

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 800
REVISIONS TO THE 2013 CONSTRUCTION & MATERIAL SPECIFICATIONS**

DATED 01-17-2014

103.05

On page 17, **Replace** the subsection with the following:

103.05 Requirement of Contract Bond. Furnish Contract Bonds within 10 days after receiving notice of award. Furnish Contract Bonds to the Director on the prescribed form, in the amount of the contract, and according to ORC 5525.16.

105.17

On page 29, **Replace** the last paragraph with the following section:

Clean hard fill consisting of reinforced or non-reinforced concrete, asphalt concrete, brick, block, tile or stone that is free of all steel as per 703.16 shall be managed in one or more of the following ways:

1. Recycled into a usable construction material.
2. Disposed in licensed construction and demolition debris facility.
3. Used in legitimate fill operations on the site of generation according to 105.16.
4. Used in legitimate fill operations on a site other than the site of generation to bring a site up to grade on an existing roadbed or parking lot project.

A Beneficial Reuse Certification form needs to be properly executed by the Recipient prior to any material leaving the project.

106.09.E

On page 33, **replace** the subsection with the following:

E. Manufactured Products. In order for a manufactured product to be subject to Federal requirements, the product must consist of at least 90% steel or iron content when it is delivered to the job site for installation.

Examples of products subject to Federal requirements include, but are not limited to, the following:

1. Steel or iron products used in pavements, bridges, tunnels or other structures, which include , but are not limited to, the following: fabricated structural steel, reinforcing steel, piling, high strength bolts, anchor bolts, dowel bars, permanently incorporated sheet piling, bridge bearings, cable wire/strand, prestressing/post-tensioning wire, motor/machinery brakes and other equipment for moveable structures;
2. Guardrail, guardrail posts, end sections, terminals, cable guardrail;
3. Steel fencing material, fence posts;
4. Steel or iron pipe, conduit, grates, manhole covers, risers;
5. Mast arms, poles, standards, trusses, or supporting structural members for signs, luminaires, or traffic control systems; and
6. Steel or iron components of precast concrete products, such as reinforcing steel, wire mesh and pre-stressing or post-tensioning strands or cables

The miscellaneous steel or iron components, subcomponents and hardware necessary to encase, assemble and construct the above components (or manufactured products that are not predominately steel or iron) are not subject to Federal requirements. Examples include, but are not limited to, cabinets, covers, shelves, clamps, fittings, sleeves, washers, bolts, nuts, screws, tie wire, spacers, chairs, lifting hooks, faucets, door hinges, etc.

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

107.10

On page 36, **Replace** the paragraph starting with “All areas proposed” with the following section:

Except for locations utilized specifically for;

1. parking of equipment between workdays for maintenance type projects;
2. disposal or stockpile locations that currently hold a Federal, ODNR or OEPA sanctioned permit that specifically allows the disposal or stockpiling activity. This exception requires the contractor to provide the Engineer with the permitted facility’s name, location, site ID number and the permit holder’s certification that disposal or stockpiling the project generated material is compliant with the recipient’s permit.

All areas proposed to be utilized by the Contractor outside the project construction limits and not described above shall be reviewed by environmental contractor(s) that are prequalified by the Department for each environmental resource. This exception applies to projects with “maintenance” in the project description. Have the consultant(s) certify that the proposed site to be utilized for the contractor will not impact:

107.19

On page 43, **Replace** the entire subsection with the following:

107.19 Environmental Protection. Comply with all Federal, State, and local laws and regulations controlling pollution of the environment. Avoid polluting streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, sediments, or other harmful materials, and avoid polluting the atmosphere with particulate and gaseous matter.

By execution of this contract, the Contractor, will be deemed to have stipulated as follows:

- A. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
- B. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
- C. That the firm shall promptly notify the Department of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
- D. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

Fording of streams is prohibited. Causeways for stream and river crossings or for Work below a bridge are permitted provided:

A. The causeway complies with the requirements of the 404 Permit the Department obtained for the Project.

B. The Contractor obtains a 404 Permit from the U.S. Army Corps of Engineers if the Department has not obtained such a permit. Obtain the 404 Permit prior to beginning construction of the causeway. The Department does not guarantee that the Contractor will be able to obtain a 404 Permit.

Comply with all current provisions of the Ohio Water Pollution Control Act, (OWPCA), (ORC Chapter 6111). The Department will obtain a storm water permit under the OWPCA provisions when the plan work acreage requires a permit. Apply for a permit to cover operations outside the Project limits shown on the plans as required by the OWPCA provisions. When the Department has not applied for a permit on the Project and a permit is required under the provisions of the OWPCA because of the total area of the Contractor's work, apply for, obtain, and comply with the required permit for both the Work within Project limits and the Contractor's work.

The Department has obtained the required permits from the U.S. Army Corps of Engineers and Ohio EPA for Work in the "Waters of the United States" and isolated wetlands under ORC Chapter 6111. Comply with the requirements of these permits.

When equipment is working next to a stream, lake, pond, or reservoir, appropriate spill response equipment is required. Do not stockpile fine material next to a stream, lake, pond, or reservoir.

Take precautions to avoid demolition debris and discharges associated with the excavation and hauling of material from entering the stream. Remove any material that does fall into the stream as soon as possible.

When excavating in or adjacent to streams, separate such areas from the main stream by a dike or barrier to keep sediment from entering the stream. Take care during the construction and removal of such barriers to minimize sediment entering the stream.

Contain, collect, characterize and legally dispose of all waste water and sludge generated during the work. Do not mix waste water with storm water. Do not discharge any waste water without the appropriate regulatory permits. Manage waste water and sludge in accordance with ORC Chapter 6111 and all other laws, regulations, permits and local ordinances relating to this waste. Waste water management is incidental to the Work unless otherwise specified in the contract.

Control the fugitive dust generated by the Work according to OAC-3745-17-07(B), OAC-3745-17-08, OAC-3745-15-07, and OAC-3745-17-03 and local ordinances and regulations. Prior to the initiation of abrasive coating removal, pavement cutting or any other construction operation that generates dust, demonstrate to the Engineer that construction related dust will be controlled with appropriate Reasonable Available Control Measures (RACM) as described in OEPA Engineering Guide #57 (<http://epa.ohio.gov/dapc/engineer/eguides.aspx>).

In addition, use dust control measures when fugitive dust creates unsafe conditions as determined by the Engineer. Perform this work without additional compensation except for Item 616.

Perform open burning according to 105.16.

109.05.C.6

On page 74, **Replace** the first paragraph with the following:

6. Subcontract Work. For Work performed by an approved subcontractor, the Department will pay an amount to cover administrative costs of 8% on the first \$10,000 of work and 5% for work in

excess of \$10,000 as provided in 109.05.C.2 through 109.05.C.5. No additional mark-up is allowed for work of a sub-subcontractor or trucking services employed by a subcontractor.

109.05.C.6

On page 74, **Delete** Table 109.05-2.

109.05.C.8.a

On page 75, **Replace** the first paragraph of 109.05.C.8.a with:

8. Trucking.

a. Trucking firms and owner operators not subject to prevailing wage will be paid at the invoiced cost plus 8% on the first \$10,000 of trucking and 5% for trucking in excess of \$10,000 to cover administrative costs.

109.05.C.8.a

On page 75, **Delete** Table 109.05-3.

202.02

On page 89, **Replace** the third paragraph of 204.02 with the following:

Use removed or excavated materials in the Work when the material conforms to the specifications; if not, then dispose of the material according to 105.16 and 105.17.

205.04.A

On page 113, **Replace** the second sentence of the third paragraph of 205.04.A with the following:
Control dust according to 107.19.

208

On page 119, **Replace** the section title of 208.10 with the following: **208.10 Cushion Blasting**

208.01

On page 119, **Replace** the last sentence of the second paragraph with the following:

Controlled blasting techniques include presplitting, cushion blasting, and sliver cut blasting.

208.10

On page 126, **Replace** the section title with the following: **208.10 Cushion Blasting.**

251.03

On page 136, **Replace** the last paragraph of 251.03 with the following:

If the Contract does not include resurfacing, seal the perimeter surface of the repaired area by applying a 2 inch (50mm) to 4 inch (100 mm) wide strip of approved 705.04 material or 702.01 approved PG binder.

255.07

On page 145, **Replace** the last paragraph of 255.07 with the following:

Seal the perimeter surface of the repaired areas by applying a 2 inch (50 mm) to 4 inch (100 mm) wide strip of approved 705.04 material or 702.01 approved PG binder.

255.08

On page 145, **Replace** the last paragraph of 255.08 with the following:

If maintaining traffic in adjacent lanes, schedule work in order to place the concrete in the prepared repair area within 48 hours after removing the existing pavement. In accordance with standard drawing MT-101.90, drums may be used as a separator to the adjacent traveled lane for repairs 60 feet or less in length. If unable to complete placement of the concrete in the exposed repair area by the end of the daily work shift, fill repair areas less than 4 feet from the traveled lane with a temporary patch material suitable to the Engineer or cover unfilled repair areas 10 feet (3 m) or less in length with a steel plate. Do not leave repair areas unfilled with concrete when work is suspended on weekends or holidays. If unable to complete placement of the concrete in the exposed repair area before suspending work for a weekend or holiday or within the time specified above, fill the excavation with an asphalt concrete mixture or other suitable temporary patch material with a durable surface as the Engineer directs. Maintain the temporary patches while they are in service.

301.02

On page 155, **Replace** the second paragraph of 301.02 with the following:

Submit for the Laboratory's approval the desired percentage of the aggregate passing the No. 4 (4.75 mm) sieve and blend of individual components. The Contractor may use reclaimed asphalt concrete pavement according to 401.04. The Laboratory will establish the required binder content within a range of 4.7 to 7 percent. Do not make changes in these JMF values due to unsatisfactory results or other conditions except as authorized by the Laboratory. Obtain a new JMF approval for any desired change to an existing JMF.

301.04

On page 155, **Replace** 301.04 with the following:

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

302.02

On page 157, **Replace** the third, fourth and fifth paragraph of 302.02 with the following:

The Contractor may use reclaimed asphalt concrete pavement according to 401.04. Should problems with proper coating or other material issues related to the use of reclaimed asphalt concrete pavement or reclaimed asphalt shingles be evident, the Laboratory may restrict the allowable percentage of reclaimed asphalt concrete pavement to the reduced limits shown in tables 401.04-1 and 401.04-2 or may eliminate use of reclaimed asphalt shingles. In this case the virgin binder content will be adjusted by the Laboratory.

Add hydrated lime in the dry form at a rate of 0.75 percent by the dry weight of aggregate for asphalt concrete base, if antistripping additive is required and hydrated lime is used.

Design the asphalt concrete base to yield 4.0 percent air voids and the following properties:

Property	Acceptable Range of Values	
	Minimum	Maximum
Binder Content, %	Note 1	6.0[Total]
Stability, lb (N), 70 blow	3000 (13,345)	--
Flow, 0.25 mm, 70 blow	--	28
Voids in Mineral Aggregate % Note 1: See Tables in 401.04	12.0	--

302.04

On page 158, **Replace** 302.04 with the following:

302.04 Spreading and Finishing. Ensure that the compacted depth of any one layer is a minimum of 4 inches (100 mm) and a maximum of 7.75 inches (190 mm). Ensure that the temperature of the mixture when delivered to the paver is a minimum of 250 °F (120 °C). Ensure the temperature of the mixture is sufficient for the roller coverage to be effective in compacting the mixture.

401.17

On page 181, **Add** the following after the 1st paragraph of 401.17:

Construct longitudinal joints using string line or other controls as a point of reference to provide a straight longitudinal joint. Prior to placing adjacent pavement, trim any locations along the longitudinal joint that deviate horizontally from the point of reference. Maintain a consistent overlap of 1 inch to 1 ½ inches on adjacent pavement when closing longitudinal joints.

402.03

Beginning on page 183, Replace the first two paragraphs of 402.03 with the following:

402.03 Polymer Binders. If an asphalt binder is modified by SBR at an asphalt concrete mixing plant, equip the plant with an automated SBR flow control and monitoring system. Obtain the Department's approval of the system before operating and demonstrate the system calibration to the District. If the District waives the demonstration, provide a letter documenting calibration data for the flow system to the DET for each project. Obtain written approval from the Laboratory for the use of SBR and ensure the QCP contains methods for properly controlling and sampling SBR binder blends.

