

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

DATED 10-18-2019

101.02

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

101.02

On page 10, Delete the following:
~~QCQC Quality Control Qualifications Committee~~

102.16

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

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

107.07

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

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

107.13

On page 46, **Replace** the last sentence in the last paragraph with the following:
The decision of the DCE will be made within 14 days and will be administratively final.

107.15

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

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

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

7. Digital Speed Limit Sign Assembly

107.15

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

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

- A.** Notify the Engineer of each occurrence of damage in writing within 10 Calendar Days.
- B.** Contact the local law enforcement agency to determine if the accident was investigated and a report filed. If an accident report was filed, obtain the report and notify the motorist, and copy their insurance company, via certified mail informing both that the motorist is responsible for the cost of damage repairs. If the motorist does not respond within 30 days, make a second attempt to contact the motorist and copy the insurance company via certified mail.
- C.** If no response is received from the motorist or insurance company within 30 days of the motorist receipt of the second notice, send a letter to the Engineer within eighteen months of the event and include documentation of good faith effort to seek recovery from responsible parties.
- D.** The Department will make an adjustment according to 108.06 and 109.05 to compensate the Contractor for the added costs and delays, if any, resulting from the repair or replacement of damaged Work.

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

108.06.D.4

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

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

108.07

On page 65, **Add** the following paragraph after Item E and before TABLE 18.07-1:

The Contractor may submit a request for waiver of liquidated damages to the Department within 30 days of the assessment of liquidated damages.

109.05.C.8.b

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

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

109.05.C.10

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

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

203.04

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

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

301.02

On Page 161, **Add** the following paragraph after the last paragraph in the section:

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

302.03

On Page 164, **Add** the following paragraph after the first sentence in the section:

Do not start mix production without a preliminary JMF approval and 48 hour notification to District Testing. Final approval of a JMF will be based upon field verification. According to 441.12 the JMF can be rejected for failure to verify in the plant or at the project.

401.04

On Page 174 **Replace** the 4th full paragraph with the following:

Determine RAS properties and usage as follows. Use no more than 3.0 percent RAS by dry weight of mix. When using RAP and RAS in combination use no more than 25 percent RAP. For design assume 12.0 percent available RAS binder. Determine gradation and specific gravity according to AASHTO PP 78-17, Section 5 or subsequent AASHTO applicable standard. Provide the required certification forms in the JMF submittal documenting that the RAS meets AASHTO MP 23-15 (2016), section 4 and that RAS from roofing tearoffs conforms to the EPA’s NESHAP, 40 CFR 61 Subpart M, and other applicable agency requirements for asbestos.

401.04

On Page 175 **Replace** Table 401.04-1 with the following:

TABLE 401.04-1 METHOD 1 – STANDARD RAP/RAS LIMITS

Asphalt Mix Application	Percent RAP by Dry Weight of Mix, Max.	RAS Usage ^[1]	Total Virgin Asphalt Binder Content, Min.	Comments
442 Polymer Surface Course	10%	None	5.2	Polymerized binder is virgin. (For non-polymer virgin binder allow 20% max RAP)
441 Surface Course	20%	None	5.0	Polymer or non-polymer virgin.
441, 442 Intermediate Course	35%	Manufacturing waste and tear-offs	3.0	Any mix type used as an intermediate course.
301 Base Course	50%	Manufacturing waste and tear-offs	2.7	OMM will establish the asphalt binder content.
302 Base Course	40% (30%)	Manufacturing waste and tear-offs	2.0	A lower RAP limit of 30 percent will be required if poor production mixing or coating is evident.

[1]No more than 3.0% RAS by dry weight of mix

Table 401.04

On Page 176 **Replace** Table 401.04-2 with the following:

TABLE 401.04-2 METHOD 2-EXTENDED RAP/RAS LIMITS

Asphalt Mix Application	Percent RAP by Dry Weight of Mix, Max.	RAS Usage [1]	Total Virgin Asphalt Binder Content, Min.	Comments
442 Polymer Surface Course	15%	None	5.0	Polymerized binder is virgin. (For non-polymer virgin binder allow 25% max RAP)
441 Surface Course	25%	None	5.0	Polymer or non-polymer virgin.
441, 442 Intermediate Course	40%	Manufacturing waste and tear-offs	3.0	Any mix type used as an intermediate course.
301 Base Course	55%	Manufacturing waste and tear-offs	2.5	OMM will establish the asphalt binder content.
302 Base Course	45% (35%)	Manufacturing waste and tear-offs	1.8	A lower limit of 35 percent will be required if poor coating is evident. The virgin requirement of 302.02 does not apply.

[1]No more than 3.0% RAS by dry weight of mix

401.04.C

On Page 176, **Replace** the first sentence in the second paragraph with the following:

Ensure RAS is processed to have 100 percent passing the 1/2 inch (12.5 mm) sieve and at least 90 percent passing the No. 4 (4.75 mm) sieve.

401.08

On Page 178, **Add** the following paragraph after the first paragraph:

At a minimum, take a split sample of asphalt binder whenever the Department requests a sample. Address in the QCP the QC of mix plant asphalt binder samples and subsequent corrective action of binder test failures of any sample (QC or Department). Failure to perform QC of asphalt binder samples is at the Contractor's risk. Any Department binder sample failures will result in penalties per Supplement 1102. These include remove and replace, pay deductions, or other penalties for the asphalt mix represented by the Department's sample.

402.02

On Page 188, **Replace** the entire section with the following:

402.02 Calibration. Ensure the plant is calibrated according to Supplement 1101 when producing any asphalt concrete for the Department. Calibrate the asphalt binder meter according to Supplement 1101.07 Method A or B. When calibrating the asphalt binder meter according to Method B, daily aggregate and RAP weighbridge validations are required to be performed according to Supplement 1101.06. Document which plants follow Supplement 1101.01 Method B in the Quality Control Program (403.03). If issues persist for Method B calibrations or documentation, the Department will require the plant to follow Method A. When performing a complete calibration for ODOT projects notify District Testing 24 hours in advance of the calibration.

403.02

On Page 190, **Replace** the second paragraph with the following:

Restoration of VA procedures will be by the Department’s Quality Control Review Group (QC Review Group) based on District recommendation and review of the Contractor problems, resolutions and QCP. The QC Review Group consists of asphalt the Materials Engineer, Office of Materials Management; the Administrator, Office of Materials Management; and the Pavement Engineer, Office of Construction Management.

403.03

On Page 190, **Add** the following sentence to the end of the first paragraph:

Include a revision date on the cover sheet and revision sheet listing the date(s), what section(s) and page(s) a revision was made, and a short description of what was revised, added, or removed.

403.03

On Page 190, **Replace** the third sentence in the second paragraph with the following:

Digital copies of the QCP and letter in pdf format are allowed in each Contractor plant laboratory and plant operation control room with the following requirements: The file icon must be appropriately labeled and be on the computer desktop of a computer in each area. Ensure the QCP contains page numbering and a Table of Contents inside the front cover locating all sections by page number. Remove out-of-date QCPs from the computer desktop.

403.03

On Page 191, **Delete** the second full paragraph.

~~The QCP is a reflection of a Contractor’s sincerity and ability in producing a quality product. Development of this program beyond the minimum requirements specified below is encouraged and is taken into consideration by the QCQC when reviewing Contractor plant operation for qualification for VA.~~

403.03

On Page 191, **Replace** the third full paragraph with the following:

As a minimum include in the program:

403.03.B

On Page 191, **REPLACE** subsection B with the following:

B. Means for annual training in ethical conduct according to company expectations of all company employees and consultants who are responsible for the mix design, production, testing, and placement of asphalt mix and their supervisors. Document how and when training is given, what the expectations are, how expectations are communicated and list all personnel trained. Describe the QC Manager's and supervisor's responsibilities and methods in ensuring ethical conduct is maintained throughout the year.

403.03.F

On Page 192, **Replace** the first paragraph with the following:

F. Methods to maintain all worksheets, including all handwritten records, and other test and sample records from all plant(s) and, or project(s) for a minimum of 8 years. Define the test record process. Define company records retention requirements. Provide copies of all test reports and forms used in the quality control process.

403.03.L

On Page 192, **Add** the following sentence after the last sentence in the paragraph:

Means of handling asphalt binder samples taken at the mix plant including any testing, labeling, and storing of samples.

403.03.N

On Page 192 **Replace** the paragraph with the following:

N. Define the roles and responsibilities of the Field Quality Control Supervisors. Provide a detailed description of how the FQCS will handle all mat issues including segregation, tenderness, mat tears, debris, holes, etc. List approved Field Quality Control Supervisors.

403.06.F

On Page 198, **Replace** the last paragraph with the following:

For all other mixes, if repeated problems with poor comparison of tests are not the District's fault; or poor comparison of Contractor tests to the JMF; or with plant operation, input materials, or any of the other requirements of Department specifications occur in a single project or successive projects, the District will request an opinion from the QC Review Group before notifying the Contractor of removal from Department VA. The District will immediately notify the Contractor of the removal with a follow up letter from District Testing. Once notified, acceptance of asphalt mixtures is by Unconditional Acceptance. Restoration of the VA procedures may occur on a future project with a District recommendation to the QC Review Group based on consistent improved plant operation and mix control, a review of the Contractor problems and resolutions, and a review of the QCP by the QC Review Group.

421.02

On Page 211, **Add** the following sentence directly after Table 421.02-2:

Do not use aggregates designated with "SR" or "SRH."

421.02

On Page 212, **Replace** the first sentence of the first full paragraph with the following:

For mineral filler, use Supplement 1028 Certified portland cement conforming to ASTM C 150, Type I.

421.03

On Page 212, **Revise** the third sentence in the second paragraph to the following:

Prepare the mix design by designing the mixture using the minimum, design, and maximum residual binder contents for gradations A or B and present all test data for all tests specified in Table 421.03-1.

421.03

On Page 213, **Replace** Table 421.03-1 with the following:

TABLE 421.03-1

ISSA Test No.	Description	Specification
TB-139	Wet Cohesion	
	30 minutes min. (set time)	12 kg-cm min.
	60 minutes min. (traffic)	20 kg-cm min or near spin
TB-114	Wet Stripping	90 percent min.
TB-100	Wet Track Abrasion Loss	
	1-hour soak 6 day soak	450 g/m ² max. 650 g/m ² max.
TB-144	Saturated Abrasion Compatibility	2 g loss max.
TB-113	Mix Time @ 25 °C	Controllable to 120 seconds
	Mix Time @ 40 °C	Controllable to 45 seconds
TB-147	Lateral Displacement (For Leveling and Rut Fill courses only)	5%, max.
TB-109	Excess Asphalt by LWT Sand Adhesion	538 g/m ² max.

421.03.A

On Page 213, **Replace** the first sentence after Table 421.03-1 with the following:

Check the ISSA TB-139 (set time) and ISSA TB-113 (mix time) tests at the highest and lowest temperatures expected during construction.

421.03.B.8

On Page 213, **Replace** B.8. with the following:

8. Quantitative effects of moisture content on the unit weight of the aggregate per AASHTO T 19 from 0.0 to 10.0% moisture content.

421.04.C

On Page 214, **Replace** paragraph C. with the following:

- C. Provisions to meet the Department mix specifications including warning bands and action plans for aggregate, Binder, and tack coat materials to ensure they meet Department testing.

421.09

On Page 217 **Replace** the third and fourth paragraphs of the section with the following:

Remove all existing pavement markings so that less than 5% of the line remains visible. Repair damage to the pavement that results in the removal of more than 1/8 inch of pavement thickness. When a grinder drum is mounted to a skid steer loader, the drum must be able to accommodate a minimum of 150 teeth.

Seal visible joints and cracks longer than 2 feet (600 mm) in length and any joint or crack greater than 1/4 inch (6 mm) in width no matter the length using Item 423 Type II only. Apply crack sealant material at a width of 2 to 4 inches (50 to 100 mm) and at a thickness of not less than 1/16 inch (2 mm) and not greater than 3/16 inch (5 mm).

421.12

On Page 219, **Replace** the next-to-last sentence in the first paragraph with the following:
Present a revised corrective action plan and obtain the Engineer's approval before resuming work.

421.12.A

On Page 220, **Replace** the entire section with the following:

A. Binder. Obtain and label a Binder sample from supply tanker and diluted tack coat sample from the distributor truck at the direction of the Engineer and give the samples to the Engineer the same day. Provide and sample the Binder and diluted tack coat in one-quart (1 L) plastic containers with plastic screw tops. Label and retain one sample per each additional day for the Department. Take more samples when requested by the Engineer.

Visually inspect Binder in supply tanker(s) to ensure uniform material with no separation or contamination. Verify temperature of binder and tack coat. Monitor and verify proportioning of asphalt emulsion and water into distributor and proper mixing before use or sampling. Perform a minimum of one Binder and tack coat cook-off each production day to determine the residue content of the Binder and tack coat and verify compliance. If residue content is in warning band or out of compliance provide the Engineer with corrective actions prior to using.

Ensure mixing equipment is set at design asphalt emulsion percentage during production. Do not exceed a tolerance of $\pm 0.3\%$ residual content from the design residual content or the minimum and maximum content in the microsurface mix due to fluctuation in residual content in the Binder. If tolerance is exceeded, stop production. Correct the issue by correcting the Binder residual content by methods allowed by Supplement 1032 certified supplier or adjust the asphalt emulsion percent, if approved by the Engineer. Recalibrate the mixing equipment to the new adjusted asphalt emulsion percent to meet the design residual content of the microsurfacing mix for positive displacement mixing equipment.

