 g/L) of qualifying sample
Color	SS 1047	Appendix A
Viscosity (krebs units)	ASTM D562	70 minimum and 95 maximum @ 77°F (25°C)
Lab Drying Time	ASTM D711	10 minutes max. @ 77°F (25°C), 50% RH 12 minutes max. @ 50°F (10°C), 50% RH 14 minutes max. @ 35°F (1.7°C), 50% RH

Prequalify materials according to Supplement 1047. Use materials certified according to Supplement 1089.

**740.02,**

On page 871, delete the following sentence in the first paragraph  
Ensure that the manufacturer formulates the traffic paint Type 2 in such a manner as to meet the requirements of this specification

**740.02,**

On page 871, delete the following sentences and table in the third paragraph:  
Type 2 paint is the fast dry, alkyd type.  
Ensure that all Type 2 paint conforms to the following requirements:

		Minimum	Maximum
1.	Consistency, Krebs units ASTM D 562. Procedure A:	90	110
2.	Field Dry Time (No Track), minutes:	--	2
Furnish pavement marking material that will be in "no tracking condition" in two minutes. The "no tracking condition" will be determined by applying the markings and beads at the specification requirements to dry pavements at a low temperature of 45°F (7 °C) and high temperature of 120 °F (49 °C). Run tests at the manufacturer's highest and lowest recommended application humidity. The marking materials will be applied at the manufacturer's recommended application temperature. The "no tracking" time will be determined by passing over the line with a passenger car at a speed of 25 to 35 mph (44 to 55 kmph) in a simulated passing maneuver. A line showing no visual deposition of the material to the pavement surface when viewed at a distance of 50 ft (15 m) will be considered as showing "no tracking" and conforming to this requirement for time to "no track".			
3.	Prime Pigment Content, percent by weight of paint:		
	white ASTM D 1394	17.0	--
	yellow ASTM D 126 or Department approved lab method	17.0	--
4.	Pigment Content, percent by weight of paint ASTM D 2698:		
	white	--	61
	yellow	--	61
5.	Nonvolatile Vehicle Solids Content, percent by weight of paint Fed. STD. 141 C Method 4053.1:		
	white	12	--
	yellow	12	--
6.	Fineness of Dispersion, ASTM D 1210 micrometers :		
		50	--
7.	Bleeding Ratio, Fed. Std. TT-P-115F, Section 4.3.2:		
	white	0.95	--
	yellow	0.93	--
8.	Color,		
	a. White, Daylight Directional Reflectance, <b>ASTM D 1347:</b>	91	--
	b. Yellow	50	
	1. Refer to Highway Yellow Color Tolerance Chart PR Color No. 1, June, 1965 U.S. Dept. of Transportation, FHWA: Yellow, Color Difference 595-33538, ASTM D 2244		
	I Measure E, L, a, b as Cielab, Source "C"		
	Type 2		
	L	+1.5	+5.5
	a	+0.5	+9.0
	b	+0.5	+15.0
9.	Condition in container, Fed Std, 141 No. 3011.2 hand stirring by spatula, in minutes		5