For drum mix plants, introduce the SBR directly into the asphalt binder line through means of an in-line motionless blender or other device approved by the Laboratory which is able to provide a homogeneous blend. Ensure the in-line motionless blender design provides aggressive interaction of asphalt binder and SBR emulsion to provide a homogenous blend at the sampling port. Some blenders such as 'swirl' type blenders do not accomplish proper blending. The Astec in line SBR blender or similar design accomplishes proper blending. Locate a sampling valve between the in-line blender and the plant drum, at least 12 ft (3 m) downstream of the in-line blender and at least 5 ft (1 m) downstream of a piping elbow. Ensure the sampling valve port is at least 1 in. (2.54cm) in diameter. Ensure the sampling valve can be opened quickly for maximizing sample flow for the purpose of obtaining a proper sample. In place of an in-line sampling valve, a sample may be taken from a 3-5 gallon (11-19 liter) surge tank as long as the tank is downstream of the required blender and the in-line flow can be quickly and directly diverted to the surge tank. Contents of the tank should be drained into a 5 gallon (19 liter) sampling bucket and stirred before filling the required

sample container. Provide a sampling valve port that is in a position to safely obtain the required sample volume in the required 5 gallon (19 liter) sampling bucket. Provide a stable sampling rack to obtain a sample.

402.04

On page 184, **Replace** Item 2 in the first paragraph of 402.04 with the following:

2. Injection equipment has variable water injection control controlled by the plant operation rate and the water injection can never exceed 2.2 percent by weight of asphalt binder.

403.03

On page 185, **Replace** the entire subsection 403.03 with the following:

403.03 Quality Control Program (QCP). Create and implement a Quality Control Program (QCP) for each paving season. The QCP will cover processes conducted to provide an asphalt mixture at the paving site that is uniform in composition, conforms to the specification requirements and that when placed is free of any defect (ex. segregation, lack of mixture and texture uniformity, raveling, rutting, holes, debris etc.) within the Contractor's control at project completion. A minimum of 3 weeks before mix production, but no later than February 28, submit a hard copy of the proposed QCP to the Laboratory for review and approval.

Send a hard copy and a digital copy (if available) of the approval letter and approved QCP to the DET in every District in which work is performed. Keep copies of the approval letter and the approved QCP in each Contractor plant laboratory and plant operation control room. Digital copies of the approved QCP and approval 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, the QCP must contain a Table Of Contents inside the front cover locating all sections by page number and the QCP must be page numbered, and out of date QCPs must be removed from the computer desktop.

Failure to comply with the approved QCP may result in removal of personnel in accordance with Supplement 1041, removal from VA, and adversely affect the Contractor's Prequalification rating.

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.

Include in the program:

A. The assignment of quality control responsibilities. Quality control includes all efforts required to achieve a product meeting specifications. The QCP will list individuals as required below and note their designated responsibilities to meet QCP requirements. Provide a Quality Control Manager holding a Supplement 1041 Level 3 approval and who is a company employee. Assign Level 2 technicians for all Level 2 QC testing duties, and provide a list designating their responsibilities and expected actions. Ensure only approved personnel handle and test samples at all times. If Level 2 consultant technicians are used provide a document in the QCP and to them listing designated responsibilities and expected actions (if different from employee expectations). Define in the QCP who is responsible at plants and specific methods for assuring haul vehicles meet all requirements and proper bed release products are used. Provide a Field Quality Control Supervisor (FQCS), holding Supplement 1041 Field Quality Control Supervisor approval and who is a company employee, who is routinely and usually at the paving site during placement of any non-temporary

asphalt concrete pavement. Ensure personnel obtaining and handling cores at the project site are approved Level 2 technicians, FQCS or personnel approved by the Laboratory.

B. Provisions to meet the Department mix specifications.

C. Procedures for extra testing (e.g., job start, responses to poor test results or field mix problems, aggregate stock testing, reclaimed asphalt concrete pavement checks, moistures) and any other testing necessary to control materials not already defined in these Specifications.

D. Methods to maintain all worksheets, including all handwritten records, and other test and sample records from the plant or project for the duration of the contract or 5 years, whichever is longer. Define the test record process. Define company records retention requirements. Provide copies of all test reports and forms used in the quality control process.

E. Procedures for equipment calibration and documentation for Level 2 lab equipment. Provide documentation that all Level 2 lab equipment has been calibrated at the time of the Level 2 lab approval inspection. Procedures for calibration record storage.

F. Method of Quick Calibration and documentation for each plant type.

G. Procedure for random sampling to be used at the plant and documentation method. Procedures for sample taking, tracking, handling and documentation method for all samples taken at the project paving site including taking of all cores used for density determination or density gauge correlation.

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

I. Procedure for ensuring that every Contractor employee involved in the testing of asphalt mix and operation of the asphalt plant facility has read the QCP and has on site access to all applicable Department specifications, proposals, policies, and the current approved JMF.

J. Means to meet the handling and storage requirements of 402.03 and asphalt binder suppliers for all asphalt binders.

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

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

M. Signature of the Quality Assurance Manager and, if different, the person in authority to enforce all operations covered by the QCP as outlined in this subsection.

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

421.04

On page 208, **Replace** 421.04 with the following:

421.04 Weather Limitations. Apply the mixture only when it is not raining and the existing pavement surface and atmospheric temperature is a minimum of 45 degrees and rising and there is no forecast of an atmospheric temperature below 32 degrees within 24 hours from the time the mixture is applied. Between September 30 and May 1, do not apply the mixture if the existing pavement surface temperature is less than 50 °F (10 °C).

421.08

On page 209, **Replace** the entire subsection 421.08 with the following:

421.08 Surface Preparation. Before applying the mixture, thoroughly clean the surface.

Remove raised pavement markers according to 621.08, when specified. The Contractor may fill the depression caused by the removal of the casting with material meeting this specification.

Remove any existing pavement markings, except 740.02 (traffic paint), using an abrasion method conforming to 614.11.G.

Apply a tack coat conforming to Item 407, consisting of one part asphalt emulsion and three parts water. Apply the tack coat at a rate of 0.06 to 0.12 gallon per square yard (0.25 to 0.45 L/m²).

Protect drainage structures, monument boxes, water valve, etc. during material application.

421.10

On page 210, **Replace** the third and fourth paragraphs of 421.10 with the following:

If a leveling course and a surface course are specified, apply the paving mixture at 14 ± 2 pounds per square yard (7.6 ± 1.1 kg/m²) for the leveling course and 16 ± 1 pounds per square yard (8.7 ± 0.6 kg/m²) for the surface course. Apply the two courses at a minimum combined rate of 30 pounds per square yard (16.3 kg/m²), regardless of the above tolerances

If a surface course is specified and it is not placed on another Microsurfacing course, apply the paving mixture at a minimum of 18 pounds per square yard (9.8 kg/m²).

421.10

On page 210, **Add** the following to the end of the seventh paragraph of 421.10:

Provide uniform appearance of the entire surface area regardless of the means used to spread material.

421.13

On page 211, **Replace** the second paragraph of 421.11 with the following:

The cost of any removal of any existing pavement markings according to 421.08 is incidental to Microsurfacing.

422.02 Materials

On page 212, **Replace** the 1st full paragraph with the following:

Use polymer emulsified binder conforming to 702.16 Type A.

422.04

On page 214, **Replace** the entire section 422.04 with the following:

422.04 Weather Limitations. Place the chip seal when the pavement temperature is between 60 °F (16 °C) and 140 °F (60 °C). Do not schedule the performance of this work for the time period before May 1 or after September 1. Do not place chip seal if any of the following conditions exist:

- A. The atmospheric temperature is below 70 °F (21 °C).
- B. Impending weather conditions do not allow for proper curing.
- C. If temperatures are forecasted below 50 °F (10 °C) within 24 hours from the time of work.

422.06

On page 215, **Replace** the 2nd paragraph of 422.06 with the following:

Remove all existing pavement markings, except 740.02 (traffic paint), using an abrasion method conforming to 614.11,G.

442.02

On page 238, **Replace** the first paragraph of 442.02 with the following:

442.02 Type A Mix Design. Design the mixture composition for a Type A mix according to 441.02 and the most recent *Asphalt Institute Superpave Mix Design Manual* (SP-2) for design procedures and material properties except as modified by this subsection. Include in the JMF submittal the standard Department cover and summary page; all printouts from the gyratory compactor (all gyratory points not necessary); and analysis covering the required mix properties. Unless otherwise directed submit one compacted gyratory sample and loose mix for compaction of another sample, in addition to a 5-pound (2000 g) loose sample, for each JMF.

446.05

Starting on page 247, **Replace** the 6th, 7th, and 8th paragraphs of 446.05 with the following:

For each Lot three cores will be taken as follows from cold longitudinal joints and seven cores will be taken from the mat not including the joints. If locations not according to this specification are given, immediately inform the Engineer. Do not take cores from ramp joints. Take joint cores from the first, last and randomly from one of the three middle sublots. Determine the longitudinal location of the joint core within the subplot randomly and also randomly determine whether or not the cold longitudinal joint core is to be taken from a confined or unconfined joint if both exist in the mat to be cored. Do not take cores on the sloped face of a wedge before the adjoining lane is placed. Take joint cores such that the core's closest edge is six inches (150 mm) from the edge of the joint upper notch of a wedge joint or 4 inches (100 mm) from the edge of a vertical face joint. If a nine inch or wider wedge joint is used take the core three inches from the upper wedge joint notch. Take the seven random mat cores that are not for the joint coring such that the core's closest edge is at least twelve inches from the cold longitudinal joint wedge joint upper notch or vertical face edge. If taken, locate cores for the Contractor's quality control (QC sister core) longitudinally from and within four inches (100 mm) of the random core. In addition to the QC sister cores, three extra cores may be taken from the first lot of a JMF for testing to correlate density gauges. Do not take additional cores beyond what is noted above unless clearly identified in the approved Contractor's QCP. Clearly label all cores with mat locations so that they may be readily identified. Any unlabeled cores may be destroyed by the Department. Notify the Laboratory if any questions arise. Do not store additional cores anywhere (project, in vehicles or at the plant) beyond what are required to be taken for testing. Test all Contractor QC cores and maintain records of all tests (core tests and correlated gauge tests) per the QCP. Destroy all cores immediately after testing is complete.

The Department will determine the pay factor for each Lot cored by the pay schedule in Table 446.05-1 for Lots with three cold longitudinal joint cores and Table 446.05-2 for Lots with less than three cold longitudinal joint cores. The Department will verify the MTD if the MSG determination has a deviation from the MTD of less than or equal to 0.020. If the MTD is not verified, establish a new MTD according to the procedures established in 441.09. If less than 10 cores are available for determining the mean, the Laboratory will determine disposition of the Lot.

Fill core holes by the next workday with asphalt concrete. Before filling, ensure the holes are dry and tack them with asphalt material conforming to 407.02. Properly compact the asphalt concrete used for filling the hole and leave it flush with the pavement.

451.09

Starting on page 256, **Replace** the entire subsection **451.09 Joints** with the following:

451.09 Joints. Unless otherwise directed, construct all transverse joints normal to the centerline of the pavement lane and of the type, dimensions, and at locations specified.

Determine contraction and longitudinal joint sawing time limits to protect the concrete from early cracking by using HIPERPAV software. Obtain the software according to Supplement 1033.

Twenty four (24) hours before placing concrete pavement create a HIPERPAV project data file according to Supplement 1033.

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

Perform a HIPERPAV analysis for each pour.

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

A HIPERPAV analysis showing paving can proceed does not eliminate the requirements of 451.17.

Accurately mark the correct locations of all joints that will be saw cut along both edges of the pavement. Ensure the method of marking remains clearly visible after the paver passes and until the joint saw cut is completed.

A. Longitudinal Joint. Construct longitudinal joints between simultaneously placed lanes by sawing.

When a standard (water cooled diamond bladed) concrete saw is used to make the longitudinal joint between simultaneously placed lanes, saw the joint within the timeframe provided in the HIPERPAV output. For pavement less than or equal to 10 inches (255 mm), saw the joint to a minimum depth of one-fourth the specified pavement thickness. For pavements greater than 10 inches (255 mm) thick, saw the joint to a minimum depth of one-third the specified pavement thickness. Saw joints $1/4 \pm 1/16$ inch (6 ± 1.6 mm) wide measured at the time of sawing.