421.12 B.

On Page 220, **Replace** the second sentence in the third paragraph with the following:
Obtain three (3) aggregate samples from the stockpile and perform gradation testing on each sample according to AASHTO R 90, AASHTO R 76, Supplement 1004 (AASHTO T 11 where required), and moisture content per AASHTO T 255.

422.02 C.

On Page 225 **Replace** the first sentence in the third paragraph of the section with the following:
If a staging location will be used for the chip seal aggregate first move the initially tested aggregates from the aggregate source stockpile to the staging location and construct a project-specific staging stockpile.

422.06

On Page 228 **Replace** the second paragraph of the section with the following:

Remove all existing pavement markings so that less than 5% of the line remains visible. Repair damage to the pavement that results in the removal of more than 1/8 inch of pavement thickness. When a grinder drum is mounted to a skid steer loader, the drum must be able to accommodate a minimum of 150 teeth.

422.10 C.

On Page 231 **Replace** the first sentence of the section with the following:

C. Coarse Aggregate. At a minimum test one sample taken from the aggregate spreader box or project-specific stockpile at production start and sample and test one sample from the aggregate spreader box or project-specific stockpile randomly during the day.

422.10 C.

On Page 231 **Replace** the fifth sentence of the section with the following:

Sample and test aggregate according to AASHTO R 90, AASHTO R 76, and Supplement 1004 (AASHTO T 11 where required).

422.13

On Page 233 **Replace** the first paragraph of the section with the following:

422.13 Method of Measurement. The Department will measure Single Chip Seal or Double Chip Seal by the number of square yards (square meters) of aggregate, and the gallons (liters) of polymer emulsified binder, completed and accepted in place. The Department will determine the width by measuring the actual width of the chip seal. The Department will determine the length along the centerline of each roadway or ramp. The Department will determine the gallons (liters) of polymer emulsified binder applied according to Item 109.

422.14

On Page 234 **Replace** the Basis of Payment table with the following:

Item	Unit	Description
422	Square Yard (Square Meter)	Aggregate, Single Chip Seal, Type ____
422	Gallons (Liters)	Emulsion, Single Chip Seal, Type ____
422	Square Yard (Square Meter)	Aggregate, Double Chip Seal, Type ____
422	Gallons (Liters)	Emulsion, Double Chip Seal, Type ____

423.02

On page 234 **Delete** the following:

~~Type III..... 702.17.C~~

423.03

On page 235, **Delete** the following from the first sentence of the first full paragraph:

For ~~Type II, III,~~ and IV crack sealants, heat the sealant in a kettle or melter constructed as a double boiler, with the space between the inner and outer shells filled with oil or other heat-transfer fluid.

423.03

On page 235, **Replace** the first sentence of the third full paragraph with:

For ~~Type II and III~~ crack sealants, use a mechanical applicator wand head capable of placing the crack sealant according to the tolerances of 423.07 while filling the cracks.

423.06

On page 236, **Delete** the following:

~~Mixing Type II and III.~~

423.06

On page 236, **Add** the following sentence after the second sentence:

Type II crack sealant may also be prepackaged per 702.17.B.

423.06

On page 236, **Delete** the last sentence of the section:

~~Do not heat Type III crack sealant to greater than 295 °F (146 °C).~~

423.07

On page 236, **Replace** the first sentence of the fourth paragraph:

For ~~Type II and III~~ crack sealants, place the sealant such that it fills the cracks with a band of sealant within 2 to 4 inches (50 to 100 mm) wide.

423.10

On page 237, **Delete** the following:

~~423 Pound (Kilogram) Crack Sealing, Type III~~

~~or Square Yard~~

~~(Square Meter)~~

~~423 Pound (Kilogram) Crack Sealing, Type II or III~~

~~or Square Yard~~

~~(Square Meter)~~

424.03

On Page 238, **Add** the following sentence to the end of the second paragraph:

Do not use RAS.

441.09

On Page 245, **Replace** the first full paragraph with the following:

Should additional testing as required above not be performed District Testing, after consultation with OMM, will require the testing frequency be increased to all tests every two hours of production for the remainder of the project. If this occurs, District Testing will request an opinion from the QC

Review Group for action(s) against the technician and/or Contractor including but not limited to warning, removal and/or a change of the facility to Unconditional Acceptance.

443.01

On Page 253, **Replace** the second paragraph with the following:

The requirements of 442; and 446 or 447 apply except as follows. Do not use the warm mix asphalt method (402.04) for this item.

443.03

On Page 253, **Replace** Note [5] after Table 443.03-2 with the following:

[5] VCA = Volume of Coarse Aggregate (Calculated for mix and dry rodded conditions according to AASHTO R 46)

443.03.E

On Page 254, **Replace** the section with the following:

E. Reclaimed Asphalt Concrete Pavement and Shingles. Do not use reclaimed asphalt concrete pavement except as described in D above. Do not use reclaimed asphalt shingles.

443.08

On Page 256, **Replace** the entire section with the following:

443.08 Acceptance. After accepting the test strips, the Department will accept SMA according to 446.04; or 447.04, 447.05, and 447.06.

443.09

On Page 256, **Replace** the section with the following:

443.09 Basis of Payment. The Department will pay for accepted quantities of Stone Matrix Asphalt Concrete, complete in place, including test strip, at the contract price as modified by 446.04; or 447.05 and 447.06, as follows:

Item	Unit	Description
443	Cubic Yard (Cubic Meter)	Stone matrix asphalt concrete, 12.5mm, PG70-22M, (_____)
443	Cubic Yard (Cubic Meter)	Stone matrix asphalt concrete, 12.5mm, PG76-22M, (_____)

447.05

On Page 263, **Replace** TABLE 447.05-1 with the following:

TABLE 447.05-1 MAT DENSITY LOTS

Mean of Cores ^[1]	Pay Factor
	Surface Course
98.0% or greater	[2]
97.0 to 97.9%	0.94
96.0 to 96.9%	1.00
94.0 to 95.9%	1.04
93.0 to 93.9%	1.00
92.0 to 92.9%	0.98
91.0 to 91.9%	0.90
90.0 to 90.9%	0.80
89.0 to 89.9%	[3]
Less than 89.0%	[2]
[1] Mean of cores as percent of average MSG for the production day.	
[2] Remove and replace.	
[3] The District will determine whether the material may remain in place. If the District determines the course should be removed and replaced, the Contractor will remove and replace this course. The pay factor for such material allowed to remain in place is 0.70.	

499.02

On Page 300, **Replace** the materials listing for “Fly ash” with “Fly ash or natural pozzolan”.

499.03

On Page 301, in Table 499.03-1, **Replace** notes [5] and [7] with the following:

[5] The maximum fly ash, natural pozzolan, or slag cement content may be increased up to 50%.

[7] Cement or a combination of cement and up to 15% fly ash or natural pozzolan; or up to 30% slag cement.

499.03

On Page 302, in Table 499.03-2, **Add** the following row after “Fly Ash”:

Natural pozzolan	25
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499.07

On Page 307, in Table 499.07-1, **Add** the following row after “Fly ash”:

Natural pozzolan	lb (kg)
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499.07

On Page 308, in Table 499.07-2, **Add** the following row after "Fly ash":

Natural pozzolan		
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501.04.B

On Page 311, **Add** the following sentence to the end of the first paragraph; Shop Drawings are not required for elastomeric bearings.

508.05

On Page 336, **Replace** the last paragraph with the following:

Include the cost for load testing required as per 508.02 in the item for which the falsework support is used.

511.03

On page 343, **Revise** the first paragraph to the following:

511.03 Concrete. Provide concrete for structures according to 499.03, using Class QC 1, QC 2, QC 3, or QC 4 or QC 5 as specified in the Contract.

511.04

On Page 343, **Delete** the third paragraph and table and **Replace** with the following:

When the concrete bid item does not require QC/QA, the Engineer will make at least one set of acceptance test cylinders for each 50 cubic yards (40 m³) of concrete.

511.15

On page 355, **Replace** the first two paragraphs with the following:

511.15 Surface Finish. For concrete that is to be sealed with Epoxy-Urethane according to 512.03, perform surface profiling and surface finish according to 512.03.F.

For all others, finish the concrete surface as detailed below:

511.15.A.

On page 355, **Replace** the paragraph with the following:

A. Standard Finish. On all surfaces, remove fins and irregular projections with a stone or power grinder, taking care to avoid contrasting surface textures. Repair all cavities produced by form ties and, on visible surfaces, repair all defects using a mortar consisting of one part of hydraulic cement conforming to Item 499 and 1-1/2 parts sand conforming to 703.03, by volume and water conforming to 499.02 with a maximum water/cementitious ratio of 0.4. A defect is an imperfection in the concrete measuring at least 3/4" (19mm) in diameter or at least 1/2" (13 mm) deep but not exceeding a total volume of 1 cubic inch (16.387 mL). Finish all repaired surfaces on the structure in a similar manner and to the extent required to produce a uniform appearance.

512.03.F.

On page 364, **Replace** the entire section with the following:

F. Surface Preparation and Profiling.

1. Non-Epoxy Sealer

Remove dust, dirt, oil, wax, curing compounds, efflorescence, laitance, coatings and other foreign materials from surfaces to be sealed.

Ensure that all wastes generated by the surface preparation operation are managed in accordance with 107.19.

If the concrete surface had curing compound applied, acid test the surface after blasting to see if the curing compound was removed. Perform the acid test for every 500 square feet (47 square meters). Use a 30%, by weight, solution of hydrochloric acid. Apply 4 to 5 drops to the concrete surface. If foaming/fizzing occurs the curing compound is removed. Rinse the tested location with an ammonia solution to neutralize the concrete area tested (1 cup ammonia to 5 gallons water).

(NOTE: Muriatic acid and ammonia can be bought in a hardware store. Muriatic acid is used to clean masonry. Only dilute by pouring the acid into the water. DO NOT pour the water into the acid.)

When surfaces show intermittent or no foaming, use chemicals or other cleaning compounds to remove the curing compounds. Only use products approved by the sealer manufacturer. Furnish the Engineer documentation of the sealer manufacturer's approval and method to test if materials are removed.

2. Epoxy-Urethane Sealer

Remove dust, dirt, oil, wax, curing compounds, efflorescence, laitance, coatings and other foreign materials from surfaces to be sealed.

Ensure that all wastes generated by the surface preparation operation are managed in accordance with 107.19.

If the concrete surface had curing compound applied, acid test the surface after blasting to see if the curing compound was removed. Perform the acid test for every 500 square feet (47 square meters). Use a 30%, by weight, solution of hydrochloric acid. Apply 4 to 5 drops to the concrete surface. If foaming/fizzing occurs the curing compound is removed. Rinse the tested location with an ammonia solution to neutralize the concrete area tested (1 cup ammonia to 5 gallons water).

(NOTE: Muriatic acid and ammonia can be bought in a hardware store. Muriatic acid is used to clean masonry. Only dilute by pouring the acid into the water. DO NOT pour the water into the acid.)

When surfaces show intermittent or no foaming, use chemicals or other cleaning compounds to remove the curing compounds. Only use products approved by the sealer manufacturer. Furnish the Engineer documentation of the sealer manufacturer's approval and method to test if materials are removed.

After concrete has cured and forms are removed, use one or both of the following methods to produce a surface profile that feels and looks like 100 grit sandpaper or coarser. Provide the Engineer sandpaper for comparison. Perform the ASTM D7682-12, Method B, Standard Test Method for Replication and Measurement of Concrete Surface Profile Using Replica Putty to obtain a replica coupon of the prepared concrete surface on a flat, test section, on the first day of production, and as requested by the Engineer. With a micrometer, measure the surface profile obtained on the coupon, and provide the coupon to the Engineer.

a. Water blast at 7000 psi (48Mpa) minimum, or

b. Abrasive blast, followed by air brooming or power sweeping, to remove dust and sand from the surface and opened pores, or

c. Use a combination of water blast and abrasive blast.

Install suitable traps, filters, drip pans and other separation devices in the cleaning equipment so oil and other foreign material are not deposited on the surface.

Fill all cavities produced by form ties and other single defects or defected areas with a prequalified trowelable mortar in accordance with Supplemental Specification 843.02 and 843.06. Provide a broom/brush finish to all trowelable mortar patches. Cure the trowelable mortar according to Supplemental Specification 843.07.

A defect is an imperfection in the concrete measuring at least 3/4" (19mm) in diameter or at least 1/2" (13mm) deep but not exceeding a total volume of 1 cubic inch (16.387 mL). A defected area is an area with a density of imperfections between 1/4" (6 mm) and 3/4" (19 mm) in diameter or between 1/4" (6mm) and 1/2" (13 mm) deep numbering 10 or more per 1 square foot (0.09 square meters) area.

Air dry for at least 10 days after completion of the manufacturer's recommended cure time for trowelable mortar. Brush abrasive blast, followed by air brooming or power sweeping, to remove dust and sand from the surface and opened pores.

512.03.G.

On page 365, **Replace** the first paragraph of the subsection with the following:

G. Application and Coverage. Do not apply sealer to surfaces with moisture. Determine moisture on surface in accordance with ASTM D4263 - Indicating Moisture in Concrete by the Plastic Sheet Method. Apply the sealer within 48 hours after moisture testing and brush abrasive blast. Do not apply sealer if rain is anticipated within six (6) hours after application. Clearly mark where the sealer application stops if not continuous.

513.13

On page 383, **Replace** the last sentence of the first paragraph with the following:

Weld stiffeners connected to cross frames and/or diaphragms to the top and bottom flange.