When using early-entry (dry cut, light weight) saws to make the longitudinal joint between simultaneously placed lanes, only use saw blades and skid plates as recommended by the saw manufacturer for the coarse aggregate type being used in the concrete. Perform the early-entry sawing after initial set and before final set. Saw the joint $1/8$ inch (3 mm) wide and $2 \frac{1}{4}$ to $2 \frac{1}{2}$ inches (56 to 63 mm) deep.

Place deformed epoxy coated steel tiebars or the epoxy coated hook bolt alternate (wiggly bolt) with epoxy coated coupling, in longitudinal joints during consolidation of the concrete. Install them at mid-depth in the slab by approved mechanical equipment. As an alternate procedure, rigidly secure them on chairs or other approved supports to prevent displacement. Provide tie bars or wiggly bolts of the size and spaced as shown on the standard construction drawings. If used, securely fasten hook bolts or wiggly bolts with couplings to the form at the longitudinal construction joint as shown on the standard construction drawings.

B. Transverse Joints

Unless otherwise directed, construct all transverse joints normal to the centerline of the pavement lane and of the type, dimensions, and at locations specified.

For all transverse joints, install round, straight, smooth, steel dowel bars of the size shown in Table 451.09-1.

TABLE 451.09-1 DOWEL SIZE	
Thickness of Pavement (T)	Diameter of Steel Dowel
Less than 8 1/2 inches (215 mm)	1 inch (25 mm)
8 1/2 to 10 inches (215 to 255 mm)	1 1/4 inches (32 mm)
Over 10 inches (255 mm)	1 1/2 inches (38 mm) or as shown on the plans

Within 2 hours prior of placing concrete coat the full length of all dowels with a thin uniform coat of new light form oil as a bond-breaking material.

Load Transfer Assemblies.

Use load transfer (dowel basket) assemblies in transverse contraction joints conforming to and placed according to the standard drawings to hold the dowels in a position parallel to the surface and centerline of the slab at mid-depth of the slab thickness.

Preset all dowel basket assemblies before the day's paving unless the Engineer determines complete presetting is impractical.

Completely install dowel basket assemblies before shipping and spacer wires are removed.

Immediately before paving, remove all shipping and spacer wires from the dowel basket assemblies; check the dowel basket assemblies are held firmly in place; check the dowels are parallel to the grade and parallel to centerline of pavement.

For each joint assembly used to hold dowels in position, provide a continuous assembly between longitudinal joints or between the longitudinal joint and pavement edge. Drive at least eight 1/2-inch (13 mm) diameter steel pins a minimum of 18 inches (460 mm) long at an angle to brace the assembly from lateral and vertical displacements during the placing of concrete. Drive two of these pins opposite each other at each end of the assembly, and drive the remaining pins in staggered positions on each side of the assembly. Where it is impractical to use the 18-inch (460 mm) length pins, such as where hardpan or rock is encountered, and provided the assembly is held firmly, the Engineer may authorize use of shorter pins. Where the dowel basket assembly is placed on granular material that may allow settlement or distortion, anchor the assembly with a combination of pins and steel plates, or by some other means satisfactory to the Engineer to prevent settlement.

When concrete pavement is placed on an existing concrete pavement or on a stabilized base, secure dowel basket assemblies from lateral and vertical displacement during concrete placement using power-driven fasteners and appropriate clips or pins driven in predrilled holes of a diameter slightly less than the pin diameter. Use either of the above methods or a combination of the two in sufficient numbers to adequately secure the basket assemblies.

Where widths other than 12 feet (3.6 m) are specified, the Contractor may use standard dowel basket assemblies with dowel spacings adjusted as follows. Maintain 6-inch (150 mm) dowel spacing at the longitudinal joint and increase the spacing at the outer edge of the lane up to 12 inches (300 mm). Where an odd width of lane occurs and if the standard dowel basket assembly would provide for a space exceeding 12 inches (300 m), place a dowel 6 inches (150 mm) from the outer edge of the lane). Hold such a dowel rigidly in proper position by a method satisfactory to the Engineer or cut and splice a dowel basket assembly of greater length than required to attain the required length.

Slip Form Paver with Mechanical Dowel Bar Inserter.

The Contractor may propose to use a slip form paver with mechanical dowel bar inserter (DBI) to place dowels in transverse contraction joints the full thickness of pavement and spaced per the requirements of the standard construction drawings. Submit details and specifications of the

proposed equipment to the Engineer at least 14 calendar days prior to mobilizing the equipment to the project.

The use of any slip form paver with DBI is allowed only after acceptable performance is demonstrated with a test section and approved by the Engineer. Continued verification during all contract paving is required for each production day as detailed below.

Provide all equipment, perform all testing, and evaluate the slip form paver with DBI as detailed in the following sections.

1. MIT Scan-2 Equipment and Reporting

Provide MIT Scan-2 equipment to determine the location of dowel bars in either fresh or hardened concrete including horizontal translation, longitudinal translation, vertical translation, horizontal skew, vertical tilt, and cover.

Provide equipment for determining dowel bar alignment that has an onboard computer that runs the test; collects and stores the test data on a memory card; performs the preliminary evaluation; and provides a printout of results immediately after scanning. Provide MagnoProof software to provide a detailed report of all required alignment parameters in an Excel spreadsheet and a graphical color representation.

Ensure the equipment is properly calibrated conforming to the manufacturer's specifications and for the specific project conditions. Provide calibration documentation to the Engineer prior to the start of construction. Establish a standard protocol for scanning direction.

Provide trained personnel to operate the equipment and documentation of training prior to start of construction.

Provide a print out, at the time of scanning, for horizontal translation, longitudinal translation, vertical translation, horizontal skew, vertical tilt, and cover for each bar in each joint scanned. For each Test Section and daily, for each day of production, provide a complete report to the Engineer at the completion of scanning along with a digital copy of all data collected in the manufacturer's native file format as well as all calibration files. Include the standard report generated using the MagnoProof software in Excel format and with color graphical representation of each joint. Include in the report project contract number, county-route-section, placement date, scan date, station location and lane, joint ID number, name of operator, and all required alignment parameters.

If non-magnetic dowel bar materials are to be used, propose and demonstrate alternative measurement equipment to the Engineer showing capability to provide measures equal or similar to the acceptance and rejection criteria of Table 451.09-2. Obtain the Engineer's approval of alternative equipment prior to paving. If no alternative equipment can demonstrate the required capability, do not use the slip form paver with DBI.

Prior to paving, review the measurement equipment applicability for the project conditions with the Engineer, including: ambient moisture conditions, dowel material, metallic concrete aggregate and potential contributors to magnetic interference (presence of tiebars, reinforcing steel or other embedded or underlying steel items that may affect measurement accuracy). Establish how the measurement device can meet the project conditions. If the measurement device cannot meet the project conditions, do not use the slip form paver with DBI.

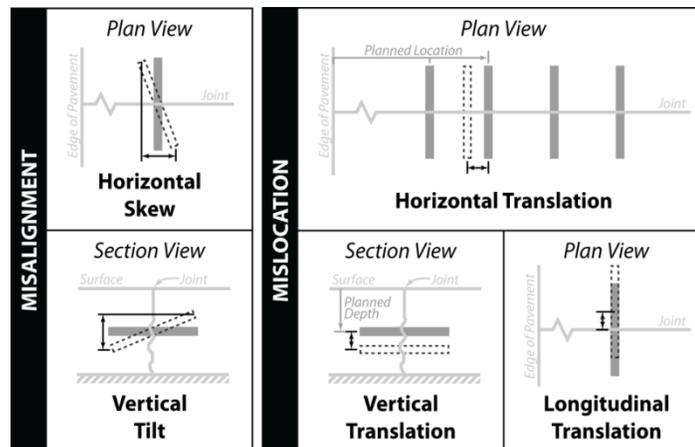
2. Acceptance/Rejection

The required dowel bar tolerances are given in Table 451.09-2. Dowel bar alignment is measured as detailed below. Any dowel bar exceeding any Acceptance Tolerance in Table 451.09-2 is considered misaligned. Rejection Criteria is in absolute inches.

**Table 451.09-2
Individual Dowel Bar Alignment Tolerances**

Alignment Parameter	Acceptance Tolerance (inches)	Rejection Criteria (inches)
Horizontal Translation ^a	±2.0	±3.0
Longitudinal Translation ^b	±2.0	±4.0
Vertical Translation ^c	±1.0	± T/6
Horizontal Skew ^d	±0.60	±1.0
Vertical Tilt ^e	±0.60	±1.0
Cover ^f	-	2.5 minimum

- Horizontal Translation - the total difference, measured horizontally, between the actual dowel bar location and the plan required dowel bar location along the transverse contraction joint.
- Longitudinal Translation - the total difference, measured in the longitudinal direction, from the center of the transverse contraction joint to the actual dowel bar center. Also termed as “side shift”.
- Vertical Translation - the total difference, measured vertically, between the centerline of the actual dowel bar location and the mid-depth of the slab. (T = Pavement Thickness in inches)
- Horizontal Skew - the total difference, measured from end to end of a dowel bar, of the dowel in the horizontal plane.
- Vertical Tilt - the total difference, measured from end to end of a dowel bar, of the dowel bar in the vertical plane.
- Cover - the least distance between the surface of embedded reinforcement and the outer surface of the concrete.



Perform a Joint Score Analysis conforming to CPTP Tech Brief *Best Practices for Dowel Placement Tolerances* (FHWA-HIF-07-021) for every joint. Joint Score is a measure of the combined effects of horizontal skew and vertical tilt. To calculate the Joint Score: calculate the Single Dowel Misalignment (SDM) by the square root of the sum of the squares of the Horizontal Skew and Vertical Tilt of each dowel in the joint; determine the weighing factor (W) for each bar from Table 451.09-3; sum the W values for every dowel in the joint and add one (1).

$$\text{Single Dowel Misalignment (SDM)} = \sqrt{(\text{Horizontal Skew})^2 + (\text{Vertical Tilt})^2}$$

Joint Score (JS) – Evaluated for a single transverse joint between adjacent longitudinal joint(s) and/or pavement edge(s) (i.e., a typical 12 ft [3.6 m] standard lane or up to 14 ft [4.3 m] widened lane), and calculated as:

$$\text{Joint Score (JS)} = 1 + \sum_{i=1}^n W_i$$

where:

n = number of dowels in the single joint

W_i = weighting factor (Table 451.09-3) for dowel i

Table 451.09-3	
Weighting Factors in Joint Score (JS) Determination	
Single Dowel Misalignment (SDM)	W, Weighting Factor
SDM ≤ 0.6 in. (15 mm)	0
0.6 in. (15 mm) < SDM ≤ 0.8 in. (20 mm)	2
0.8 in. (20 mm) < SDM ≤ 1 in. (25 mm)	4
1 in. (25 mm) < SDM ≤ 1.5 in. (38 mm)	5
1.5 in. (38 mm) < SDM	10

Joint Score Trigger (JST) – A scaling of the Joint Score risk value to account for the actual number of dowels required in a single joint for pavement width other than 12 ft (3.6 m), calculated as:

$$\text{Joint Score Trigger (JST)} = 10 * \frac{\text{\# of Dowel Bars in Single Joint}}{12}$$

Include the Joint Score and Joint Score Trigger for every joint scanned in the report to the Engineer. Any joint with a Joint Score equal to or greater than the Joint Score Trigger is considered locked and rejectable.

3. Test Section

Prior to production use of a DBI slip form paver, perform at least a 500-foot (150 m) long test section for acceptance of the machine. Measure the alignment and location of each dowel bar in the test section using the MIT Scan-2. The test section will be considered acceptable if the following acceptance criteria are met:

1. Each Joint Score (JS) is less than Joint Score Trigger (JST);
2. Ninety percent (90%) of the dowel bars meet the Acceptance Tolerances of Table 451.09-2;
3. None of the dowels exceed the Rejection Tolerances of 451.09-2.

If the test section acceptance criteria is not met, use the data to refine the paving process and reduce/eliminate misalignments and mislocations. Modify, repair or replace any slip form paver with DBI that does not meet the acceptance criteria and perform another test section. Do not begin production paving until the slip form paver with DBI test section acceptance criteria is met.

Perform corrective action of all joints in the test section according to Section 5 below.

Perform a new test section for any new slip form paver with DBI that will be used for any contract item of work.

Perform a new test section at the beginning of every construction season; after major paver maintenance/repairs; at mobilization or remobilization to a project, for major concrete mix design changes or different concrete mix designs; and as required by Section 4 of this specification.

If the length of the section to be paved makes it unreasonable to perform the test section, scan all joints for conformance with the requirements of Section 2, Acceptance/Rejection. Correct any joints with dowels found to be rejectable or JS greater than JST according to Section 5, Corrective Action.

Determine during the test section if embedded tiebars are affecting the Rejection Tolerances and JS's. If the test section demonstration shows interference, exclude from the JS and JST calculations any dowel bar(s) closer than 12 in. (300 mm) in any direction to tiebars in the longitudinal joint(s). At the Engineer's discretion, establish the location of excluded dowels by another equivalent non-destructive method or by probing.

4. Paving Quality Control Testing (QCT) for Dowel Bar Inserters

When using the accepted slip form paver and DBI for any contract item of work, perform quality control scans with the MIT-Scan 2 equipment at the following minimum:

- a. Measure the alignments and location for every 10th joint and calculate the JS and JST for each measured joint. Acceptable QCT is when all measures are within the acceptance tolerances in Table 451.09-2 and JS is less than JST.
- i. When the daily QCT finds more than 10 percent of the joints scanned have dowels exceeding the acceptance tolerances of Table 451.09-2 but the JS is less than the JST, increase the scanning frequency to every 5th joint. Evaluate the paving process to reduce/eliminate misalignments and mislocations and continue to pave. The QCT frequency will revert back to every 10th joint when two consecutive days of scanning every 5th joint show no dowels exceeding the acceptance tolerances of Table 451.09-2 and all JSs are less than the JST.
- ii. When QCT finds any individual dowel bars exceeding the rejection criteria of Table 451.09-2 or the JS is found to exceed the JST, the joint is considered to be locked and immediate investigation needs to be made as follows:
 1. Scan joints in front and behind the locked joint location until five (5) consecutive joints in both directions are found with no dowel bars exceeding the rejection criteria of Table 451.09-2 and no JS is found to exceed the JST.
 2. If the additional scanned joints show no additional dowel bars exceeding the rejection criteria of Table 451.09-2 and no JS exceeding the JST, evaluate equipment to determine what caused the original problem. Before continuing paving increase the frequency of QCT to conform to 4.a.i.
 3. If the additional scanned joints show additional dowel bars exceeding rejection criteria of Table 451.09-2 or joints with a JS exceeding the JST, stop paving. Investigate to determine the cause of the dowel bar rejection issues and provide the causes and alternative corrections to the Engineer.

The Engineer will determine if the corrections will correct the problem and may allow paving to temporarily continue to validate if the corrections work. During any evaluation, scan all joints to determine if the corrections were successful. If successful, continue QCT scanning at the frequency of 4.a.i. If not successful, discontinue paving, repair or replace the slip form paver and DBI, and repeat the Test Section
- b. All dowel bars found beyond rejection criteria of Table 451.09-2 or joints with a JS exceeding the JST require a corrective action proposal conforming to Section 5, Corrective Action.

Provide report formats as described in Section 1, MIT Scan-2 Equipment and Reporting.

5. Corrective Action

Submit a proposal for corrective action to the Engineer for any dowel that exceeds the rejection criteria in Table 451.09-2 or any joint that has a JS greater than the JST. As a minimum, include the following in the corrective action proposal:

1. Locations of rejectable dowels with identification information as described in Section 1, MIT Scan-2 Equipment and Reporting.
2. Locked joint identification information as described in Section 1, MIT Scan-2 Equipment and Reporting.
3. Proposed method of remediation for each identified location, including supporting documentation of the effectiveness of the means of proposed remediation.

The Department may not require corrective action for random dowels that exceed the rejection criteria of Table 451.09-2 depending on location; what alignment parameter was the cause for the rejection; and the frequency of the rejectable dowels.

The Department may not require corrective action for all JS exceeding the JST, if they are random in nature. Up to two (2) consecutive joints with a JS exceeding the JST may be accepted, provided that the adjacent three (3) joints before or after do not have dowels exceeding Table 451.09-2 rejection limits and have JS's less than the JST. The Department will require corrective action where there are more than two (2) consecutive joints with a JS exceeding the JST.

Do not proceed with any corrective action until the Engineer approves the proposed method(s) of correction.

C. Expansion Joints. Where a pressure relief joint is not provided adjacent to a bridge structure, construct expansion joints at the first two regularly spaced joint locations adjacent to the bridge approach slab on each side of the bridge. If the pavement is constructed in two or more separately placed lanes, construct the transverse expansion joints in a continuous line for the full width of the pavement and shoulders.

Construct expansion joints according to the standard construction drawings. Install the face of the expansion joint perpendicular to the concrete surface except when expansion joint is installed at a skewed bridge approach slab.

Use round, straight, smooth, steel dowels, and within 2 hours of placing concrete, coat the dowels with a thin uniform coat of new light form oil as a bond-breaking material to provide free movement. After coating the dowel, install a sleeve of metal or other approved material approximately 3 inches (75 mm) long, with crimped end, overlapping seams fitting closely around the dowel, and a depression or interior projection to stop the dowel a sufficient distance from the crimped end to allow 1 inch (25 mm) for longitudinal dowel movement with pavement expansion on one free end of each dowel. If approved by the Engineer, use other means to allow for 1 inch (25 mm) of expansion.

Punch or drill proper size dowel holes into the preformed expansion joint filler to assure a tight fit around each dowel.

Form a 1-inch (25 mm) wide and 1-inch (25 mm) deep opening on top of the expansion joint filler and seal this opening with 705.04 joint sealers.

D. Contraction Joints. For pavement less than or equal to 10 inches (225 mm) thick, saw contraction joints with a standard (water cooled diamond bladed) concrete saw to a minimum depth of one-fourth of the specified pavement thickness. For pavement greater than 10-inches (255 mm) thick, saw contraction joints to a minimum depth of one-third the specified pavement thickness. When cutting joints using a standard (water cooled diamond blade) saw assure the joint is $1/4 \pm 1/16$ -inch (6 ± 1.6 mm) wide when measured at the time of sawing.

When using the option of early-entry (dry cut, light weight) saws, only use saw blades and skid plates as recommended by the saw manufacturer for the coarse aggregate type being used in the concrete. Perform the early entry contraction joint sawing after initial set and before final set. Saw

the contraction joint 2-1/4 to 2-1/2-inches (56 to 63 mm) deep. Ensure any early entry saw joints are approximately 1/8-inch (3 mm) wide at the time of sawing.

If the pavement is constructed in two or more separately placed lanes, install the joints continuous for the full width of the pavement. Saw the pavement with sawing equipment approved by the Engineer as soon as the saw can be operated without damaging the concrete. Provide saws with adequate guides, blade guards, and a method of controlling the depth of cut. After wet sawing, clean the joint using a jet of water. After dry sawing clean the joint using air under pressure. During sawing of contraction joints, maintain a standby saw in working condition with an adequate supply of blades.

E. Construction Joints. Install dowelled construction joints at the end of each day's work and when work is suspended for a period of more than 30 minutes.

Use dowels in transverse construction joints. Within 2 hours of placing concrete, coat the free half of all dowels with a thin uniform coat of new light form oil. Use an adequate bulkhead, with openings provided for dowel bars spaced as specified and shaped to fit the typical section of the pavement, to form a straight joint. During placing of concrete, hold dowels rigidly in position.

Locate construction joints at or between contraction joints. If located between contraction joints, construct the construction joint no closer than 10 feet (3 m) to the last contraction joint.

451.10

On page 264, **Replace** paragraph 3 and 4 with the following two paragraphs:

Texture the surface in the longitudinal or transverse direction using a broom to produce a uniform, gritty, texture. Immediately following the broom drag texture, tine the pavement in the longitudinal direction using an approved device that produces uniform tine spacing 3/4 inches wide (19 mm), 1/8 inch deep (3 mm) and 1/8 inch wide (3 mm). Do not tine within 3 inches (75 mm) of pavement edges or longitudinal joints. Only use equipment that will tine the full width of the pavement in one operation and uses string line controls for line and grade to assure straight tining texture.

Use transverse tining in small areas only with the approval of the Engineer. Use equipment that produces a random pattern of grooves [0.05 inch (1.3 mm) to 0.08 inch (2.0 mm) deep and 0.10 inch (3 mm) wide] spaced at 3/8 to 1-3/4 inches (10 to 45 mm), with 50 percent of spacings less than 1 inch (25 mm). Transverse tining may be used as an option for shoulders of main line or shoulders of ramps and gore areas. Tine all mainline shoulders or all ramp shoulders in a consistent direction if choosing this option. Request the use of transverse tining and identify the locations for approval at the preconstruction meeting.

501.05.B

On page 295, after the fourth paragraph, and sentence **change** the first section to:

This section applies to working drawings for the following:

1. Cofferdams and Excavation Bracing, impacting active traffic, or with an exposed height over eight feet, except when a complete design is already shown in the plans. Perform all work as specified below:

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

506.01

On page 306, **change** the last sentence to:

When subsequent static load tests are specified, the Office of Geotechnical Engineering will determine whether subsequent static load tests are to be performed and the location of all piles to be tested

506.02

On page 306, in the second paragraph, **change** the last sentence to:

If the Contractor finds it necessary to use a different hammer, the Office of Geotechnical Engineering will determine if an additional static load test is necessary.

506.04

On page 309, **change** the first sentence of the first paragraph to:

If the Contractor subsequently finds it necessary to use a different hammer, the Office of Geotechnical Engineering will determine if an additional static load test is necessary; the Contractor shall complete any such additional test at no additional cost to the Department.

507.04

On page 310, **change** the eight paragraph to:

When using open ended diesel hammers, provide electronic equipment, such as a saximeter, or equivalent, for the Engineer’s use to accurately measure and record the average stroke for each unit of length driven.

508.02

On page 316, after the third and last paragraph of this section, **add** the following sentence, Inserts cast into prestressed members for the purposes of falsework support shall be galvanized according to 711.02 and shall be shown in the shop drawings according to 515.06.

511.05

On pages 325 and 326, **Replace** section 511.05, (delete the second paragraph), with the following: Mix concrete according to 499.08.

511.07

On page 326, **Replace** the 2nd paragraph of 511.07 with the following:

Place and finish concrete to the lines and grades shown in the plans. Unless otherwise noted, the proposed beam seat elevations shown in the plans for prestressed beam superstructures are based on the design midspan camber for prestressed beams which are 30 days old (D30). Adjust each beam seat elevation using measured midspan camber data provided by the fabricator if available. In the absence of measured midspan camber, adjust each beam seat elevation using the following:

$$\Delta Y = Dt - D30 \geq 0$$

Where:

ΔY = Distance that each seat elevation shall be lowered from plan elevation to account for midspan camber growth rounded to the nearest 1/8-inch

Dt = $(1 + \psi) D0$

$D30$ = Design Midspan Camber at Day 30 provided in the plans; inch

$D0$ = Design Midspan Camber at Day 0 provided in the plans; inch

ψ	=	1.97 KS KF KTD
KS	=	$1.45 - 0.13 (V/S) \geq 1.0$
V/S	=	Ratio of the prestressed concrete member's volume-to-surface area exposed to the atmosphere. For each of the standard I-beam sections, this ratio is provided on PSID-1-13; inch
KF	=	$5/(1 + f'ci)$
f'ci	=	Compressive strength of prestressed concrete at release provided in the plans; ksi
KTD	=	$t/(61 - 4 f'ci + t)$
t	=	Age of prestressed concrete measured between release of prestressing force (i.e. 0.75 days) and time of deck placement; days

Provide the Engineer with revised plan sheets and Design Camber calculations or measured camber data signed, sealed and dated by an Ohio Registered Professional Engineer at least 7 days prior to constructing the beam seats. The revised plan sheets shall include the measured camber data (if available), Design Camber (Dt) and beam age (t) assumed for establishing the revised elevations. Provide haunch reinforcement for prestressed I-beam members as necessary to extend the beam's composite reinforcement at least two inches into the design deck thickness. All revisions resulting from adjusted beam seat elevations shall be clearly marked as revised. Do not begin work until the Engineer approves the revised plan.