516.03

On Page 433, **Replace** the second paragraph with the following:

Coat metal parts of expansion joints not part of extensions to existing steel expansion joints with metalized 100 percent zinc wire. Prepare the surface to be coated and apply coating as required by The Society of Protective Coatings SSPC-CS-23.00(1). Apply coating to a minimum thickness of 6 mils. The vertical extensions to existing steel expansion joints are not to have any protection and the horizontal extensions to existing steel expansion joints are to match the existing protection.

518

Beginning on page 438 **Replace** the section with the following:

ITEM 518 DRAINAGE OF STRUCTURES

- 518.01 Description**
- 518.02 Fabrication**
- 518.03 Materials**
- 518.04 General**
- 518.05 Porous Backfill**
- 518.06 Prefabricated Geocomposite Drain (PGD)**
- 518.07 Pipe**
- 518.08 Scuppers**
- 518.09 Excavation**
- 518.10 Method of Measurement**
- 518.11 Basis of Payment**

518.01 Description. This work consists of constructing drainage systems.

518.02 Fabrication. Fabricate scuppers according to Item 513. Select a fabricator that is at least pre-qualified at level SF. The Department will base final acceptance of all fabricated members on the Engineer’s approval that the fabricated items can be successfully incorporated into the structures. Submit mill test reports for structural steel, steel castings, bronze, and sheet lead certified according to 501.06.

518.03 Materials. Furnish materials conforming to:

Scuppers, structural steel and cast steel.....	513
Metal pipe	707
Plastic pipe.....	707.33, 707.45
Other metals.....	711
Prefabricated Geocomposite Drain (PGD).....	712.16

Geotextile fabric, Type A	712.09
Reinforced thermosetting resin pipe.....	707.80

Furnish pipe specials of a grade at least as high as the type of pipe specified.

Furnish porous backfill consisting of gravel, stone, or air-cooled blast furnace slag, with a No. 57 size gradation according to Table 703.01-1. The sodium sulfate soundness loss shall not exceed 15 percent.

Furnish ACBFS conforming to Supplement 1027.

518.04 General. As shown on the plans, connect all parts to new or existing sewers or other outlets.

When installing to superstructure, take into account the deflection of spans under full dead load.

518.05 Porous Backfill. Place porous backfill as shown on the plans. When not shown on the plans, place backfill at least 2 feet (0.6m) thick behind the full length of abutments, wing walls, and retaining walls. Measure the thickness of porous backfill normal to the abutment or wall face. The Contractor may leave undisturbed rock or shale within 18 inches (0.5 m) of the abutment or wall. Place 2 ft³ (0.23 m³) of bagged No. 3 aggregate at each weep hole to retain the porous backfill. Place the porous backfill for the full width of the trench and extend it to the bottom of the approach slab or base, as shown in the plans. Place porous backfill in loose lifts not to exceed 12 inches. Run a plate compactor or tamper over the top of each lift for consolidation of approximately 85% of original layer thickness. If placed in loose lifts greater than 12 inches, flood the porous backfill at the appropriate moisture content for consolidation of approximately 85% of original layer thickness.

518.06 Prefabricated Geocomposite Drain (PGD) Do not use PGD on Integral Abutments or above the beam seat elevation on Semi Integral Abutments.

A. Preparation. Prepare the surface of the wall or abutment, on which the PGD is to be placed, to be free of soil, debris, and excessive irregularities that prevent continuous contact between the wall surface and the PGD.

B. Placement. Place PGD strips to provide continuous coverage over the face of the wall. Unroll PGD directly onto the prepared surface. Do not drag the PGD across the ground. Tension the PGD to remove any creases or wrinkles. Do not expose PGD to weather or direct sunlight for longer than 5 days. Place the geotextile fabric side to face toward the backfill or retained soil.

Construct the PGD in horizontal or vertical courses. Place the PGD in direct contact with the wall and secure to the surface using either adhesives per manufactures recommendation or nails as follows. Secure with 2 inch (51 mm) or longer concrete nails along with washers or wood battens of not less than 9 square inches (5887 square mm). Space the concrete nails no more than 3 feet (0.9 m) apart, both horizontally and vertically. Use at least one horizontal row of nails in each horizontal course of PGD, or use at least one vertical column of nails in each vertical course of PGD. Do not affect the drainage area and the downward flow in the drain by the adhesive or fasteners.

C. Splicing and covering. Form horizontal or vertical seams between courses by utilizing the flap of geotextile extending from one course and lapping over the flap on that of the next course. Securely fasten the overlapped flaps with a continuous strip of 3 inch (76 mm) wide, waterproof, plastic tape.

Where splices are necessary without a geotextile flap, place and center a 12 inch (0.3 m) wide continuous strip of geotextile over the seam and fasten with continuous strips of 3 inch (76 mm) wide, waterproof, plastic tape.

As an alternative method of splicing, either horizontally or vertically, rolls of PGD may be joined together by turning back the geotextile flap at the roll edges and interlocking the drainage core approximately two inches. Fold the flap under and tape it beyond the seam with 3 inch (76 mm) wide, waterproof, plastic tape. Shingle lap the core and fabric in the direction of water flow.

To prevent soil intrusion, cover all exposed edges of the PGD core by tucking the geotextile flap over and behind the core edge. Alternatively, a 12 inch (0.3 m) wide strip of geotextile may be used to wrap the edge, taping it to the geotextile side 8 inches (203 mm) in from the edge with a continuous strip of 3 inch (76 mm) wide, waterproof, plastic tape and folding the remaining 4 inches (102 mm) over and behind the core edge. Caps (bottom, top, or end) provided by the manufactures can also be used according to manufacturer's instructions.

Construct all seams, splices, and caps to prevent the backfill material from entering the PGD.

D. Connecting to Weep Holes and Drainage System. Connect the PGD to the drainage system as shown on the plans or per manufacturer's recommendations if not shown in the plans. Maintain a positive outlet for the water in the PGD at all locations.

Do not seal, block or restrict weep holes with the PGD. If available, use weep hole fittings provided by the manufacturer and installed to the manufacturer's instructions. If the PGD core is not perforated at the weep hole location, make a hole in the PGD core matching the diameter of the weep hole or larger to accommodate the pipe or fitting. When making holes in the core, do not damage the geotextile fabric.

Use manufacturer provided outlet fittings that transition between the PGD and the outlet pipe, and prevent material from entering the outlet pipe. If manufacturer fittings are not available, provide smooth-lined or corrugated outlet fittings according to manufacturer's recommendations. Fasten and seal outlet fittings to the wall drains according to manufacturer's recommendations.

E. Repair. Patch or replace damaged PGD. Remove the damaged area and place a PGD patch and splice the edges according to 518.06.C. If the damaged portion is larger than 50 percent of the PGD roll width, cut across the entire width of the roll to remove the damaged portion and splice according to 518.06.C.

If damage is limited to tears in the geotextile fabric, place a geotextile patch extending 6 inches (152 mm) beyond the damaged area in all directions or to the edge of the roll, and seal the entire perimeter with 3-inch (76 mm) wide, waterproof, plastic tape.

Replace and repair damaged PGD at no additional expense to the Department.

F. Backfilling. Replace or repair any PGD component that is damaged during the backfilling operation. Use hand operated compaction equipment to compact the backfill within 1-foot (0.3m) of the PGD.

518.07 Pipe. For drain pipe leading down from the superstructure, use either galvanized steel pipe, 748.06, or plastic pipe, 707.45, or reinforced thermosetting resin pipe, 707.80. Provide specials, elbows, tees, wyes, and other fittings essential for a complete and satisfactory installation of the same material and quality as the pipe. Construct watertight joints of adequate strength. In steel pipe, weld joints or use clamp-type couplings having a ring gasket. In plastic pipe, make joints according to the applicable ASTM standard. In reinforced thermosetting resin pipe, make joints according to manufacturer guidelines and procedures. Securely fasten the pipe to the structure with hanger or clamp assemblies that are galvanized according to 711.02.

Place subsurface pipe as shown in the plans. If the plans require drainage pipe in the porous backfill, provide plastic pipe conforming to 707.33.

For corrugated metal pipe, perforated specials are not required and the Contractor may make bends with adjustable elbows conforming to the thickness requirements of the pipe specifications.

518.08 Scuppers. Construct secure and watertight connections, including the connections to adjacent concrete. Provide castings, true to form and dimension. Weld the joints of structural steel scuppers. Galvanize scuppers according to 711.02.

518.09 Excavation. Excavate all material encountered to the dimensions necessary to provide ample space at least to install pipe or other drainage facility behind abutments and for outlets.

518.10 Method of Measurement. The Department will measure Porous Backfill and Porous Backfill with Geotextile Fabric, by the number of Square Yards (Square Meters), Cubic Yards (Cubic Meters) or lump sum. The Department will measure Prefabricated Geocomposite Drain by the number of Square Yards (Square Meters) or lump sum. The Department will measure pipe specials by the same method as the pipe. If pipe is by the foot (meter), the Department will measure the pipe along its centerline.

The Department will measure all Square Yard (Square Meters) items as the area of the abutment or wall being covered for drainage.

518.11 Basis of Payment. The cost to backfill, if not separately itemized in the Contract, and excavation is incidental to the drainage facility that necessitates them.

The Department will include bagged aggregate with porous backfill for payment.

The Department considers all items to place the Prefabricated Geocomposite Drain including surface preparation, tape, fasteners, adhesives, outlet fittings or other support material, incidental to the Prefabricated Geocomposite Drain.

The Department will pay for perforated and non-perforated pipes for the Prefabricated Geocomposite Drain as separate pay items per 518.07.

The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
518	Cubic Yard (Cubic Meter)	
	Square Yard (Square Meter) or Lump Sum	Porous Backfill
518	Cubic Yard (Cubic Meter)	
	Square Yard (Square Meter) or Lump Sum	Porous Backfill with Geotextile Fabric
518	Square Yard (Square Meter) or Lump Sum	Prefabricated Geocomposite Drain
518	Foot (Meter)	___ inch (___ mm) ___ Pipe, Including Specials
518	Each	Scuppers, Including Supports
518	Pound or Foot (Kilogram or Meter)	Trough Horizontal Conductors
518	Pound or Foot (Kilogram or Meter)	Pipe Horizontal Conductors
518	Foot (Meter)	___ inch (___ mm) Pipe Downspout Including Specials

523.02

On page 451, **Replace** the first sentence of the first paragraph with the following:
523.02 General. Perform dynamic tests on two successfully tested piles.

605.02

On page 476, **Replace** the first paragraph of 605.02 with the following:
Backfill unclassified pipe underdrains, shallow pipe underdrains, deep pipe underdrains, base pipe underdrains, ~~or~~ rock cut underdrains, with or without a Geotextile Fabric, construction underdrains and aggregate drains with granular material consisting of ACBFS, limestone, or gravel. Furnish granular material meeting Size Nos. 8, 9, or 89. Gradations may be modified in accordance with Supplement 1069.11.C. Use granular material with a maximum sodium sulfate soundness loss of 15 percent.

606.02

On page 480, **Revise** the third paragraph to the following:
Type MGS may be constructed using round wooden posts of 72" length until **March 2020**. After that date, round wooden posts shall be 69" in length. Prior to **March 2020**, posts may be trimmed or may extend above the blackout.

608.03.E.

On Page 486, **Delete** the last two sentences of paragraph E.
~~After the minimum curing period and a 30 day drying time apply an approved non epoxy sealer (705.23.B) according to Item 512. Ensure any remaining curing compounds that are incompatible with the selected sealer and all foreign materials are removed prior to sealer treatment.~~

609.06.E.

On Page 491, **Delete** the last two sentences of paragraph E.
~~After the minimum curing period and a 30 day drying time apply an approved non epoxy sealer (705.23.B) according to Item 512. Ensure any remaining curing compounds that are incompatible with the selected sealer and all foreign materials are removed prior to sealer treatment.~~

611.02.B

On page 497, **Delete** the following:
~~Corrugated steel spiral rib pipe.....707.12~~

611.02.B

On page 497, **Add** the following after the fifth item on the list:
Polymer-precoated corrugated steel spiral rib pipe.....707.11

611.02.C

On page 498, **Delete** the following:
~~Corrugated steel spiral rib pipe.....707.12~~

611.02.C

On page 498, **Add** the following after the fifth item on the list:
Polymer-precoated corrugated steel spiral rib pipe.....707.11

611.03

On page 501, **Add** the following to the seventh paragraph between the "707.07" and "707.12" material references:

, 707.11

611.11

On page 512, **Add** the following sentence to the beginning of the fourth paragraph of the section:
 For all aluminum conduits, prior to placing concrete, coat the area to be paved with a zinc chromate primer or an epoxy paint formulated for applying to aluminum. Extend primer or epoxy 4 inches beyond the proposed paving limits.

611.12 Performance Inspection

On page 515, **Add** the following to TABLE 611.12.B:

TABLE 611.12.B

Conduit Type	Measurement Equipment	Type of Measurement
Rigid conduit and 748.06, steel casing pipe	Crawler mounted camera according to SS902.01 with crack measuring capabilities according to SS902.02 C	Joint gaps Crack widths
Plastic conduit, 707.12, corrugated steel spiral rib conduit, 707.24, corrugated aluminum spiral rib conduit, 748.01, ductile iron pipe, and Circular corrugated metal conduit not listed below	Crawler mounted camera with laser profiler according to SS902.02 A, B, and C or Mandrel according to SS902.03 and Crawler mounted camera according to SS902.01 with crack measuring capabilities according to SS902.02 C	Joint gaps Crack widths Deflection
The following types of corrugated metal conduit: 707.04, precast, galvanized steel culverts 707.05 and 707.07, bituminous coated corrugated steel pipe with paved invert, 707.11 Polymer-precast corrugated steel spiral rib pipe 707.13 and 707.14, bituminous lined corrugated steel pipe	Crawler mounted camera with laser profiler according to SS902.02 A, B, and C	Joint gaps Crack widths Deflection

614.03

On page 523, **Add** the following title to the beginning of the second paragraph:

A. Training and Responsible Person.

614.03

On Page 524, **Add** the following title to the beginning of the second paragraph:
B. Temporary Traffic Control Devices.