511.09

On page 331, **Revise** the fourth paragraph to the following:

Form construction joints using bulkheads with keyways. Locate keyways clear of exposed surfaces by approximately one-third the thickness of the joint. Construct transverse or longitudinal construction joints in deck slabs with keys located between the reinforcing mats and having a depth of 3/4 inch (19 mm).

511.19

On page 339, **Revise** the 1th paragraph to:

After completing all curing operations and allowing the deck to thoroughly dry, seal the following areas with a high molecular weight methacrylate (HMWM) sealer. Flood the areas and squeegee off the excess material as specified in Item 512 before opening the deck to traffic:

511.24

On page 343, **Add** the following after the 1st paragraph of 511.24:

Work necessary to adjust seat elevations and deck haunches for prestressed beam members is incidental to the affected structural concrete items. The Department will pay for final quantities as measured and field verified.

512.03.F

On page 346, **Change** the second paragraph of 512.03.F to:

Use one 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.

1. Water blast at 7,000 psi (48 MPa) minimum, or
2. Abrasive blast, followed by air brooming or power sweeping, to remove dust from the surface and opened pores,
3. or use a combination of water blast and abrasive blast.

512.03.G.1.b

On page 347, **Change** 512.03.G.1.b to:

b. Provide documentation to the Engineer that the ambient, surface and material temperature is 50 °F (10 °C) or above, 5 °F higher than the dew point, and the relative humidity is 80% or below during the application of the sealer.

513.03

On page 361, under the Level UF, Description of Capabilities, **change** the last sentence to:

Quality assurance of shop drawings, material test reports, and inspection according to Supplement 1078.

Under the Level 1, Description of Capabilities, **change** the last sentence to:

Quality assurance of shop drawings, material test reports, and inspection according to Supplement 1078.

Under the Level 2, Description of Capabilities, **change** the last sentence to:

Quality assurance of shop drawings, material test reports, and inspection according to Supplement 1078.

Under the Level 3, Description of Capabilities, **change** the last sentence to:

Quality assurance of shop drawings, material test reports, and inspection according to Supplement 1078.

Under the Level 4, Description of Capabilities, **change** the last sentence to:

Quality assurance of shop drawings, material test reports, and inspection according to Supplement 1078.

Under the Level 5, Description of Capabilities, **change** the last sentence to:

Quality assurance of shop drawings, material test reports, and inspection according to Supplement 1078.

Under the Level 6, Description of Capabilities, **change** the last sentence to:

Quality assurance of shop drawings, material test reports, and inspection according to Supplement 1078.

513.22

On page 372, in the third paragraph, **change** the last sentence to:

For galvanized structures with welded shear connectors, remove the galvanic coating by grinding at each connector prior to welding.

514.19

On page 396, **Revise** the first paragraph to:

(QCP #9). After the intermediate coat cures and before applying the finish coat, caulk gaps or crevices greater than 1/8 inch (3 mm). Allow for the cure of the caulk, per the Manufacturer’s recommendations prior to the application of the finish coat.

515.08

On page 404, **add** the following material to the list:
Welded wire reinforcement.....709.12

Change the last sentence to:

For gradation, use No. 6, 67, 68, 7, 78 or 8 size coarse aggregate.

515.14

On page 407, at the end of the section **add** the following paragraph:
Unless otherwise shown in the plans, do not install inserts or holes in the beam web within a distance of 1.5 times the beam height from the end of the beam.

515.15

On page 407, **change** B to:
B. W/c ratio (maximum = 0.40)

515.15

On page 408, **change** the 8th paragraph to:
Screed the top surface of composite members and finish the surface with a wire broom, in a transverse direction and penetrating the finished surface approximately 1/4 inch(6 mm) + 1/16 inch (1.5 mm) -1/8 inch (3 mm) at a maximum spacing of 1-1/2 inches (38 mm).

515.17

On page 411, **Replace** the Beam Sweep and Camber Tolerances table with the following:

Beam Sweep and Camber Tolerances

Description	Box Beam	I Beam
Horizontal Sweep	$\pm 1/8"$ per 10 ft (1 mm/m) max $\pm 3/4"$ (19 mm)	$\pm 1/8"$ per 10 ft (1 mm/m) max $\pm 1"$ (25 mm)
Max Gap between beam	1" (25 mm)	N/A
Deviation from Design camber (Dt) [1]	+ Sacrificial Haunch[2] or $-1/8"$ per 10 ft (1 mm/m) max $-1/2"$ (13 mm)	+ Sacrificial Haunch[2] or
Variation in camber between beams in same span	max $1/2"$ (13 mm)	N/A

[1] Design camber (Dt) calculated in accordance with 511.07.

[2] Unless otherwise noted, the Sacrificial Haunch thickness is 2".

515.18

On page 411, **Add** the following after the 3rd paragraph of 515.18:

The Department will not accept for shipping, prestressed members with measured camber exceeding the Design Camber (Dt), used to establish the seat elevations, according to 511.07, by more than the Sacrificial Haunch thickness, until a corrective work plan has been approved by the Engineer. The plan shall be signed, sealed and dated by an Ohio Registered Engineer and shall include all revised plan information necessary to place the deck to the plan thickness. If the prestressed members are acceptable, exclusive of the deviation from Design Camber, the Department will pay for all costs incurred resulting from measured camber exceeding Design Camber calculated for the actual beam age at the time of deck placement, as Extra Work, 109.05.

516.07

On page 415, **change** the second paragraph to:

Accurately set, level and align elastomeric bearings, bearing plates and bolsters. Set bearing plates and bolsters on 1/8-inch (3 mm) thick sheet lead conforming to 711.19.

523.04

On page 430, **change** the last sentence to:

Submit an electronic version of the report and data files from the testing and analysis to the Office of Geotechnical Engineering and the Office of Construction Administration.

524.09

On page 436, **change** the second paragraph of this section to the following;

Tie and support the reinforcing steel so it remains within the required tolerances. Securely tie spacers at quarter points around the cage perimeter and space at intervals not to exceed 5 feet (1.5 m) along the length of the cage. If the size of the longitudinal reinforcing steel equals or exceeds 1-inch (25 mm) in diameter, the Contractor may increase the distance between the spacing devices to a maximum of 10 feet (3 m). Use spacers of adequate dimensions to ensure a minimum annular space between outside of cage and side of hole or casing of 3 inches (75 mm) for shaft diameters up to 4 feet (1.2 m) and 6 inches (150 mm) for shaft diameters larger than 4 feet (1.2 m). The Contractor may use round plastic spacers.

526.04

On page 440, **change** the paragraph to:

Immediately before placing concrete according to Item 511.07, thoroughly moisten the subgrade or subbase with water in the amount and manner directed by the Engineer. When the bridge superstructure and the approach slab require QC/QA, make at least one set of test cylinders for each 50 cubic yards (35 cubic meters) of concrete. Include the results of the cylinders into the LOT for the 511 superstructure item.

526.08

On page 440, **change** the 1st paragraph to:

The Department will calculate the final adjusted payment per 511 and Supplement 1127. The Department will pay for accepted quantities at the contract price as follows which includes all concrete, curbs, reinforcing steel, dowels, joints, and other materials:

526.08

On page 440, **Add** the new item as follows:

Item	Unit	Description
526	Square Yard (Square Meter)	Reinforced Concrete Approach Slabs with QC/QA

602.03

On page 447, **Replace** the first sentence of 602.03 C.:
 Cast-in-place structures are headwalls, wingwalls, pipe cradles, collars, and other units.

608.01

On page 460, **Replace** the entire section 608.01 Description with the following:
608.01 Description. This work consists of constructing walks, curb ramps, and steps as per plans, specifications and standard drawings.

608.02

On page 460, **Replace** the entire section **608.02 Materials** with the following:

- 608.02 Materials.** Furnish materials conforming to:
- Aggregate Base304.01 and 304.02
 - Asphalt concrete Type 1 448
 - Concrete,
 - Class QC Misc or QC 1* 499
 - Reinforcing steel 509.02
 - Crushed aggregate meeting
 - grading requirements of 703.10
 - Detectable Warning Devices..... 712.14
 - Expansion joint material 705.03

* Replacing Coarse aggregate in the concrete mixes with Recycled Concrete Aggregate conforming to Supplement 1117 is an option

608.07

On page 462, **Replace** the entire section **608.07 Curb Ramps** with the following:
608.07 Curb Ramps. Excavate, form, place, finish, and cure according to 608.03.A, 608.03.B, 608.03.C, and 608.03.E. Finish ramps to a rougher final surface texture than the adjacent walk and with striations transverse to the ramp slope using a coarse broom or other method approved by the Engineer.
 Provide detectable warning devices conforming to 712.14 in curb ramps. Install the detectable warning devices according to manufacturer’s written recommendations and standard drawings. Provide a warranty to conform with the requirements of 712.14. Provide the manufacturer’s written installation instructions and the 5-year warranty to the Engineer at or before the pre construction meeting.

611.02

On page 472, **Remove** “with welded bell inlet” from the second to last item of 611.02 A.:
 Corrugated polyethylene smooth lined pipe 707.33

On page 472, **Remove** “with welded bell inlet” from the last item of 611.02 A.:
 Steel reinforced thermoplastic ribbed pipe SS938

611.04.A

On page 476, **Replace** the entire section **611.04.A Shop Drawings** with the following:

A. Shop Drawings. Prepare shop drawings and calculations for C&MS items 706.051, 706.052, 706.053, 706.13 and “Special Design” 706.02 as required below. Have an Ohio Registered Engineer prepare, sign, seal and date all drawings and calculations. Have another Ohio Registered Engineer check all drawings and calculations, then sign, and seal and date all drawings and calculations. Submit load rating report in accordance to the most current version of ODOT’s Bridge Design Manual along with one copy of the shop drawings and one copy of the calculations to the Office of Structural Engineering for all structures with a 10 foot or larger span. Submit an additional copy of the shop drawings and calculations to the Engineer.

1. If Reinforced Concrete Circular Pipe, 706.02, requires a “Special Design” with a specified D-load requirement other than Tables 706.02-1 through 706.02-4, submit shop drawings and design calculations. Design the pipe to meet the D-load requirements to ensure the performance of this specification. Include the following information in the submittal: all structural design and loading information, all material specifications, all dimensions, and the installation plan.

2. Submittals for Precast reinforced concrete 3-sided flat topped culverts, precast reinforced concrete arch sections, or precast reinforced concrete round sections, (706.051, 706.052, or 706.053) shall include structural analysis methods, structural design criteria and calculations, structure details, and shop drawings. Include details for a precast slab bottom if required.

3. To substitute a precast reinforced concrete 3-sided flat topped culvert (706.051), a reinforced concrete arch section (706.052), or a precast reinforced concrete round section (706.053) for one another, the submittal shall include hydraulic calculations. The proposed culvert shall meet or exceed the same hydraulic requirements as the specified culvert and minimum cover requirements. If the specified culvert is on pedestal walls, include the shop drawings for the pedestal wall design in the submittal because 3-sided flat topped culverts, arch culverts, and round sections require different pedestal wall designs.

4. To substitute either a precast reinforced concrete 3-sided flat topped culvert, a precast reinforced concrete arch section, or a precast reinforced concrete round section (706.051, 706.052, or 706.053) placed on a precast or cast-in-place slab bottom for a precast reinforced concrete box culvert (706.05), the submittal shall include hydraulic calculations. The proposed culvert shall meet or exceed the same hydraulic requirements as the specified box culvert and minimum cover requirements. The Department may allow the bottom slab to be cast-in-place but will not issue a time extension for any delays resulting from the use of a cast-in-place bottom slab.

Department approval of shop drawings and calculations is not required.

611.04.B

On page 477 through 479, **Replace** the entire section **611.04 B. Installation Plan** with the following:

Submit a written installation plan to the Engineer for installing all conduit and drainage structures for review and acceptance.

Submit the installation plan at least 15 days before any conduit or drainage structure work begins. Do not perform work without an accepted installation plan.

Include the following required information for each conduit type and size:

1. Trench and excavation cross-sections with dimensions.
2. Locations where the conduit is installed in a cut situation and where it is installed in a fill situation.
3. Type of bedding and backfill material used and maximum lift thickness.
4. Compaction density requirements for bedding and backfill and compaction equipment.
5. Identify the starting location (outlet or inlet) for each run of conduit. All conduit must be laid from the outlet to the inlet unless approved by the Engineer. Bell or groove-end Type A conduit must have a bell or groove-end at the inlet.
6. Maximum allowable joint gap between conduit sections.
7. Other installation details as necessary.
8. Provide written confirmation from the conduit manufacturer that the pipe material and strength supplied are appropriate for the material and density requirements described in the installation plan for the backfill and bedding as well as the height of cover. Ensure the pipe material meets the durability design specified in the plans. This confirmation by the conduit manufacturer will not relieve the Contractor of the responsibility for obtaining the required results.

Include the following required information for each type of drainage structure:

1. Trench and excavation cross-sections with dimensions.
2. Locations where the drainage structure is installed in a cut situation and where it is installed in a fill situation.
3. Type of bedding and backfill material used and maximum lift thickness.
4. Compaction density requirements for bedding and backfill and compaction equipment.
5. Location.
6. Other installation details as necessary.

Deviations from the installation plan during construction require a revision of the installation plan. Resubmit all revisions to the installation plan to the Engineer within 14 days of the change with the conduit manufacturer's written confirmation that the pipe material and strength supplied are appropriate for the material and density requirements described in the newly revised installation plan for the backfill and bedding. If the conduit manufacturer does not provide this written confirmation to the newly revised installation plan, all the conduit installed according to the unconfirmed plan must be replaced. No new installation plans will be considered until all previous installation plans have been confirmed and accepted.

Provide the conduit manufacturer's structural calculations when specified or within 10 days when requested by the Engineer.

For structural plate and metal pipe arch conduit with a span of 57 inches (1440 mm) or larger, ensure the manufacturer provides match-marked ends on the conduit. Include a layout drawing in the installation plan.

For metal conduit with two structural plate thicknesses specified, identify the location of the thicker plates. For precast concrete 3-sided flat and arch topped structures (706.051 and 706.052) provide a 3 inch (75 mm) deep keyway centered on the leg and at least 6 inches (150 mm) wider than the thickness of the leg at the bottom. For precast concrete round sections (706.053) provide an 8-inch (200 mm) deep keyway for spans up to 24 feet (7.3 m) and a 10-inch (254 mm) deep keyway for spans greater than 24 feet, (7.3 m). Center the keyway on the precast arch base. The width of the keyway must be 8 inches (200 mm) greater than the thickness of the precast arch base. For non-

vertical leg arches set on pedestal walls, a one sided keyway is acceptable if the required pedestal wall design thickness is not sufficient for a full keyway.

611.04.C

On page 478, **Replace** the first sentence.

Perform work so that it can be verified by the Contractor's representative doing the inspection.

611.04.D

On page 479, **Replace** the first sentence.

Provide a performance report for each performance inspection.

611.04.D

On page 479, **Delete** "D. Conduit diameter report from the Manufacturer"

On page 479, **Add** "J. Conduit Evaluation"

On page 480, **Replace** the first sentence of the first paragraph with the following:

Submit a performance report to the Engineer within 14 days of completing the performance inspection of the conduit run or drainage structure.

611.05

On page 480, **Delete** the entire third paragraph.

"Provide a firm bed for the full width and length of the trench. If bedding material is not provided, loosen the middle third of the bed to seat the conduit. Provide a firm bed beneath the drainage structure."

611.07

On page 480, **Replace** the second sentence of the first paragraph.

Any planned temporary diversion of flows and drainage is the responsibility of the Contractor. Maintain flows and drainage or provide temporary diversion at no additional cost to the Department.

On page 480, **Delete** "in the presence of the Engineer" from the first sentence of the second paragraph.

611.08

On page 482, **Delete** "in the presence of the Engineer" from the third sentence of the first paragraph of **611.08 Joining Conduit**.

On page 483, **Replace** the entire first sentence of **611.08.B.3**

For precast reinforced concrete box culverts, precast reinforced concrete 3-sided flat topped culverts, precast reinforced concrete arch sections, and precast reinforced concrete round sections (706.05, 706.051, 706.052, and 706.053), place the sections according to the installation plan.

On page 483, **Replace** the entire first sentence of **611.08.B.3.c**

For precast reinforced concrete arch sections and precast reinforced concrete round sections (706.052 and 706.053), install a 7/8 x 1 3/8-inch (24 x 34 mm) preformed flexible joint sealant (706.14) along the outside joint chamfer.

On page 483 & 484, **Replace** the entire first sentence of **611.08.B.3.d**

For precast reinforced concrete box culverts, precast reinforced concrete 3-sided flat topped culverts, precast reinforced concrete arch sections, and precast reinforced concrete round sections (706.05, 706.051, 706.052, and 706.053), apply an approved epoxy-urethane sealer per the plans to all top surfaces not covered by membrane waterproofing.

611.10

On page 485, **Delete** “in the presence of the Engineer” from the first sentence of the second paragraph.

611.11

On page 486, in the last paragraph, first sentence, **Replace** “4 x 4-W1.4 x W1.4” with “2 x 2-W0.9 x W0.9”

On page 486, in the last paragraph, after the second sentence, **Add** the sentence:
Provide support beneath the mesh where necessary using galvanized support chairs or #4 reinforcing steel, meeting the material requirements of 509.02

On page 487, in the second paragraph, **Delete** the second sentence “Provide galvanized reinforcing steel support chairs beneath the mesh where necessary.”

611.12

On page 487, **Replace** the entire sixth paragraph.
In each phase of construction of a conduit, perform the inspection no sooner than 30 days and no later than 90 days after the completion of the finished grade when not below pavement and after the completion of the rough subgrade when any portion of the conduit is below pavement. The Engineer may permit inspection beyond the 90 day limit. If any corrections are made to the installed pipe after the completion of the finished grade or rough subgrade and prior to the performance inspection, wait 30 days after the correction was made to do the performance inspection. If the contract duration will not permit a 30 day waiting period then the Engineer may adjust the waiting period.

611.13

On page 489, **Replace** the entire first sentence of the first paragraph.

Have an independent Registered Engineer evaluate the Performance Inspection results and any defects as required by AASHTO [*LRFD Bridge Construction Specifications*](#), Section 26 for metal

conduit, Section 27 for concrete conduit, and Section 30 for plastic conduit, with modifications according to this specification.

611.17

On page 493, in the first paragraph, **Replace** the last sentence with:

When a pay item calls for conduit to be field paved, all work and materials necessary for the item are included in the contract unit price for each conduit.

611.17

On page 493, **Add** the following paragraph after the second paragraph.

All conduits and drainage structures installed without required submittals per 611.04 are considered unacceptable materials per 106.07.

On page 493, **Replace** the third paragraph.

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

On page 493, **Delete** the following pay structure from the third paragraph.

“After installation of conduit or drainage structure 60%

After performance inspection is completed 10%”

After acceptance of the conduit or drainage structure 30%”

614.03

On page 499, **Add** the following paragraph after the fourth paragraph

Furnish object markers that are a minimum size of 6 x 12 inches and that consists of reflective sheeting adhered to an aluminum or plastic plate.

614.08

On page 502, **Replace** the last sentence in the second paragraph with the following:

The Contractor may, instead of using flaggers, or supplemental to them, furnish, install, maintain and operate a traffic signal or signals, for the purpose of regulating traffic according to a written agreement approved by the Engineer.

614.08

On page 502, **Add** the following paragraph after the second paragraph:

The Contractor may (supplemental to using flaggers) furnish, install, maintain and operate automated flagger assistance devices (AFADs) with incidental items, for the purpose of assisting the flagger(s) in regulating traffic according to a written agreement approved by the Engineer. AFADs shall be furnished per the Department’s Approved List and shall be used in accordance with Supplemental Specification 830.

614.11.G

On page 506, **Add** the following sentence before the first sentence:

Conflicting markings are considered to be any markings not actively in use, not behind channelizing devices or portable barrier and/or could be misinterpreted by the traveling public or cause confusion to the driver as determined by the engineer.

615.05

On page 516, **Replace** the 5th paragraph of 615.05 with the following:

Where Class A or Class B pavement is shown on the plans, provide either rigid pavement or flexible pavement conforming to the following minimum requirements:

MINIMUM COURSE THICKNESS REQUIRED

Pavement Type	Course Make-Up	Class A	Class B
Rigid	452	9 in (230 mm)	7 in (180 mm)
Flexible	448 Type 1[1]	1-1/4 in (32 mm)	1-1/4 in (32 mm)
	448 Type 2[2][5]	1-3/4 in (45 mm)	1-1/2 in (38 mm)
	302[3][5]	5-1/2 in (140 mm)	3-1/2 in (90 mm)
	304[4][5]	6 in (150 mm)	6 in (150 mm)

[1] Meet surface course requirements. The Contractor may use Type 2 surface.

[2] Meet intermediate course requirements.

[3] The Contractor may use 301 or 448 Type 2 intermediate course.

[4] The Contractor may use 2-1/2 inches (65 mm) 301, 302, or 448 Type 2 intermediate course in lieu of 6 inches (150 mm) of 304.

[5] The Engineer may waive maximum placement lift thicknesses if quality control testing conforming to Supplement 1055 is performed and a final density between 93 and 96.5 percent is achieved.

625.22

On page 548, **Replace** the first sentence in the third paragraph with the following:

Foundations for light poles or light towers include excavation, dewatering, sleeving, casing, reinforcing steel, raceways, concrete, backfilling, and when required the 8 foot or 10 foot foundation section of concrete barrier, and the disposal of surplus excavation.

630.07.B

On page 560, **Replace** the section with the following:

Use self-aligning aluminum mounting clips, stainless steel T-bolts, stainless steel washers, and stainless steel nylon insert lock nuts, to attach extrusheet signs to sign attachment assemblies, beam or U-channel post supports, and for U-channel post sections used to attach exit number and supplemental panels to extrusheet signs. Use aluminum bolts, washers, lock washers, and nuts to assemble extrusheet signs shipped in two pieces. Tighten nuts and lock nuts using hand tools only. Do not use pneumatic, hydraulic, battery, electric or other power-assisted tools.

630.14

On page 561, **Replace** the first paragraph with the following

Method of Measurement. The Department will measure Ground Mounted Post Support by the number of feet (meters) measured from the bottom of the support to the top of the support, and will include driving, hardware for anchor base installation, and furnishing and placing of patching materials for excavations in paved areas. The Department will not measure the overlap length of post for the anchor base installation.

630.14

On page 561, **Replace** the first sentence in the second paragraph with the following

The Department will measure Foundations for ground mounted pipe supports, ground mounted structural beam supports, rigid overhead sign supports and span wire sign supports by the number of each for one pipe, structural beam, pole, end frame or strain pole, and will include excavation, dewatering, sleeving, casing, reinforcing steel, concrete, backfilling raceways, and when required the 10 foot (3m) foundation section of concrete barrier, and the disposal of surplus excavation.

630.14

On page 562, **Replace** the first paragraph with the following

The Department will measure One Way Support and Street Name Sign Support by the number of feet (meters) measured from the bottom of the support to the top of the support, and will include driving, hardware for anchor base installation, and furnishing and placing of patching materials for excavations in paved areas. The Department will not measure the overlap length of post for the anchor base installation.

632.06

On page 574, **Add** the following sentences at the end of the second paragraph

Before closing serrations, apply a bead of Room-Temperature Vulcanizing (RTV) silicone to all serrated surfaces and then tighten. RTV silicone shall be white to facilitate visual inspection. On heads with dual concentric serrated rings, completely fill the space between the rings with RTV silicone.

632.11

On page 575, **Replace** the last sentence in the second paragraph with the following:

Conform to all applicable state and local nuisance dust regulations, and OAC 3745-17-08 while saw cutting.

632.24

On page 546, **Add** the following paragraph after the 2nd paragraph

Furnish each enclosure with at least one padlock. Use padlocks with a bronze or brass lock body and a corrosion protected steel shackle. Obtain the appropriate master key number from the maintaining agency.