614.03

On Page 524, **Add** the following paragraph after the third paragraph:
For truck-mounted attenuators and trailer attenuators (TMAs) see 614.03.D.

614.03

On Page 525, **Add** the following paragraph after the first paragraph:
All temporary traffic control devices shall conform to the Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles.

614.03

On Page 525, **Add** the following title to the beginning of the second paragraph:
C. Conspicuity.

614.03

On Page 525, in the 7th paragraph **Replace** the following: “A. Apply one” with “1. Apply one”.

614.03

On Page 525, in the 8th paragraph **Replace** the following: “B. Outline” with “2. Outline”.

614.03

On Page 525, in the 9th paragraph **Replace** the following: “C. Outline” with “3. Outline”.

614.03.C

On Page 526, **Replace** the second paragraph with the following:
Acceptable methods for delineating material supply vehicles are depicted in the Quality Standards for Temporary Traffic Control Devices and Acceptable Delineation Methods for Vehicles.

614.03

On Page 526, **Add** the following at the end of the subsection:
D. Truck-mounted or Trailer Attenuator (TMA). Furnish a TMA that is NCHRP-350 (manufactured prior to 1/1/20) or MASH TL-3 compliant. Do not use a TMA in place of the arrow board at the beginning of a merge taper, or as a substitute in locations where other positive protection methods are required (portable barrier/impact attenuators, tapering outside of the clear zone, etc.). Use of a TMA for a work area already otherwise protected by positive protection shall be at the Contractor’s expense.

Furnish a TMA to protect each work area in the following situations:

1. When working on a multi-lane highway (45 mph and above) in a closed lane or shoulder without portable or permanent traffic barriers separating the work area from the traveled lanes.
2. Any situation on a multi-lane highway (45 mph and above) where a TMA is depicted or labeled as required or optional on a shadow vehicle in the OMUTCD.

Furnish a TMA for each work area if two or more localized work areas occur within the same stationary work zone and are separated by more than 700 feet.

Attach the TMA to the shadow vehicle in accordance with manufacturer specifications and place in advance of the work area according to recommended spacing in Table 614.03-1. Distances are considered as guidelines. However, engineering judgement should be used to alter distances to take into account traffic conditions, vehicle mix, sight distance, and other site-specific conditions.

Table 614.03-1

For Shadow Vehicles Weighing 22,000 lb. or More		
Speed Limit (MPH)	Recommended Spacing ^[1]	
	Stationary Operation (Ft)	Moving Operation (Ft) ^[2]
Greater than 55	150	172
45-55	100	150
Less than 45	74	100
For Shadow Vehicles Weighing Less than 22,000 lb. but Greater Than 9,900 lb.		
Speed Limit (MPH)	Stationary Operation (Ft)	Moving Operation (Ft) ^[2]
Greater than 55	172	222
45-55	123	172
Less than 45	100	100

[1] Recommended spacing is distance between front of shadow vehicle and beginning of work area to provide adequate roll ahead distance and minimize the risk of vehicles cutting in ahead of the shadow vehicle.

[2] Distances are appropriate for speeds up to 15.5 mph.

614.10

On page 529, **Add** the following sentence to the end of the second paragraph:
Covering of one or more permanent or temporary vehicle or pedestrian signal head(s) shall be according to 632.25, except payment shall be included in Item 614 Maintaining Traffic.

614.10

On page 529, **Add** the following sentence to end of the second paragraph:
Energized signal covers shall block light from being visible.

614.11.B.1

On page 530, **Replace** TABLE 614.11-1 and TABLE 614.11-1M with the following:

TABLE 614.11-1

Type of Pavement Marking	Line Width (inch)				
	4	6	8	12	24
	Gallon per Mile of Line				
Solid Line	22	33	44	66	132
10-foot Dashed Line	5.5	8.25	--	--	--
4-foot Dashed Line	2.2	3.3	--	--	--
Dotted Line	7.3	10.95	14.6	21.9	--
Arrows, Symbols, and Words	1.4 gallons per 100 square feet				
Glass Beads: 740.09, Type A	15 pounds per 100 square feet				

TABLE 614.11-1M

Type of Pavement Marking	Line Width (mm)				
	100	150	200	300	600
	Liter per Kilometer of Line				
Solid Line	52	78	105	157	314
3.0 m Dashed Line	13	19.5	--	--	--
1.2 m Dashed Line	5.2	7.8	--	--	--
Dotted Line	17.3	25.95	34.6	51.9	--
Arrows, Symbols, and Words	0.6 liters per square meter				
Glass Beads: 740.09, Type A	7.3 kg per square meter				

614.11.B.2

On page 530, **Replace** TABLE 614.11-2 and TABLE 614.11-2M with the following:

TABLE 614.11-2

Type of Pavement Marking	Line Width (inch)				
	4	6	8	12	24
	Gallon per Mile of Line				
Solid Line	12	18	24	36	72
10-foot Dashed Line	3	4.5	--	--	--
Dotted Line	4	6	8	12	--
Arrows, Symbols, and Words	0.75 gallons per 100 square feet				
Glass Beads: 740.09, Type A	7.5 pounds per 100 square feet				

TABLE 614.11-2M

Type of Pavement Marking	Line Width (mm)				
	100	150	200	300	600
	Liter per Kilometer of Line				
Solid Line	28	42	56	84	168
3.0 m Dashed Line	7	10.5	--	--	--
Dotted Line	9.4	14.1	18.8	28.2	--
Arrows, Symbols, and Words	0.3 liters per square meter				
Glass Beads: 740.09, Type A	3.7 kg per square meter				

614.11.G.1.a

On page 532, **Delete** the third paragraph:

~~Use only sand, shot, or water blasting for removal of all pavement markings in preparation for placing Item 422 Chip Seal or Item 421 Microsurfacing.~~

614.16.B

On page 539, **Add** the following language as a new line at the end of the subsection:

6. TMAs.

614.16.C

On page 539, **Replace** the subsection with the following:

C. If traffic permanently damages beyond use any of the work zone traffic control items listed in 107.15, the Department will compensate the Contractor for replacement of the damaged item by Change Order provided the Contractor has pursued but failed to obtain compensation from the motorist.

614.16

On page 540, **Revise** the section as follows:

Item	Unit	Description
614	Lump Sum	Maintaining Traffic
614	Lump Sum	Detour Signing
614	Each	Replacement Drum
614	Each	Replacement Sign
614	Each	Object Marker, ___ - Way
614	Each, Mile, Foot (Kilometer, Meter)	Work Zone Pavement Markings
614	Each	Work Zone Raised Pavement Marker
614	Sign Month	Portable Changeable Message Sign
614	Each	Work Zone Speed Limit Sign
614	Each	Work Zone Marking Sign
614	Hour	Law Enforcement Officer with Patrol Car
614	Each	Barrier Reflector
614	Each	Work Zone Crossover Lighting System
614	Each	Work Zone Impact Attenuator
614	Mile (Kilometer)	Work Zone Lane Line, Class ___, ___*, ___**
614	Mile (Kilometer)	Work Zone Center Line, Class ___, ___**
614	Foot (Meter)	Work Zone Channelizing Line, Class ___, ___*, ___**
614	Mile (Kilometer)	Work Zone Edgeline, Class ___, ___*, ___**
614	Foot (Meter)	Work Zone Gore Marking, Class II, ___**
614	Foot (Meter)	Work Zone Stop Line, Class I, ___**
614	Foot (Meter)	Work Zone Arrow, Class I, ___**
614	Foot (Meter)	Work Zone Crosswalk Line, Class I, ___**
614	Foot (Meter)	Work Zone Dotted Line, Class ___, ___*, ___**
614	Cubic Yard (Cubic Meter)	Asphalt Concrete for Maintaining Traffic

* Width of marking (4" or 6" for Lane Lines, Edgelines and Dotted Lines; 8" or 12" for Channelizing Lines and Dotted Lines).

** Type material (642 paint; 740.06, Type I or Type II; or left blank to allow any of the three.)

617.03

On page 544, **Replace** the first paragraph of 617.03 with the following:

617.03 Prosecution. If reconditioning shoulders as part of a resurfacing project and traffic is maintained, place shoulder material along with the paving operations as rapidly as possible. Complete all shoulder reconditioning within four days following placement of the surface course and any course that results in a drop-off of 2.0 inches (50 mm) or greater. Adjacent to a safety edge constructed as part of the Work, complete all shoulder reconditioning within ten days following construction of the safety edge.

618

On page 546, **Replace the** Item heading with the following:

ITEM 618 RUMBLE STRIPS

618.03

On page 547, **Replace** the second and third sentences with the following:

The Department will measure lengths along the inside edge of the shoulder, edge line or center line, from the center of the first depression in a segment to the center of the last depression in that segment. If Rumble Strips are provided on more than one shoulder or edge line, the Department will measure lengths separately for each shoulder or edge line segment and add the individual lengths together to obtain the total length for the shoulder or the edge line.

618.04

On page 547, **Replace** the pay items with the following:

- 618 Feet (Meter) Rumble Strips, Shoulder (Asphalt Concrete)
- 618 Mile (Kilometer) Rumble Strips, Shoulder (Asphalt Concrete)
- 618 Feet (Meter) Rumble Strips, Shoulder (Concrete)
- 618 Mile (Kilometer) Rumble Strips, Shoulder (Concrete)
- 618 Feet (Meter) Rumble Stripes, Edge line (Asphalt Concrete)
- 618 Mile (Kilometer) Rumble Stripes, Edge line (Asphalt Concrete)
- 618 Feet (Meter) Rumble Stripes, Edge line (Concrete)
- 618 Mile (Kilometer) Rumble Stripes, Edge line (Concrete)
- 618 Feet (Meter) Rumble Stripes, Center line (Asphalt Concrete)
- 618 Mile (Kilometer) Rumble Stripes, Center line (Asphalt Concrete)
- 618 Feet (Meter) Rumble Stripes, Center line (Concrete)
- 618 Mile (Kilometer) Rumble Stripes, Center line (Concrete)

618.04

On page 547, **Add** the following paragraph after the first paragraph:

The Department will pay for longitudinal pavement marking material in accordance with Item 641.

619

On page 548, **Replace** Table 619.02-1 FIELD OFFICE with the following:

TABLE 619.02-1 FIELD OFFICE

Item	Type A	Type B	Type C
Minimum ceiling height, ft (m)	7 (2.1)	7 (2.1)	7 (2.1)
Floor space, ft ² (m ²)	150 (14)	500 (46)	1000 (93)
Separate enclosed room, ft ² (m ²) (Part of specified floor space)	0 (0)	0 (0)	100 (9)
Telephone service ^[1]	2	2	2
Internet service connection ^[5]	1	1	1
Multi-Function copier that is setup for scanning, printing and copying. ^[2]	1, 11×17	1, 11×17	1, 11×17
Calculator with tape	1	2	3
Desk and chair set	1	3	5

Item	Type A	Type B	Type C
Work table, 30 × 72-inch (750 × 1800 mm)	1	2	3
4-drawer, legal size, lockable metal file cabinet	---	1	2
2-drawer, metal file cabinet	1	2	2
Portable fire extinguishers ^[3]	1	1	2
Plan rack ^[4]	1	1	2
All-weather parking spaces	8	16	20

[1] For each telephone and/or computer station specified, all ethernet wiring necessary to connect the phone and/or computer and multi-function copier to the internet company system, and a working separate phone number for the printer for faxing.

[2] Copier must meet minimum specifications provided for each field office type. Contractor responsible for paper supplies, copier supplies, and maintenance of copier.

Type A:

One of the following MFC machines/series:

HP models E77822dn, E77825dn, E77830dn, E87640dn, E87650dn, E87660dn, E77822z, E77825z, E77830z, E87640z, E87650z, E87660z

Type B and C:

One of the following MFC machines/series:

HP Models: E77650dn, E77660dn, E77650dns, E77660dns, E77650z, E77660z, E77650zs, E77660zs, E77660zts, E77650z+, E77660z+, E77822dn, E77825dn, E77830dn, E87640dn, E87650dn, E87660dn, E77822z, E77825z, E77830z, E87640z, E87650z, E87660z

[3] Type 2-A:10-B:C, 5-pound (2.27 g) size

[4] Capable of handling the breakdown of 22 × 34-inch (559 × 864 mm) sized plans into ten sections.

[5] Provide a broadband internet connection capable of minimum download speeds as follows:

30 Mbps download 5 Mbps upload - Network Latency less than 50 milliseconds. If speeds are not available through an individual or singular circuit, provide the highest speed available in the area and install multiple circuits to achieve the specified speeds. When multiple broadband services are available the following is the preferred order: Cable, DSL, Cellular, and Wireless Radio (Satellite Communication is not compatible with ODOT VPN connection and will not be accepted). If a cellular network is used, provide the cellular equipment, including software and router equipment to connect to the ODOT provided Cisco ASA 5505 firewall. Supply ODOT with all documentation for the broadband circuit including all username/user ids, passwords and account information. Verify that the broadband internet connection is active and working as specified. ODOT IT personnel will confirm that bandwidth and network latency are compliant with the required field office specifications. All field office Internet connections are for ODOT use only.

621.03.E

On page 552, **Delete** “or on line” in the first sentence of the second paragraph.

632.25

On page 604, **Replace** the first paragraph with the following:

Cover vehicular signal heads if erected at intersections where traffic is maintained before energizing the signals. Cover pedestrian signal heads when specified in the plans. Use a sturdy opaque covering material specifically made for use with traffic signals and ensure that the color of the cover is different than the signal head, tan or beige, so that it is clear to drivers and pedestrians the heads are covered, not dark. Use a method of covering and cover attachment and materials as approved by the Engineer. Covers are to be free of text, pictures, or any type of advertising. Maintain covers and remove them when directed by the Engineer.

633

On page 609, **Delete** the following from the table of contents:

633.01 Description

633.02 Contractor Personnel Requirements

633.03 Materials and Equipment

633.04 Shop Drawings

633.05 General

633.06 Testing and Prequalification

633.07 Controllers

- 633.08 Cabinets
- 633.10 Foundations
- 633.11 Controller Work Pad
- 633.12 Flasher Controller
- 633.13 Controller, Master, Traffic Responsive
- 633.14 Centrally Controlled Arterial Traffic Signal System
- 633.15 Communications
- 633.16 Training
- 633.18 Uninterruptible Power Supply
- 633.19 Method of Measurement
- 633.20 Basis of Payment

633.03

On page 610, **Delete** the following from the last paragraph:

Furnish material and equipment conforming to:

Concrete (cabinet foundations and work pads)	
QC Misc or QC 1	499, 511
Conduit	725.04, 725.051, 725.052
Controller unit.....	733.02
Cabinet and auxiliary equipment.....	733.03
Cabinet riser.....	733.04
Flasher controller.....	733.05
Controller, master, traffic responsive	733.06
Remote monitoring station	733.07
Uninterruptible Power Supply	733.09

633.06.A.

On page 611, **Delete** the following from the first paragraph:

A. For traffic control equipment required by this specification to meet NEMA Standards Publication ~~TS-1~~ or TS-2, conform to the following:

633.06.A.1.

On page 611, **Delete** the following from the first paragraph:

1. Furnish a certified test report indicating compliance to all requirements of NEMA Standards Publication ~~TS-1~~ or TS-2 as applicable.

633.06.C

On page 611, **Revise** the first sentence to the following:

For **Type 2070** controllers, use conflict monitors listed on the Department’s prequalified list as specified in Supplement 1076.

633.07

Beginning on page 611, **Delete** the entire section.

~~**633.07—Controllers.** Install controller units, consisting of the timing unit, software, and signal timing, into the specified type of prewired cabinet.~~

~~Program controller units as shown on the plans unless otherwise directed by the Engineer. If the plan timing data or the supplemental timing data supplied by the Engineer does not exactly fulfill the timing requirements of the installed equipment, notify, in writing, the Engineer of the problem and~~

identify the discrepancies. The Engineer will consult with the maintaining agency and notify the Contractor within 2 weeks. After programming, briefly operate controllers, with the signals turned off by means of the signal shutdown switch, to ensure that operation is reasonable and conforms to the plans.

If the plans show two or more intersection controllers operated in a progressive signal system, coordinate signals by relating the various controller cycle start times to a zero time base, or other cycle start time at an adjacent signalized intersection. Ensure that the controller unit software provides coordination capability to allow associated controllers to be operated within the progressive traffic system. Coordination equipment shall supervise the operation of its associated controller by causing the end of certain phases and the beginning of the following phases to occur at set points. Program coordination timing according to the coordination timing data shown on the plans or provided by the Engineer.

633.19

On page 615, **Delete** the first two paragraphs:

The Department will measure Controller Unit, Type ____, with Cabinet, Type ____ by the number of each complete unit, and will include controller unit with software, all required auxiliary equipment, loop detector units, and a prewired cabinet, with all items completely wired and tested. Ground mounted cabinets will include anchor bolts and conduit ells for installation in the foundation. Pole mounted cabinets will include pole mounting hardware.

The Department will measure Controller Unit, Type ____ by the number of each controller timing unit with software, and will include any signal timing programming or installation. The Department will measure Controller Unit, Type ____, Furnish Only by the number of each controller timing unit with software, and will exclude any signal timing programming or installation

633.19

On page 615, **Delete** the first three pay items:

633 Each _____ Controller Unit, Type ____, with Cabinet, Type ____

633 Each _____ Controller Unit, Type ____

633 Each _____ Controller Unit, Type ____, Furnish Only

641

On page 627, **Revise** the table of contents to the following:

641.01 Description

641.02 Materials

641.03 General

641.04 Equipment

641.05 Pavement Preparation

641.06 Layout and Premarking

641.07 Line Placement Tolerance

641.08 Marking Types

641.09 Two-Way Radio Communication

641.10 Removal of Pavement Markings

641.11 Unsatisfactory Materials and Deduction for Deficiency

641.12 Method of Measurement

641.13 Basis of Payment

641.11

On page 632, **Revise** the header to the following:

641.11 Unsatisfactory Materials and Deduction for Deficiency.

641.11

On page 632, **Replace** the second paragraph with the following:

The Department will consider materials unsatisfactory if conformance to at least one of the following:

- A. Deficiency of marking material or glass beads is 20 percent or more.
- B. Materials applied outside the temperature or application requirements in Items 642, 643, and 646 without written approval of the Engineer.
- C. Markings not meeting the performance parameters contained in Supplement 1047, Appendices C, D, E, and G.
 - 1. Numerical rating of 8 or lower for Daytime Color (Appendix C)
 - 2. Composite rating of 8 or lower for Night Visibility (Appendix D)
 - 3. Numerical rating of 9 or lower for Durability (Appendix E)
 - 4. Less than the initial measurement for Retroreflectivity (Appendix G)

Replace pavement markings and glass beads in all sections determined to be unsatisfactory by retracing over the unsatisfactory markings at the full thickness specified in Items 642, 643 and 646.

642.02

On page 633, **Add** the following to the to the end of the first sentence of the first paragraph:
“in accordance with supplement 1089.”

643.02

On page 636, **Add** the following to the to the end of the first sentence of the second paragraph:
“in accordance with supplement 1089.”

643.04

On page 636, **Delete** the first sentence of the third paragraph.

~~After sampling of resin is completed, transfer the entire contents of each material container to the striper tanks.~~

644.02

On page 638, **Add** the following to the to the end of the first sentence of the second paragraph:
“in accordance with supplement 1089.”

644.04

On page 640, **Replace** the fifth full paragraph with the following:

The Department will consider materials unsatisfactory if conformance to at least one of the following:

- A. Deficiency of thermoplastic marking material or glass beads is 20 percent or more.
- B. Materials applied outside the temperature or application requirements in 644.04 without written approval of the Engineer.
- C. Markings not meeting the performance parameters contained in Supplement 1047, Appendices C, D, E, and G.
 - 1. Numerical rating of 8 or lower for Daytime Color (Appendix C)
 - 2. Composite rating of 8 or lower for Night Visibility (Appendix D)
 - 3. Numerical rating of 9 or lower for Durability (Appendix E)
 - 4. Less than the initial measurement for Retroreflectivity (Appendix G)

Replace thermoplastic markings and glass beads in all sections determined to be unsatisfactory by entirely removing the unsatisfactory thermoplastic material by grinding as per 641.10 and then reapplying at the

full thickness specified in 644.04. Do not apply a layer of sprayed thermoplastic to sections determined to be unsatisfactory to achieve the required thickness.

646.02

On page 643, **Add** the following to the to the end of the first sentence of the second paragraph: “in accordance with supplement 1089.”

647.01

On page 648, **Add** the following to the first sentence of the first paragraph after "740.08": , 740.09

647.02

On page 648, **Add** the following sentence after the second sentence:
Glass beads, Type E740.09

648.02

On page 650, **Add** the following to the to the end of the first sentence of the second paragraph: “in accordance with supplement 1089.”

648.05

On page 652, **Replace** the sixth paragraph with the following:

The Department will consider materials unsatisfactory if conformance to at least one of the following:

- A. Deficiency of spray thermoplastic marking material or glass beads is 20 percent or more.
- B. Materials applied outside the temperature or application requirements in 648.05 without written approval of the Engineer.
- C. Markings not meeting the performance parameters contained in Supplement 1047, Appendices C, D, E, and G.
 - 1. Numerical rating of 8 or lower for Daytime Color (Appendix C)
 - 2. Composite rating of 8 or lower for Night Visibility (Appendix D)
 - 3. Numerical rating of 9 or lower for Durability (Appendix E)
 - 4. Less than the initial measurement for Retroreflectivity (Appendix G)

Replace or reapply spray thermoplastic markings and glass beads in all sections determined to be unsatisfactory.

700.00

On Page 687 **Add** the following table row after specification 409:

421	Microsurfacing Emulsion and Tack Coat	CSS-1hM: Certified Material. At the refinery or source as directed by OMM. Project and/ or Plant Sample per 421.12. Non-certified material is sampled and approved by OMM before use. 421 Tack Coat per 421.09: Project and/ or Plant Sample per 421.12. Tag and ship sample to the District lab for OMM Asphalt section testing. Document in SM.	CSS-1hM: Certified material; Submit to OMM. Non-certified material: Submit to OMM. Do not use until approved. 421 Tack Coat per 421.09. Dilute per 421.09. Do not use non-certified material to dilute.
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700.00

On Page 689, for Spec. Number 701.11, **Replace** “Ground Granulated Blast Furnace Slag (GGBFS)” with “Slag Cement”.

700.00

On Page 689, for Spec. Number 701.13 **Replace** “Fly Ash” with “Fly Ash/Natural Pozzolan”.

700.00

On Page 690 **Replace** the second full table row with the following:

702.02	Cut Back Asphalt	Certified material:	Certified material: Submit to OMM.
702.03			
702.04	Cut Back Asphalt	At the refinery or source as directed by OMM.	
702.07	Emulsions	Project and/ or Plant: One sample per each	
702.12		25,000 gallons. None for less than 300 gallons.	
702.13	Emulsified Asphalts		Non-certified material: Submit to OMM. Do not use until approved.
	Asphalt Emulsion MWS	Non-certified material:	
	Non-Tracking Asphalt Emulsion	Will be sampled and approved by OMM before use.	
	SBR Asphalt Emulsion	702.13 – Provide Certified Test Data per specification requirements.	

700.00

On Page 690 **Add** the following table row after the third full table row:

702.08	Cold Liquid-Applied Elastomeric Waterproofing Membrane	Provide Certified Test Data per specification requirements.	
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700.00

On Page 693 **Add** the following row after 705.26:

705.27	Carbonate Micro-fines	Verify manufacturer on Concrete Plant Batch Ticket is on Certified List for S 1016 maintained by OMM. Verify material against bill of lading description. Document in SM	
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700.00

On page 696, **Replace** 707.11 with the following:

707.11	Polymer-precoated corrugated steel spiral rib pipe	Products will be supplied by a source on the Certified List for S 1019 maintained by OMM. Receive with TE-24. Check dimensions and markings. Document in SM.	Notify District Testing and OMM Structural Welding and Metals section, if rejecting material because material non-performs or looks defective during use.
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700.00

On page 709, **Delete** 732.07 A from the table.

732.07.A	Loop Detector Units NEMA TS 1	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non performs or looks defective during use notify District Testing and OMM.
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700.00

On page 711, **Delete** 733.02 E, 733.02 F, and 733.03 A from the table.

733.02.E	Controller Unit Type 2070L	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non performs or looks defective during use notify District Testing and OMM.
733.02.F	Controller Unit Type 2070E	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non performs or looks defective during use notify District Testing and OMM.

733.03.A	Cabinet Type TS 1	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non performs or looks defective during use notify District Testing and OMM.
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700.00

On page 711, **Revise** 733.03 D as follows:

733.03 D	Cabinet Type 336L	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non-performs or looks defective during use notify District Testing and OMM.
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700.00

On page 711, **Delete** 733.03 E:

733.03.E	Cabinet Type 336	Verify type and brand name of material is on TAP at the time of use. Inspect for conformance to dimension and condition. Document in SM.	Notify District Testing if rejecting material. If material non performs or looks defective during use notify District Testing and OMM.
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700.00

On page 711, **Revise** 733.04 A as follows:

733.04 A	Cabinet Riser for TS-1 TS-2 cabinet	Field inspect for 1/4 aluminum thickness and accept.	Notify District Testing if rejecting material.
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701.00

On Page 714 **Replace** section 701.00 with the following:

701.00 Acceptance. Provide cements meeting 701.01, 701.02, 701.04, 701.05, 701.07 and 701.09 and certified according to Supplement 1028; fly ash or natural pozzolan meeting 701.13 and certified according to Supplement 1026; slag cement meeting 701.11 and certified according to Supplement 1034; and micro silica meeting 701.10 and certified according to Supplement 1045, without prior sampling, testing and approval by the Department. Lists for certified cement, fly ash, natural pozzolan, slag cement and micro silica sources are maintained by the Laboratory.

701.11

On Page 714 **Replace** section 701.11 with the following:

701.11 Slag Cement. Provide slag cement according to ASTM C 989, Grade 100 minimum.

701.13

On Page 714 **Replace** the first paragraph of section 701.13 with the following:

701.13 Fly Ash or Natural Pozzolan for Use in Portland Cement Concrete. Provide fly ash or natural pozzolan according to ASTM C 618, Class C, F, or N, except ensure a maximum loss on ignition (LOI) of 3 percent for fly ash and 5 percent for natural pozzolan.