632.29

On page 549, **Replace** the 6th paragraph with the following:

The Department will measure Power Service by the number of complete units, and will include weatherhead, conduit, fittings, clamps and other necessary hardware, installation of meter base, ground wire connection, and disconnect switch with enclosure and padlock.

632.30

On page 583, **Replace** the first and second Item with the following:

632 Each Vehicular Signal Head, (Yellow or Black), (Aluminum or Polycarbonate), ___-
Section ___ inch (___ mm) Lens ___-Way (with Backplate)

632 Each Vehicular Signal Head, Optically Programmed, (Yellow or Black), (Aluminum or Polycarbonate), ___-Section, ___ inch (___ mm) Lens, ___-Way (with Backplate)

632 .30

On page 564, **Replace** this individual item description with the following:

632 Each Pedestrian Signal Head, (Aluminum or Polycarbonate) (Countdown), Type ___

644.04

On page 617, **Replace** the second sentence in the first paragraph with the following:

However, if applying thermoplastic to pavements that are older than six months, ensure that both the pavement surface and the ambient air temperature at the time of application are not less than 70 °F (21 °C) and rising.

648.05

On page 630, **Replace** the second sentence in the first paragraph with the following:

However, if applying spray thermoplastic to pavements that are older than six months, ensure that both the pavement surface and the ambient air temperature at the time of application are not less than 70 °F (21 °C) and rising.

659.01

On page 638, **Replace** paragraphs one through four with the following:

659.01 Description. This work consists of placing topsoil, preparing the seed bed, and placing and incorporating seed, agricultural lime, commercial fertilizer, and placing mulching material used to achieve NPDES final stabilization.

Perform this work in areas shown on the plans for seeding and mulching.

Perform seeding and mulching after completing all work in the area and within 7 days of obtaining final grade. If it is anticipated that future work may disturb an area, place temporary NPDES compliant Best Management Practices as needed until final stabilization measures under this item can be installed. If the Contractor disturbs a final area, then the Contractor shall restore this area. With the Engineer's approval, the Contractor may apply permanent seed between October 30 and March 1 on projects started and completed within the same calendar year.

702.01

On page 696, **Replace** the entire section **702.01 Asphalt Binders** with the following:

702.01 Asphalt Binders.

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

Ensure PG 70-22M, PG 76-22M, PG 88-22M, and PG 64-28 meet the requirements of Table 702.01-1.

An independent laboratory will not be owned or operated, in whole or part, by the binder supplier, Contractor, or affiliates of either.

Materials and Manufacture. Replace the requirements of AASHTO M 320-10 Table 1 Section 5 "Materials and Manufacture" Section with the following:

5.1 Supply PG Binder from the refining of crude petroleum, or combination of asphalt binders from the refining of crude petroleum, or asphalt binders and suitable liquid from the refining of crude petroleum, and possible organic modifiers for performance enhancement. Material from the

crude refining stream is considered neat. Liquid from crude refining may be used for adjustments, but do not use liquid from crude refining for the purpose of substitution of crude refined asphalt binder in a PG Binder. In the event of a failure investigation where asphalt binders exhibit unusual properties a supplier may be requested by the Laboratory to supply information about the makeup of a PG Binder. Failure to cooperate will mean removal from Supplement 1032 certification.

5.2 A modifier may be any approved material of suitable manufacture that is proven compatible with asphalt binder (does not separate appreciably in routine storage), and that is dissolved or reacted in asphalt binder to improve its performance. Performance enhancement is defined as a decrease in the temperature susceptibility of the asphalt binder while maintaining or improving desirable properties in a neat asphalt binder such as coat ability, adhesiveness and cohesiveness. Unless otherwise noted limit modifiers to no more than 6.0 percent by PG Binder weight.

5.3 The use of previously used materials in a PG Binder must be approved by the Department. Since no standard test procedures exist for reprocessed materials (and original tests were not developed with the use of such materials in mind), appropriate test methods may be chosen by the Department for review. Department approval does not relieve the binder supplier from full responsibility for content and use of any previously used material in a PG Binder nor guarantee suitable performance enhancement as defined above. The detected presence in a PG Binder sample of any unapproved previously used material will mean immediate removal from Supplement 1032 certification. Limit approved reprocessed materials to 6.0 percent by PG Binder weight.

5.4 Ensure the PG Binder is homogeneous, free from water and deleterious materials, and does not foam when heated to 350 °F (175 °C). Prove the asphalt binder (before modification or after modification if liquid modifier used) is fully compatible with a negative result by means of the Spot Test per AASHTO T 102 using standard naphtha solvent. If standard naphtha shows a positive result, a retest using reagent grade 35 percent Xylene/ 65 percent Heptane (volume) may be used.

5.5 Ensure the PG Binder is at least 99.0 percent soluble as determined by AASHTO T44. Ensure any insoluble component is free of fibers or discrete particles more than 75 µm.

5.6 Ensure flash point is 500 °F (260 °C) minimum. Ensure mass change on RTFO of the final PG Binder grade is 0.5 percent maximum.

5.7 Ensure that PG 64-22 has a Penetration (AASHTO T49) of no more than 75.

5.8 Direct Tension testing is not required, unless otherwise required in this specification.

Requirements for PG Modified Binder. Furnish PG Modified Binder according to the requirements of Table 702.01-1 by modifying a non-oxidized, non-air blown, neat asphalt binder by using a styrene butadiene latex rubber compound (SBR polymer), a styrene butadiene styrene polymer block copolymer (SB, SBS polymer), an ethylene/ nbutyl acrylate/ glycidyl methacrylate copolymer (Elvaloy) as specified or Ground Tire Rubber (GTR) according to Supplemental Specification 887. For SB, SBS products the polymer supplier will certify to the refiner and Contractor that the polymer used meets a minimum 68 percent by weight butadiene content. Perform SB, SBS, Elvaloy or GTR modification prior to shipment to the asphalt concrete mixing plant (pre-blend). Perform SBR modification at the asphalt concrete mixing plant (post-blend) or prior to shipment to the asphalt concrete mixing plant (pre-blend) where allowed by specification.

Polyphosphoric acid (PPA) is allowed in PG binders as follows. PPA is a polymer of orthophosphoric acid. When using PPA ensure all the applicable requirements of the required PG binder in Table 702.01-1 are met. Ensure PPA does not contain water. To retain Supplement 1032 certification suppliers of PPA modified asphalt will provide a written certification to OMM that the

amount of PPA used is less than 1.0% by weight of neat binder. Suppliers of PPA can have their Supplement 1032 certification removed for not following the above PPA requirements.

For each project, the PG Modified Binder supplier will give the Contractor a handling guide specifying temperature, circulation, shelf life, and other requirements for assuring the PG Modified Binder will perform as desired. Give this handling guide to the Monitoring Team and place a copy in the plant control room and plant laboratory.

If PG Modified Binder is retained at the asphalt concrete mixing plant for more than two weeks before use or beyond the supplier recommended shelf life, whichever is less, a top and bottom sample test (material property difference between samples taken from the top and bottom of the storage tank) will be performed by the Laboratory on samples retrieved by the Contractor at the District's direction. Do not use material on hand until approved.

**Table 702.01-1
Material Requirements for PG Modified Binder**

Test / Requirement	SBR Polymer		Pre Blended Binder				Note
	70-22M (a, b)	64-28 (b)	64-28 (a)	70-22M (a,k)	76-22M (a,k)	88-22M (a,l)	
Final PG Binder Grade							c
Actual Pass Temperatures	Report						i
RTFO Mass Change, percent max	0.5						d
Phase Angle, max	78		80	76			d
Elastic Recovery, min			65	75	90		e, d
Toughness, in. lb	125	105					f, d
Tenacity, in lb.	70	80					f, d
Elongation, in. min	20	20					f, d
Ductility, in. min	28	28					j, d
Separation, F max	10						g, d
Homogeneity	None Visible						h, d

a. Pre-blended Binder. Use a base neat asphalt binder that is a -22 grade for 70-22M and 76-22M. Use a base neat asphalt binder that is a -28 grade for 64-28. 64-28 can be neat, PPA modified or modified with SB, SBS or Elvaloy. Ensure SB, SBS or Elvaloy modified 64-28 meets all requirements listed. Rotational viscosity for 88-22 not required.

b. Post-blended Binder made from neat Supplement 1032 certified or preapproved standard PG Binder grade and SBR solids amount equal to or above 3.5 percent by weight of total binder to achieve the PG Binder grade. Ensure all listed properties are met.

c. Without Direct Tension, graded with actual pass temperatures

d. PG Modified Binder

e. AASHTO T301, 10cm @ 77 °F (25 °C), hold 5 min. before cutting, on RTFO material for SB, SBS, Elvaloy

f. ASTM D 5801, 50cm/min @ 77 °F (25 °C)

g. Softening point difference of top and bottom of tube sample conditioned at 340 °F (171 °C) for 48 hours. Compatibility of polymer and neat binder is sole responsibility of supplier. Formulate PG Modified Binder to retain dispersion for 3 days minimum.

h. Heat a minimum 400 gram sample at 350 °F (177 °C) for 2.5-3 hours. Pour entire sample over a hot No 50 (300 µm) sieve at 340°F (171 °C). Look for retained polymer lumps.

- i. Actual high and low temperature achieved by PG Modified Binder beyond required grade, but will not grade out to the next standard PG Binder grade for low temperature.
- j. AASHTO T51, @ 39 °F (4 °C), 1 cm/min
- k. SB, SBS, Elvaloy or Supplemental Specification 887 GTR
- l. SB, SBS, Elvaloy

706.02

On page 742, **Replace** part 6.2.4 with the following:

6.2.4 Ensure that no more than two holes are cast, drilled, or otherwise neatly made in the shell of each piece of pipe for the purpose of handling or laying. Taper the holes unless drilled, and before backfilling, fill the tapered holes with portland cement mortar, precast concrete plugs secured with portland cement mortar, or a device on the Department's approved list specifically designed for filling the hole. Fill drilled holes with portland cement mortar.

706.04

On page 749, **Replace** part 10 with the following:

10 Ensure that no more than two holes are cast, drilled, or otherwise neatly made in the shell of each piece of pipe for the purpose of handling or laying. Taper the holes unless drilled, and before backfilling, fill the tapered holes with portland cement mortar, precast concrete plugs secured with portland cement mortar, or a device on the Department's approved list specifically designed for filling the hole. Fill drilled holes with portland cement mortar.

706.05:

On page 752, **Replace** the first paragraph with the following:

7.1 For the following box sizes, span by rise, refer to ASTM C1577: 8x4, 5, 6, 7; 10x5, 6, 7, 8, 9; and 12x4, 6, 8, 10 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.

706.051

On page 752, **Revise** the 4th paragraph of 706.051 as follows:

Ensure that the manufacturer submits design calculations, a structural load rating and shop drawings according to 611.04. Ensure that the shop drawings include the following:

706.052

On page 757, **Revise** the 4th paragraph of 706.052 as follows:

5. Ensure the manufacturer submits design calculations, a structural load rating and shop drawings according to 611.04. Ensure the shop drawings include the following:

706.053

On page 761, **Revise** the 4th paragraph of 706.053 as follows:

5. Ensure the manufacturer submits design calculations, a structural load rating and shop drawings according to 611.04. Ensure the shop drawings include the following:

706.13

On page 767, **Replace** part 7 with the following:

7.0 Ensure that no more than two holes are cast, drilled, or otherwise neatly made in the shell of each piece of each riser section for the purpose of handling or laying. Taper the holes unless drilled, and before backfilling fill the tapered holes with portland cement mortar, precast concrete plugs secured with portland cement mortar, or a device on the Department’s approved list specifically designed for filling the hole. Fill drilled holes with portland cement mortar.

708.01

On page 784, **Revise** the second paragraph to:

5.1 A green colorant approximately No. 34159 of FS 595C.

708.02.B.1.f

On page 785, **Revise** sentence in **f. Color** to:

Greenish gray, approximating **FS-595C-34159**, visual comparison.

708.02.C.1.f

On page 785, **Revise** sentence in **a. Color** to:

White, meeting or exceeding, **FS-595C-37875** according to **ASTM E 1347**.