702.01

On Page 715, **Replace** the first sentence with the following:

General. According to AASHTO M 320-10 Table 1 and Supplement 1105 except as follows.

702.01

On Page 716, **Add** before the next-to-last sentence of the first full paragraph the following:

Do not use paraffin wax, organic wax, or like materials.

702.12

On Page 721, **Replace** the section with the following:

702.12 Non-Tracking Asphalt Emulsion. Provide certified non-tracking asphalt emulsion material meeting Table 702.12-1 and Supplement 1128 and Supplement 1032. Emulsion will comply with all specification requirements for at least 30 days after sample date.

Table 702.12-1

Tests on emulsion, AASHTO T 59, unless otherwise designated:	
Viscosity, Saybolt Furol at 77 °F (25 °C) (SFS)	20 to 100
Storage Stability Tests, 24-hr (% difference), max.	1.0
Settlement tests, 5-day (% difference), max.	5.0
Sieve Tests (%) (Distilled Water), max.	0.30

Distillation, Residue % solids, min. [1]	50
Oil distillate, %, max.	3

[1] Products may use residual by evaporation to perform residual and may use the material to perform residual tests but must be submitted during approval process in S-1128. Will be required to perform residual by distillation to obtain oil distillate %.

703.05.C

On page 733, **Add** the following sentence to the end of the paragraph:
Should the sample contain less than 10 percent of any of the sizes specified in AASHTO T104 Section 5.1, that individual size shall not be held to the above maximum loss requirement.

706.05

On page 772, **Replace** the second paragraph with the following:

7.1 For the following box sizes, span by rise, refer to ASTM C1577: 6x4, 5, 6; 7x4, 5, 6, 7; 8x4, 5, 6, 7, 8; 9x4, 5, 6, 7, 8, 9; 10x4, 5, 6, 7, 8, 9, 10; 11x4, 5, 6, 7, 8, 9, 10, 11; and 12x4, 5, 6, 7, 8, 9, 10, 11, 12 feet. For the following box sizes, span by rise, refer to SS940: 14x4, 5, 6, 7, 8, 9, 10; 16x4, 5, 6, 7, 8, 9, 10; 18x4, 5, 6, 7, 8, 9, 10; and 20x4, 5, 6, 7, 8, 9, 10 feet.

707.01

On page 788, **Replace** the table with the following:

Pipe			Pipe-Arch	
Diameter (inch)	Wall Thickness (inch)		Size (inch)	Wall Thickness (inch)
6	0.052			
8	0.064			
10	0.064			
12	0.064			
15	0.064		17 × 13	0.064
18	0.064		21 × 15	0.064
21	0.064		24 × 18	0.064
24	0.064		28 × 20	0.064
27	0.064			
30	0.064		35 × 24	0.064
33	0.064			
36	0.064		42 × 29	0.064
42	0.064		49 × 33	0.079
48	0.064		57 × 38	0.109
54	0.079		64 × 43	0.109
60	0.109		71 × 47	0.138
66	0.138		77 × 52	0.168
72	0.138		83 × 57	0.168
78	0.168			
84	0.168			

707.01

On page 789, **Replace** the first table with the following:

Pipe	
Diameter	Wall Thickness
(mm)	(mm)
150	1.32
200	1.63
250	1.63
300	1.63
375	1.63
450	1.63
525	1.63
600	1.63
675	1.63
750	1.63
825	1.63
900	1.63
1050	1.63
1200	1.63
1350	2.01
1500	2.77
1650	3.51
1800	3.51
1950	4.27
2100	4.27

Pipe-Arch	
Size	Wall Thickness
(mm)	(mm)
430 × 340	1.63
530 × 380	1.63
610 × 460	1.63
710 × 510	1.63
885 × 610	1.63
1060 × 740	1.63
1240 × 840	2.01
1440 × 970	2.77
1620 × 1100	2.77
1800 × 1200	3.51
1950 × 1320	3.51
2100 × 1450	4.27

707.11

On page 792, **Revise** the following to:

707.11 Polymer-Precoated Corrugated Steel Spiral Rib Conduits. Provide conduits that have a center-to-center rib spacing of 7 1/2 inches (190 mm). Provide conduits and fittings according to AASHTO M 36, Type IR, with the following modifications:

6.1 Fabricate pipe from polymer-precoated, on both sides, steel sheet according to AASHTO M 246.

7.2.2 The ribs shall conform to AASHTO M 196, Section 7.2.2.

7.7.1 Reroll the ends of the individual pipe sections to form at least two annular corrugations on each end. Paint the rerolled end with zinc rich paint.

8.1.2 Ensure that the minimum wall thickness (coated) of steel pipe is as follows:

Pipe

Diameter (inch)	Wall Thickness (inch)		Diameter (mm)	Wall Thickness (mm)
18	0.064		450	1.63
21	0.064		525	1.63
24	0.064		600	1.63
30	0.064		750	1.63
36	0.064		900	1.63
42	0.064		1050	1.63
48	0.064		1200	1.63
54	0.079		1350	2.01
60	0.079		1500	2.01
66	0.109		1650	2.77
72	0.109		1800	2.77
78	0.109		1950	2.77
84	0.138		2100	3.51
90	0.138		2250	3.51

9.1 Coupling bands shall have annular corrugations.

9.2 Coupling bands shall conform to 707.01.

9.3 A bell and spigot joint according to ASTM A 760 (A760M) may be used with the following modifications:

9.3.1 These joints may be used for conduits ranging in size from 18 (450mm) to 48 (1200mm) inches in diameter.

9.3.2 Ensure the bell and spigot has a soil tight joint by use of a shop applied gasket on the bell end and a field applied gasket on the spigot end.

9.3.3 Provide a minimum of 0.064 (1.63mm) inch nominal sheet thickness or not more than two (2) nominal sheet thickness thinner than the thickness of the pipe to be joined.

14.1 Ensure that the certification and sampling conform to 707.01.

707.12

On page 793, **Replace** the table with the following:

Pipe

Diameter	Wall Thickness		Diameter	Wall Thickness
(inch)	(inch)		(mm)	(mm)
18	0.064		450	1.63
21	0.064		525	1.63
24	0.064		600	1.63
30	0.064		750	1.63
36	0.064		900	1.63
42	0.064		1050	1.63
48	0.064		1200	1.63
54	0.079		1350	2.01
60	0.079		1500	2.01
66	0.109		1650	2.77
72	0.109		1800	2.77
78	0.109		1950	2.77
84	0.138		2100	3.51
90	0.138		2250	3.51

707.62

On page 802, **Replace** the first paragraph with the following:

Polypropylene Corrugated Single Wall Pipe. Provide polypropylene corrugated single wall pipe for drainage pipe from 3 to 30-inch diameters according to ASTM F 3219, with the following modification:

707.65

On page 803, **Replace** the first paragraph with the following:

Polypropylene Corrugated Double Wall Pipe. Provide polypropylene corrugated double wall pipe for non-pressure storm sewer pipe from 12 to 60-inch diameters according to ASTM F 2881 with the following modification:

707.69

On page 803, **Replace** the entire section with the following:

Polypropylene Triple Wall Pipe. Provide polypropylene triple wall pipe and fittings for non-pressure sanitary sewer pipe from 30 to 60-inch diameters according to ASTM F 2764, with the following modifications:

1.2 Provide pipe and fittings for underground use for non-pressure sanitary sewer and storm sewer systems.

10.1 Provide a letter for certification to cover each shipment of material verifying that it meets specification requirements.

708.01

On Page 804, **Replace** the second paragraph with the following:

5.1 A green colorant approximately AMS-595A-34159.

708.02 B.1.f

On page 804, **Replace f.** with the following.

- f. Color.** Greenish gray, approximating AMS-595A-34159, visual comparison.

708.02 C.1.a

On page 805, **Replace a.** with the following.

- a. Color.** White, meeting or exceeding, AMS-595A-37875 according to ASTM E 1347.

708.02 D.1.a

On page 806, **Replace a.** with the following.

- a. Finish, Specular gloss, ASTM D 523.** Use AMS-595A-16440 Gray: 70 % minimum after 3000 hours weathering resistance. Color change less than 2.0 ΔE*, (C.I.E 1976 L*a*b*) ASTM D2244.

708.02.D.1.f

On page 806, **Replace f.** with the following:

- f. Colors.**

- (1) **Specified.**^[2]

Brown	AMS-595A, 10324
Green	AMS-595A, 14277
Blue	AMS-595A, 15526
^[2] If not defined in the plans, the Engineer will specify from the list.	

- (2) **Elective.** As specified on the plans.

710.06

On page 815, **Replace** the first sentence of the first paragraph with the following:

Furnish deep beam rail according to AASHTO M 180, Type II or VI, Class A, with the following modifications:

712.16

On page 835, **Insert Item 712.16** after the last paragraph of Item 712.15:

712.16 Prefabricated Geocomposite Drain (PGD). Furnish Prefabricated Geocomposite Drain (PGD) consisting of a drainage core with geotextile fabric bonded to one side. Use drainage core material consisting of a preformed, stable, polymer plastic material with a cusped or geonet structure. Use drainage core that supports the geotextile and provides a bonding surface for the geotextile at intervals not exceeding 1-1/8 inches (29 mm) in any direction. Supply core that provides at least 14 square inches per square foot of flat area in contact with the geotextile.

Furnish a geotextile fabric composed of over 85% of polyester, polypropylene, polyolefin, or polyamide fibers by weight, that are formed into a stable network to ensure the performance during handling, installation, and service life. Use geotextile fabric that is resistant to chemical attack, rot, and mildew. Use geotextile fabric that is free of treatments or coatings that would adversely change the hydraulic properties of geotextile after installation. Furnish PGD that has the geotextile fabric covering the full length of the drainage core and has minimum 3 inch (76 mm) wide flaps/flanges of

fabric extending beyond both longitudinal edges of the drainage core. Do not supply PGD that has ripped or torn geotextile fabric.

Furnish PGD in rolls, or in another acceptable manner, wrapped with an opaque, waterproof wrapping. Label or tag each roll or package to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number, and date of manufacture. Prior to installation, protect the PGD from mud, dirt, dust, debris, harmful ultraviolet light, direct sunlight or temperature greater than 140 °F (60 °C). Furnish 3 inch (76 mm) wide, plastic tape for the sealing, seaming, and splicing the PGD. Furnish waterproof tape designed for underground applications that provides a strong bond that does not deteriorate over time in a buried condition. Furnish fittings and accessories provided by the manufacturer if available.

Submit Certified Test Data showing the product will meet or exceed the requirements listed in Tables 712.16-1 and 712.16-2.

TABLE 712.16-1 REQUIRED PGD CORE PROPERTIES

Property	Test Method	Unit	Required Value		
			Conventional Abutment/Wall Height		
			<10 ft (3m)	10 to 30 ft (3 to 9m)	30 to 50 ft (9 to 15m)
Thickness	ASTM D5199	in (mm)	0.4 to 1.0 (10 to 25)		
Minimum Compressive Strength	ASTM D1621	psf (kPa)	4625 (221)	10625 (508)	16625 (796)
Minimum In-Plane Flow Rate*	ASTM D4716	gal/min/ft (l/min/m)	5 (62)	15 (186)	25 (310)

* Tested under a confining pressure of 3,600 psf (172 kPa) and a hydraulic gradient of 1.0.

TABLE 712.16-2 REQUIRED PGD GEOTEXTILE PROPERTIES

Property	Test Method	Unit	Required Value		
			Percent <i>In Situ</i> Soil Passing 0.075 mm		
			<15	15 to 50	>50
Minimum Permittivity	ASTM D 4491	sec ⁻¹	0.5	0.2	0.1
Apparent Opening Size	ASTM D 4751	mm	AOS ≤ 0.43	AOS ≤ 0.25	AOS ≤ 0.22
Minimum Grab Strength	ASTM D 4632	lb (N)	157 (700)		
Maximum Elongation	ASTM D 4632	%	50		
Minimum Trapezoidal Tear Strength	ASTM D 4533	lb (N)	56 (250)		

Minimum Puncture Strength	ASTM D 6241	lb (N)	309 (1375)
	or ASTM D 4833	lb (N)	58 (260)

720.01

On page 836, in the second paragraph, **Replace** “730.192 or 730.192” with “730.192 or 730.193”

721.03

On page 836, **Replace** the section in its entirety with the following:

721.03 Casting Adhesive. Furnish casting adhesives that conform to Supplement 1062.07 - Raised Pavement Marker Casting Adhesive Acceptance Procedure.

Only furnish material listed on the Department’s QPL.

725.20

On page 848, **Replace** the entire section with the following:

725.20 Multiple Cell Conduit and Fittings. Ensure that fittings are factory made couplings that couple inner ducts and the outer conduit simultaneously, maintain the continuity and indexing of the inner ducts and are of a push fit design mechanically locked in place.

Furnish materials according to the Department’s QPL.

A. Polyvinyl Chloride. Ensure that the multiple cell conduit consists of inner ducts conforming to NEMA TC-8 type DB in an outer conduit conforming to NEMA TC-2 (type EPC-40 or EPC-80 as specified except that size shall be the true inside diameter) in a factory preassembled unit.

B. High Density Polyethylene. Ensure that the multiple cell conduit consists of inner ducts conforming to ASTM F2160 with smooth or ribbed inside, and Superglide permanent friction layer, in an outer conduit conforming to ASTM F2160 in a factory preassembled unit.

731.06

On page 861, **Revise** the first paragraph to the following:

731.06 Sign Flasher Assembly. Furnish beacons consisting of single traffic signal sections with 8 or 12-inch (200 or 300 mm) yellow lenses. Ensure that the flasher control unit flashes the beacons at a rate for each beacon of between 50 to 60 times per minute with the light period from one-half to two-thirds of the total cycle. Furnish flasher control units that have all solid state components and that meet **NEMA TS-2**. House control units within a weatherproof corrosion-resistant enclosure with a lockable door. Include the LED lamps.

731.07

On page 861, **Revise** the first paragraph to the following:

731.07 School Speed Limit Sign Assembly. Furnish yellow beacons that are 8 inches (200 mm) or 12 inches (300 mm). Ensure that the flashers flash the beacons alternately at a rate for each beacon of 50 to 60 times per minute with the light period from one-half to two-thirds of the total cycle. Furnish flashers that have all solid state components and that meet **NEMA TS-2**. Ensure that the backing members with hardware are compatible with the method of support.

732.06

On page 869, **Replace** the last sentence of the second paragraph with the following:
Furnish housing with manufacturers applied external surfaces **black Color 17038 or yellow Color 13655**, Federal Standard 595, unless specified otherwise in the Plans.

732.06

On page 869, **Replace** the third paragraph with the following:
The pushbutton shall be a minimum of 2 inches across in at least one dimension. The force required to activate the pushbutton shall be no greater than 3.5 pounds (15.5N) and operate with a closed fist. There shall be a visible and audible indicator that the button press has occurred.

732.06

On page 869, **Replace** the fourth paragraph with the following:
Furnish materials according to the Department's **QPL**.

732.07.A.

Beginning on page 869, **Delete** the entire section.

~~A. **NEMA TS-1.** Ensure that the loop detector units comply with the requirements of NEMA TS-1, section 15, with the following modifications. Furnish shelf mounted loop detector units that are powered from 120 volts. Use solid state isolated output units for all controller applications where directly connected to a solid state digital controller unit. Ensure that the conductors in the cable harness for loop input pins are twisted three to five times per 1 foot (300 mm).~~

~~Ensure that the electrical connections for four channel shelf mounted units either are the 19 pin MS connector, as required by the foregoing specification, or consist of four connectors of the type required for single channel shelf mounted detector units.~~

~~If specified, design detector unit electrical connection plugs or wiring harness such that any multi-channel shelf mounted detector unit may be readily replaced with single channel detector units. Accomplish this by furnishing only units with the connector type required for single channel shelf mounted detector units, or by wiring the controller back panel to single channel harnesses which are, in turn, plug connected to an adapter harness which is mated to the multi-channel connector of the detector unit.~~

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

~~Furnish materials according to the Department's TAP List.~~

732.08

On page 870, **Revise** the first sentence to the following:

732.08 Loop Detector Units, Delay and Extension Type. Ensure that the loop detector units of this type comply with the requirements of **NEMA TS-2**.

732.22

On page 875, **Revise** the first sentence to the following:

732.22 Backplates. Furnish louvered backplates constructed of wrought sheet aluminum, according to ASTM B 209 (B 209M), 6061-T6, **0.050 inch (1.3 mm)** minimum thickness.

732.22

On page 875, **Replace** the tenth sentence with the following:
Reflective sheeting shall be Type J, ASTM D4956 Type XI.

733.01

On page 875, **Delete** the second definition.
~~“NEMA TS-1” and “Type TS-1” refers to equipment manufactured in conformance with the National Electrical Manufacturers Association (NEMA) Standards Publication No. TS-1.~~

733.02.B.1.d

On page 877, **Delete** the following:
d. ~~TS-1 Conflict Monitors~~

733.02.B.2.b

On page 877, **Replace** the entire subsection with the following.
b. 2070LX Controller Units including the following subassembly units:
(1) 2070-1C CPU Board
(2) 2070-3B Front Panel.
(3) 2070-6A,B.

733.02.D

On page 877, **Delete** the second sentence in the first paragraph:
~~Furnish a controller unit that includes all ports and input/output connectors for complete interchangeability between NEMA TS 1 and TS 2 cabinets.~~

733.02.E

On page 878, **Delete** the entire section.
~~E. **Type 2070L.** Furnish controller units that meet the specifications for “Transportation Electrical Equipment Specifications”, California Department of Transportation, including all addenda. Furnish a controller unit that is listed on the ODOT TAP.~~

~~The Type 2070L version controller unit consists of the following assembled modules:~~

Unit Chassis	
Model 2070-1B:	CPU module, single board
Model 2070-2A:	Field I/O module
Model 2070-3B:	Front panel, Display B (8 lines of 40 char.)
Model 2070-4B:	Power supply module, 3.5 amp. [Power supply Model 2070-4A (10 amp) may be supplied in lieu of Model 2070-4B]
Model 2070-7A:	Async. Serial Communication Module

733.02.F

On page 878, **Delete** the entire section.
~~F. **Type 2070E.** Furnish controller units that meet the specifications for “Transportation Electrical Equipment Specifications”, California Department of Transportation, including all addenda. Furnish a controller unit that is listed on the ODOT TAP.~~

~~The Type 2070E version controller unit consists of the following assembled modules:~~

Unit Chassis	
--------------	--

Model 2070-1E	CPU Module, Single Board
Model 2070-2A	Field I/O for 170 Cabinet
Model 2070-3B	Front Panel, Display B (8 lines of 40 characters)
Model 2070-4A or Model 2070-4B	Power Supply
Model 2070-7A	Asyne Serial Communication

733.02.G

On page 878, **Revise** the second paragraph to the following:

The Type 2070LX version controller unit consists of the following assembled modules:

Unit Chassis	
Model 2070-1C	CPU Module, Single Board
Model 2070-2A	Field I/O for 2070 Cabinet
Model 2070-3B	Front Panel, Display B (8 lines of 40 characters)
Model 2070-4A or Model 2070-4B	Power Supply
Model 2070-7A	Async Serial Communication

733.03

On page 879, **Delete** the following from the second paragraph:

Supply two through four phase controller operation with a minimum twelve position backpanel, configured for four pedestrian movements and four overlaps, with a ~~twelve channel NEMA TS-1 conflict monitor or~~ NEMA TS-2 malfunction management unit.

733.03

On page 879, **Delete** the following from the fourth paragraph:

For signal phasing configurations that require a larger capacity backpanel or conflict monitor, supply a 16 position backpanel with a ~~16 channel NEMA TS-1 conflict monitor or~~ NEMA TS-2 malfunction management unit.

733.03.A.

Beginning on page 880, **Delete** the entire section.

~~A. Type TS-1.~~

~~1. Cabinets. Furnish a cabinet size that provides ample space for housing the controller unit and all associated electrical devices furnished with it, together with any other auxiliary devices that are specified. Furnish a cabinet with sufficient shelf space to accommodate all existing, proposed, and designated future equipment. Ensure that the space provided accommodates the appropriate controller unit frame as designated in NEMA TS-1, Section 14.~~

~~Construct the cabinets of cast aluminum or sheet aluminum, drawn or formed, with aluminum support and stiffening of members provided as necessary. Ensure that the exterior is smooth with no sharp edges. Weld all joints. Ensure that the cabinet is rigid and is designed to support all components. Ensure that the application of the following loads do not result in breakage, deformation, or loss of weatherproof qualities: a 100-pound (445 N) load applied to any 1-inch (25 mm) square surface of the cabinet or door (open or closed), in any direction; or a 300-pound (1.3 kN) load applied vertically downward to any 4-inch (100 mm) square of the top surface or to the top edge of the closed and latched door.~~

~~Provide cabinet exterior surfaces of bare aluminum. When the plans specify a cabinet color, prime and finish all cabinet exteriors with two coats of high-grade enamel paint of the specified color. Ensure that the cabinet interior surfaces are the same as the exterior, or may be painted flat white.~~

Ensure that the cabinet contains at least one rain-tight louvered vent equipped with a replaceable filter. Install vents to allow for the release of excessive heat and any explosive gases that might enter the cabinet.

Ensure that the cabinets are functional in design and have a door in the front providing access to substantially the full interior area. Attach a gasket of elastomeric material to the cabinet or door to form a weatherproof seal. Furnish door hinge pins of stainless steel or equivalent corrosion resistant material. Furnish a door stop to retain the door in at least a 90-degree open position.

Include a small, hinged, and gasketed door in door (police door) on the outside of the main controller door. Ensure that the door in door does not allow entrance to the controller mechanism nor to exposed electrical terminals, but provides access to a small switch panel and compartment (police panel).

Fit the cabinet with the necessary provisions for mounting, with a bottom conduit connection provided for pole-mounted cabinets. Furnish suitable hardware and equipment for each cabinet mounting method, including bolts for drilled and tapped holes on metal supports, pole attachment clamps, pedestal slipfitter, and anchor bolts and conduit ells for installation in concrete foundations. Furnish steel anchor bolts that are galvanized at least 1 inch (25 mm) beyond the threads. Certified cabinet anchor bolts are not required.

Directly place all equipment designed for shelf mounting on a shelf except for loop detector units (amplifiers) and similar devices designed for stacking on each other. Arrange components on shelves and devices on the door so that a 1-inch (25 mm) minimum space separates them when the door is shut. Ensure that plugs, wires, controls, or similar items do not compromise this space.

Reserve a minimum 4-inch (100 mm) clear area on the bottom of the cabinet for the routing of cables. Do not locate panel-mounted equipment in the bottom 6 inches (150 mm) of the cabinet. Do not locate shelves or components within 6 inches (150 mm) of the bottom of foundation-mounted cabinets.

Arrange all equipment for easy withdrawal and replacement, without the necessity of disturbing adjacent equipment. Permanently locate devices within the cabinet to allow free circulation of air and that do not restrict air flow from fan ducts or vents.

Ensure that the auxiliary equipment operates within a weatherproof cabinet at ambient temperatures between -30 and 165 °F (-34 and 74 °C).

When terminals and panel-mounted devices with exposed electrical contact points are located next to shelf-mounted equipment, provide spacers, shelf lips, or other means to assure that component units cannot be accidentally moved into contact with any exposed electrical terminal points.

Ensure that load switches, relays, flashers, fuses, switches, terminal blocks, and other equipment mounted or plugged into the back or side panels are readily accessible. Ensure that switches, controls, and indicator lights are visible and easily operable without moving the components from their normal shelf positions.

Furnish an aluminum shelf with integral storage compartment in the space immediately below the controller. Ensure the storage compartment has telescoping drawer guides for full extension. Ensure the compartment top has a non-slip plastic laminate attached.

Furnish LED-strip lighting for internal illumination.

Furnish materials according to the Department's TAP List.

2. Accessory Equipment

a. Ventilating Fan. Equip all cabinets with a forced air ventilating fan. Furnish a fan that provides a capacity of at least 100 cubic feet (2.8 m³) per minute. Furnish a fan that is thermostatically controlled and adjusted to start at cabinet temperatures above 120 °F (49 °C) and to stop when the temperature has dropped below 100 °F (38 °C).

b.— Load Switches. Furnish all cabinets with solid state, triple-signal load switches complying with NEMA TS-1, Section 5. Additionally, ensure that all load switches have both input and output indicators.

c.— Conflict Monitor. Furnish all cabinets with a separate solid-state conflict monitor device. Ensure that the cabinet wiring, in the event of monitor disconnection, transfers the signals to a flashing condition. Furnish conflict monitors that comply with NEMA TS-1, Section 6. Additionally, ensure that all conflict monitors are capable of causing the signals to flash as a result of the following events:

(1) All red lamps associated with a load switch are burned out;

(2) Within one second when red and green, or yellow and green color pairings are displayed on the same phase;

(3) The absence of a minimum yellow interval.

Ensure that the monitor indicates the exact load switch output channel upon which the failure event occurred. Furnish conflict monitors that are capable of storing a minimum of nine fault events (event logging feature). Furnish a monitor that utilizes a LCD display and has a RS-232 port for connection to a laptop computer. Furnish software and connector cables to diagnose the conflict monitor.

d.— Flashers. Furnish solid-state flashers that comply with NEMA TS-1, Section 8. When signals have a normal stop-and-go sequence that includes flashing, either ensure that the controller unit generates that flashing display or provide flashers. For this purpose, provide separate flashers from those provided for emergency back-up. Furnish flashers that are designed with two circuits of at least 10 amperes each.

Equip each controller cabinet with terminals that are wired so that, by an interchange of jumpers, the flashing operation is arranged to display either flashing yellow or flashing red on the vehicular signals.

e.— Relays. Ensure that the relays required for proper operation of the specified equipment are furnished and completely wired. Furnish relays that are enclosed, readily replaceable, and designed for one million operations without failure or need for adjustment.

f.— Surge Protection Devices. Furnish surge protection on incoming power lines, interconnect lines, and detector leads.

The primary surge protection device (SPD) shall be an EDCO SHA-1250 or approved equal. A plug-in base shall be used to hold the device. All wiring connections shall be made to the base, and appropriate cabinet clearances maintained, to allow the SPD module to be replaced by hand without the use of tools.

Furnish loop detector lead-in cable protection that consists of devices installed in each detector circuit where the lead-in connects to the terminal block. House each device in a case that consists of two stages; a 3-electrode gas tube arrester and a semiconductor circuit. Ensure that the arrester shunts to ground a common mode transient with a 1,000-ampere peak and an 8/20-microsecond wave shape, ionizing at 400 volts within 100 nanoseconds when subjected to a 1,000-volt-per-microsecond transient. Furnish a semiconductor circuit that clamps a differential transient to 30 volts within 40 nanoseconds of the appearance of the transient, and a common mode transient to 30 volts within 500 nanoseconds of the ionization of the gas tube arrester. Ensure that the second stage is able to withstand a peak current of 13 amperes. Furnish a device that has impedance characteristics compatible with the detector unit so as not to cause false calls or increase the loop impedance above the sensitivity of the detector unit.

Furnish pedestrian pushbutton inputs with the same protection as specified for the loop detector lead-in cables.

Protect interconnect cable against transients by devices across each conductor of the cable and ground. The devices may be either 2 or 3 terminal devices. If 3 terminal devices are used, connect two

conductors and ground to the same device. Furnish a protection device that consists of a gas tube arrester with a maximum ionization voltage of 1000 volts on a 10,000 volt per microsecond transient or a maximum ionization voltage of 950 volts on a 3000 volt per microsecond transient. Ensure that the maximum time from beginning of the transient to ionization is 1.1 microseconds on a 10,000 volt per microsecond transient. Ensure that the device is not ionized by normal voltage variations on a 120 volt AC line. Furnish a device that is able to withstand a 10,000 ampere peak with an 8/20 microsecond waveshape.

g. Main Power Breaker. Furnish an incoming AC+ power line that is controlled by a main circuit breaker rated at 240 volts and an auxiliary breaker, with capacity and wiring as specified in NEMA TS-1, Section 10.3.2.2 and Figure 10-4.

If a power service disconnect switch is located before the controller cabinet, the neutral (AC-) and the grounding bar in the controller cabinet shall not be connected together as shown in NEMA TS-1, Figure 10-4.

h. Radio Interference Filter. Furnish an incoming AC+ power line that contains a radio frequency interference (RFI) filter installed between the main circuit breaker and the solid state equipment. Also, provide RFI filtering for the load switches and flasher, unless the equipment furnished provides signal and flasher circuits switching at the zero voltage point of the power line sinusoid wave form.

i. Convenience Outlet and Light. Wire a convenience outlet into the cabinet for use by electrical maintenance equipment. Ensure that the outlet contains at least one standard duplex three-wire NEMA 5-15 receptacle of the ground fault circuit interrupting (GFCI) type. Wire a second non-GFCI convenience outlet, not fed thru the UPS system (if used). Furnish and mount a white LED lamp in the upper portion of the cabinet. Furnish a door switch to control the convenience light.

j. Manual Control and Pushbutton. When required by the plans, provide intersection controller units with means for substituting manual operation of interval timing for automatic interval timing. Ensure that manual operation provides the same interval sequence as when the controller unit is operating automatically.

Obtain manual interval timing by a momentary pushbutton contact switch mounted on a 5-foot (1.5 m) minimum flexible weatherproof extension cord. Store that switch and cord behind the small door-in-door.

k. Switches. Furnish completely wired switches that are required for proper operation of specified equipment. Clearly and permanently label switches as to function and setting position, and ensure that they are accessible without the necessity of moving components.

(1) Signal Shutdown Switch. Furnish a cabinet with a signal shutdown switch for turning off the power to the signals at the intersection. Ensure that this switch only affects the power to the signals, and allows the controller to continue in operation. Locate the switch in the panel behind the small door-in-door (police door).

(2) Auto/Flash Switch. Furnish a cabinet with a flash control switch for activating the flashing of vehicular signals in a preselected emergency flash display. Ensure that the operation of the flash control switch causes a flashing display even under conditions of controller unit malfunction or of its removal from the cabinet. Ensure that the operation of the switch overrides any operation commands from a local or remote time switch. Locate the switch in the panel behind the small door-in-door (police door).

Program the transfer to and from flashing operation, when called remotely or by a local time switch, to occur only at points in the cycle allowed by the OMUTCD.

(3) Automatic/Manual Transfer Switch. Furnish a cabinet with an automatic/manual transfer switch. In the automatic position, ensure that the controller unit automatically sequences the

signal head displays. In the manual position, ensure that the signal phase or interval sequencing occurs only upon manual activation of the manual control pushbutton. Locate the switch in the door-in-door (police door). Ensure that it is unnecessary, when switching from manual to automatic operation, or vice versa, to do so at any certain time or to make any time adjustments.

(4) Run/Stop Time Switch. Furnish a cabinet with a run/stop time switch that activates the controller stop time feature when in the “stop time” position. Locate the run/stop time switch on a switch panel in the cabinet.

(5) Controller Shutdown Switch. Furnish a cabinet with a controller shutdown switch that cuts off power to the controller unit, conflict monitor, and detector units. Ensure that power is not cut off to those components required to maintain flashing operation. Locate the controller shutdown switch on a switch panel in the cabinet.

(6) Coordinated/Free Switch. Furnish controllers operated in a coordinated system with a coordinated/free switch. Ensure that this switch allows the choice of operating the controller under the supervision of a coordination device or operating the controller independently of coordination control. Locate the coordinated/free switch on a switch panel in the cabinet.

(7) Detector Test Switches. Furnish momentary contact switches that will enter a vehicular or pedestrian call for any actuated phase. Furnish a switch for each actuated phase vehicular and pedestrian detection input. Conveniently group and label the switches.

i. Terminal Blocks. Furnish cabinets that include terminal blocks mounted on panels on the walls of the cabinet. Ensure that the blocks are not obstructed by shelf-mounted devices. Furnish sufficient terminal sets for each individual harness wire as well as for contacts of signal load switches, flasher transfer relays, flasher, and other components. Also, provide separate terminal sets for field wiring connections, including power, signal, interconnection, and detector lead-in cables. Group terminal sets to separate higher voltage (120 VAC) from lower voltage, and arrange them into logical groups. Protect terminal blocks from accidental contact during the installation and removal of shelf-mounted equipment. Locate the blocks no closer than 4 inches (100 mm) from the bottom of pole and pedestal mounted cabinets, and no closer than 6 inches (150 mm) from the bottom of foundation mounted cabinets.

Ensure that the terminal points are UL listed as suitable to carry the rated loading. Ensure that the capacity and size of the terminals are as specified in NEMA TS-1, Section 10.2.5. Ensure that the terminal points for signal field wiring for each circuit accommodates at least four 12 AWG conductors with spade type terminals.

Furnish terminal points for incoming power wiring that accepts either spade terminals or bare stranded wire and are suitable for either aluminum or copper conductors.

Space terminal sets for easy wiring. Furnish at least six reserve terminal sets for controllers. Harnesses may terminate on the back of terminal blocks using through-panel terminals. Clearly mark terminal sets for ready identification including through-panel terminals that are identified on both sides. Ensure that the contact between adjacent terminal points are made by bus bar, or by wire jumpers having spade type terminals securely attached to each end.

m. Terminal Buses. Furnish a cabinet with supply terminal buses fed from the line side of the incoming 120 VAC power line, after the phase wire has passed through the main power switch. Ensure that the requirements for use of radio interference filters are according to Item 8 of this Section, with the buses supplying load switches and with flashers being filtered when required. Ensure that a signal bus relay controls power to the bus supplying power for the signal load switches. The following overrides NEMA requirements for signal bus relays. A solid state relay shall be used for the signal bus relay. The signal bus relay shall maintain output equal to or above the rating of the cabinet main overcurrent

protection device over the NEMA TS-2 Environmental Operating Range of -50 to +185 degrees F (-45 to +85 degrees C).

Furnish a common terminal bus for the connection of the neutral wire of the incoming 120 VAC power line. Ensure that the common bus has sufficient terminal points to accommodate all potential cabinet wiring as well as field wiring. Use a separate common terminal, insulated from the panel, for the interconnect common.

Furnish bus terminal points that comply with Item 12 of this Section for conductor accommodation, attachment and identification.

n. Grounding System/Bus Bars. Furnish a cabinet that includes a grounding system as specified in NEMA TS-1, Section 10.3.2.1 with an adequate number (minimum of three) of ground terminal points.

o. Wiring. Neatly organize and route the harnesses and wiring bundles to individual terminals. Ensure that the harness provides a wire for each pin or contact of the device. Connect each wire to a marked terminal position. Use labeled spade type terminals or plug connections on all harness wiring. Group and lash or restrain wire bundles in such a manner that they will not interfere with the access to components, terminal blocks or buses, or the legibility of terminal identification. Ensure that the harnesses are of sufficient length to reach any point within the cabinet. Ensure that the cables and harness bundles are easily traced through the cabinet to their terminations. Route all wiring terminated on printed circuit boards (as commonly done for BIU backpanel connectors) at right angles to the pin array; no wires shall pass over the connector pins.

Wire the cabinet so that controller pin connections associated with a given phase number matches the phase number assigned to the specified traffic movement as shown on the plans.

Furnish all wiring with stranded conductors. Ensure that the wiring is adequate for the voltage and load that represents the ultimate load of the devices connected. Ensure that the ampacity rating of the wires are as specified in NEMA TS-1, Section 10.3.3.1. Ensure that the wiring is color coded as follows:

- (1) Solid white, AC common.
- (2) Solid green or green with yellow stripes, equipment ground.
- (3) Solid black, AC line side power (AC+).

p. Loop Detector Units. Furnish loop detector units that comply with the requirements of NEMA TS-1, Section 15, with the following modifications:

- (1) Furnish loop detector units that are shelf mounted and powered from 120 volts.
- (2) Ensure that the unit uses solid state isolated output devices.
- (3) Furnish conductors in the cable harness for loop input pins that are twisted three to five times per foot (300 mm).
- (4) Furnish detector unit electrical connection plugs or wiring harness that are designed such that any multi-channel shelf mounted detector unit is readily replaced with single channel detector units. Furnish only units with the connector type required for single channel shelf mounted detector units, or by wiring the controller back panel to single channel wiring harnesses which are, in turn, plug connected to an adapter harness that is mated to the multi-channel connector of the detector unit.
- (5) When shown on the plans, supply delay and extension timing capability on the detector unit; otherwise, the controller unit software requirements of 733.02 will provide these features.
- (6) Ensure that the harness provides a wire for each pin or contact of the device.

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

~~If vehicle detector types other than "loop" detectors are required by the plans, provide these detectors by separate bid item.~~

~~Furnish TS-1 cabinets according to the Department's TAP List.~~

733.03.D

On page 900, **Delete** 733.03.D in its entirety.

733.03

On page 901, **Replace** "E. Type 336L." with the following:

D. Type 336L.

733.05

On page 903, **Revise** the first sentence to the following:

733.05 Flasher Controller. Furnish solid-state flasher that complies with NEMA TS-2, ~~Section 8,~~ and have two circuits, each rated at 10 amperes.

733.06.B.1.

On page 903, **Replace** the first paragraph with the following.

1. Design. Furnish a solid state, digital microprocessor master controller design. Furnish a controller that uses menu driven prompts. If the master controller is used with Type 2070 controllers, provide software unless otherwise shown on the plans.

733.09.A.

On page 907, **Replace** the second paragraph with the following:

Furnish a UPS compatible with all of the following traffic signal equipment; NEMA TS-2 controllers and cabinets, Model 332 & 336 cabinets, 2070 controller and electrical service pedestals.

733.09.D.

On page 909, in the first paragraph, **Replace** the first sentence with the following.

Furnish an enclosure mountable to a standard Model 332, NEMA TS-2 traffic signal cabinet and be constructed of natural unpainted aluminum.

740.04.G

On page 913, **Replace** the first sentence of the section with the following:

Furnish yellow material containing a minimum of 5 percent by weight of primary yellow lead free pigment (measured according to ASTM D 126 or Department approved lab method).

740.08

On page 916, **Replace** the section in its entirety with the following:

740.08 Heat-Fused Preformed Thermoplastic Pavement Marking Material. Furnish heat-fused preformed thermoplastic pavement marking materials conforming to the following:

Material Type	Thickness	Pre-heat	Post-heat
Type A90	90 mil (2.29 mm)	Yes	Yes
Type B90	90 mil (2.29 mm)	No	Yes

Type A125	125 mil (3.18 mm)	Yes	Yes
Type B125	125 mil (3.18 mm)	No	Yes

Furnish heat-fused preformed thermoplastic pavement marking materials conforming to AASHTO M249 with the following the following requirements:

A. Pigments. Furnish white material with sufficient titanium dioxide pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. Furnish yellow material with sufficient pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. The yellow pigments must be organic and must be heavy-metal free.

B. Heating indicators. Furnish the material with the top surface of the material (same side as the factory applied surface beads) shall have regularly spaced indents. The closing of these indents during application, shall act as a visual cue that the material has reached a molten state allowing for satisfactory adhesion and proper bead embedment, and as a post-application visual cue that the application procedures have been followed.

C. Skid Resistance. Furnish the material with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E 303.

D. Environmental Resistance. Furnish the material that must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline.

Ensure that the material contains reflective glass beads, 740.09 Type E. Prequalify materials according to Supplement 1047. Furnish materials according to the Department’s Approved List.

740.09.E

On page 918, **Add** the following new section after section 740.09.D. Type D.:

E. Type E. Furnish heat-fused preformed plastic pavement marking materials that contain a minimum of thirty percent (30%) intermixed graded glass beads by weight and factory applied coated surface beads in addition to the intermixed beads at a rate of 1 lb. (\pm 10%) per 10 sq. ft.

Furnish factory applied coated surface beads with the following specifications:

- 1) Minimum 80% rounds
- 2) Minimum refractive index of 1.50

Furnish intermixed graded glass beads and factory applied coated surface beads that conform to Type 1 and/or Type 3 AASHTO M247 as recommended by the manufacturer.

Use materials certified according to Supplement 1089.