708.02.D.1.a

On page 786, **Revise** sentence in **a. Finish, Specular gloss, ASTM D 523** to:

Use Fed. Std. 595C-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.(1)

On page 786, **Revise** the table in **f. Colors** to:

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

Brown	FS-595C, 10324
Green	FS-595C, 14277
Blue	FS-595C, 15526
^[2] Contractor’s choice unless specified on plans	

712.14

On page 815, **Add** the entire section **712.14 Detectable Warning Devices** as follows:

712.14 Detectable Warning Devices Furnish materials conforming to the following requirements:

Products must be compliant with the Americans with Disabilities Act (ADA).

Products will be designed to be physically embedded into concrete and be of a color that visually contrasts with the concrete. Do not use black as a color.

Products may be manufactured from materials of cast iron, stainless steel, polymer concrete, reinforced polymer composite, or granite. Products may be designed as either one time installation products or replaceable products.

Surface applied, stamped concrete, concrete, and brick products will not be permitted.

Detectable Warning Devices will be provided with a minimum 5 year written warranty with at least the following:

1. The installed device will remain ADA compliant for the term of the warranty period.
2. During the warranty period at least 85% of the truncated domes on installed device will remain entirely intact.

3. The installed device will remain securely affixed to and flush with the concrete substrate.
4. Any surface coating applied to the installed product will remain in place and color fast.
5. At no cost to the Department, the manufacturer will replace the product, including all installation costs, if during the 5 year warranty period the product fails to comply with the above warranty requirements. Any new device installed under the warranty will meet the requirements of this specification

As part of the Department Acceptance process for inclusion on the Qualified Product's List (QPL) submit the proposed warranty to the Department along with material samples, dimensional drawings, and written installation procedures.

Upon acceptance by the Department the materials will be listed on the QPL
Furnish materials according to the Department's Qualified Product List (QPL)

Begin warranty period upon Contract acceptance.

At the preconstruction meeting provide the Engineer with the written warranty signed by the executive officer of the manufacturing company

725.11.C

On page 777, **Delete** the following sentence from the second paragraph:

If the ballast is to be wired line to grounded neutral or phase to grounded neutral, the ballast may be either the isolated primary winding design or the auto transformer design.

730.14

On page 838, **Replace** the entire section with the following

Furnish sand castings according to ASTM B 26/B 26M, 356-T6 or T7. Furnish self-aligning aluminum extrusheet sign mounting clips with manufacturer identification mark conspicuously incorporated in relief on the top surface of the casting, and in accordance with Supplemental Specification 992. Furnish permanent mold castings according to ASTM B 108, 356-T6 or T7. Furnish certified material according to Supplement 1092 or 1093.

732.01

On page 843, **Add** the following sentence after the sixth sentence in the third paragraph of the section:

Tri-studs shall be secured to the head using stainless steel nylon-insert or distorted thread locknuts.

732.01

On page 843, **Add** the following sentence after the third paragraph of the section:

For polycarbonate signal heads, obtain proper exterior colors by use of colored plastic rather than painting.

732.11

On page 853, **Add** the following sentences at the end of the first paragraph:

A rectangular, rounded-corner aluminum Pole Identification Tag with minimum dimensions of 1 x 3 x 0.040 inches shall be attached to the pole at a height of 6 inches above the base plate. The Pole Identification Tag shall be clearly and deeply stamped with the ODOT Standard Construction Drawing Number, Design Number, and the fabrication date of the pole (e.g., TC-81.21, DES. 12, 05-12) in characters with a minimum height of 3/8 in. Attach to the pole with four stainless steel 3/16 inch rivets.

732.11

On page 853, **Replace** the last sentence in the third paragraph with the following:
Weld according to 513.21

732.12

On page 854, **Add** the following sentences at the end of the first paragraph:
A rectangular, rounded-corner aluminum Pole Identification Tag with minimum dimensions of 1 x 3 x 0.040 inches shall be attached to the pole at a height of 6 inches above the base plate. The Pole Identification Tag shall be clearly and deeply stamped with the ODOT Standard Construction Drawing Number, Design Number, and the fabrication date of the pole (e.g., TC-81.21, DES. 12, 05-12) in characters with a minimum height of 3/8 in. Attach to the pole with four stainless steel 3/16 inch rivets.

733.03

On page 862, **Add** the following paragraph after the fifth paragraph:
Any fasteners (rivets, bolts, etc.) that penetrate the cabinet exterior shall be tack-welded or brazed on the inside surface to prevent punch-thru if the fastener head is ground off from the outside. The preferred method of cabinet construction uses no such fasteners, but internal welds only.

733.03.A.2.i

On page 867, **Replace** the third sentence in the section with the following:
Wire a second non-GFCI convenience outlet, not fed thru the UPS system (if used).

733.03.B.1.i

On page 871, **Replace** the second sentence in the section with the following:
Furnish a pushbutton with a 5-foot (1.5 m) cord, and panel connector, not hard wired, unless a strain-relieving panel feed-thru bushing is provided.

733.03.B.1.k

On page 871, **Replace** the third sentence in the section with the following:
This relay shall maintain output equal to or exceeding the requirements of the cabinet main overcurrent protective device over the NEMA TS-2 Environmental Operating Range of -30 to +165 degrees Fahrenheit.

733.03.C.4.a

On page 874, **Add** the following sentence after the first paragraph:
Flash Transfer Relays shall use AC coils only; the use of a series rectifier in combination with a DC coil is prohibited.

733.03.C.4.b

On page 874, **Replace** the section in its entirety with the following:
Furnish a rack mounted detector test panel with test switches. Test switches shall call vehicle phases 1-8, pedestrian phases 2,4,6,8 and EVPE channels A,B,C,D as defined in the published ODOT Plan Insert Sheet for default 332/336 cabinet input file assignments. Furnish switches with three position "on/off/momentary on" switches.

733.03.E.1

On page 884, **Replace** the section in its entirety with the following:

1. General. Furnish Model 336 cabinets that meet the basic cabinet specifications “Traffic Signal Control Equipment Specifications”, California Department of Transportation, latest edition. Ensure that the manufacturer of these Model 336 cabinets is listed on the ODOT QPL.

733.09.A

On page 891, **Replace** the second paragraph in its entirety with the following:

Ensure the UPS cabinet has a mastic tape, neoprene foam, or silicone weather-resistant seal between the cabinet bottom flange and the concrete foundation. Minimum tape thickness shall be 1/8-inch (3 mm) and the tape shall be continuous with no gaps between tape pieces or between cabinet and foundation. Sealing tape shall completely cover the bottom cabinet flange and shall be rated for a temperature range of at least -30 °F to +140° F.

733.03.D

On page 884 **Add** the following subsection:

D. Type 334.

1. General. Furnish Model 334C cabinets that meet the specifications “Traffic Signal Control Equipment Specifications” and “Transportation Electrical Equipment Specifications”, California Department of Transportation. Ensure that the manufacturer of the cabinets is listed on the CalTrans QPL at the time of the project award.

2. Cabinets. Furnish cabinets that are constructed of aluminum and are supplied unpainted. An anodic coating is not required. Supply galvanized anchor bolts with nuts and washers with each cabinet. Furnish 3/4-inch (19 mm) diameter by 16 inches (0.4 m) minimum length anchor bolts with an “L” bend on the unthreaded end.

3. Terminals and Wiring. Ensure that the vehicle detector field wiring inputs connect to side mounted terminal blocks. Install terminal blocks and associated wiring to the input file. Label the field wiring terminals of the side mounted terminal block by a permanent screening process to identify the input panel (I), the input file slot number (1 through 14) and the channel terminal (D, E, J, or K). An example is “I4-E”. Ensure that all terminals on these detector blocks are accessible without removing equipment from the EIA mounting rack.

4. Accessories.

a. Fully equip the cabinets with two channel loop detector sensors, transfer relay, power supply, conflict monitor and switchpacks. When ramp meter warning signs with flashers are used, include a NEMA or Caltrans type flasher wired for control from the controller.

b. Furnish a police panel in each cabinet with the Caltrans required switches. No pushbutton with cord is provided.

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

d. Ensure that each cabinet has two fluorescent lights installed at the top of the cabinet, one near each door. Wire the lights to the door switches such that opening either door will turn on both lights.

5. Lightning/Surge Protection. Comply with the requirements of 733.03.C.5.

6. Conflict Monitor. Furnish a Model 208 conflict monitor unit.

Furnish 334 cabinet according to the Department's Qualified Products List (QPL).

740.09

On page 853 **Replace** the entire section with the following:

740.09 Glass Beads.

Furnish certified test data for the arsenic and lead content of all glass bead samples sent to the Department for testing to ensure that all glass beads furnished to the Department contain no more than 200 parts per million of arsenic or lead as determined in accordance with Environmental Protection Agency testing methods 3052, 6010B, or 6010C, according to SEC 1504 STANDARDS. Section 109 of title 23, United States Code, (r) Pavement Markings.

A. Type A. Furnish Type A glass beads for traffic paint conforming to Supplement 1008 and to AASHTO M 247, Type 1 without flotation properties but dual coated (for moisture resistance and adhesion), with the following exception: 4.6 Flotation Test.

Ensure that the glass beads for traffic paint are packaged in bags designated "740.02". Use materials certified according to Supplement 1089.

B. Type B. Furnish Type B glass beads for polyester marking material conforming to Supplement 1008 and AASHTO M 247, Type 1 with 50 ± 5 percent flotation coating and ensure that a 50 ± 5 percent moisture resistant coating is retained on each sieve, with the following exception: 4.6 Flotation Test. Ensure that the minimum percent floating equals 90 of flotation coated beads or 40.5 percent of total mixture.

Ensure that the glass beads for polyester marking material are packaged in bags designated "POLY".

Use materials certified according to Supplement 1089.

C. Type C. Furnish Type C glass beads for thermoplastic material conforming to Supplement 1008 and meeting the following specification.

Sieve Size	Percent Retained		
No. 16 (1.18 mm)	3 maximum	Refractive Index	1.50 to 1.60
No. 20 (850 μ m)	5 to 20	Roundness	80 minimum
No. 40 (425 μ m)	65 to 95	Coating	Moisture resistant (for drop-on beads only)
No. 50 (300 μ m)	0 to 5		

Ensure the glass bead packaging is clearly marked "THERMO"

Use materials certified according to Supplement 1089.

D. Type D. Furnish Type D glass beads for Epoxy Pavement Marking conforming to Supplement 1008.

Ensure that the glass bead packaging clearly indicates EPOXY - SIZE I or EPOXY SIZE II.

Ensure that the glass beads have the following gradation when tested according to Supplement 1089.

SIZE I		SIZE II	
Sieve Size	Percent Retained	Sieve Size	Percent Retained
No. 10 (2.00 mm)	0	No. 20 (850 μm)	0 to 5
No. 12 (1.70 mm)	0 to 5	No. 30 (600 μm)	5 to 20
No. 14 (1.40 mm)	5 to 20	No. 50 (300 μm)	30 to 75
No. 16 (1.18 mm)	40 to 80	No. 80 (180 μm)	9 to 32
No. 18 (1.00 mm)	10 to 40	No. 100 (150 μm)	0 to 5
No. 20 (850 μm)	0 to 5	Pan	0 to 2
Pan	0 to 2		

Reflective Media: Ensure that the glass beads are smooth, clear, free from any air inclusions, and scratches that might affect their functions as a retro-reflective media, and that have the characteristics listed below.

Roundness (Percent by Weight): Ensure that not more than 20 percent of the glass beads are irregular or fused spheroids and that at least 80 percent of the beads are true beads.

Index of Refraction: Ensure that the refractive index of the beads is a minimum of 1.50 as determined by the liquid immersion method at 77 °F (25 °C). Ensure that the silica content of glass beads is not less than 60 percent.

Coating: Furnish Size I glass beads that are coated with a silane-type adherence coating to enhance its embedment in, and adherence to the applied binder film. Ensure that the coated beads emit a yellow-green fluorescence when tested by the Dansyl Chloride test procedure. Furnish Size II glass beads that are treated with a moisture-proof coating. Ensure that both types of glass beads show no tendency to absorb moisture in storage and remain free of clusters and lumps. Ensure that they flow freely from the dispensing equipment at any time when surface and atmosphere conditions are satisfactory for marking operations.

Determine the moisture-resistance of the glass beads on the basis of the following test:

Place 2.2 pounds (1 kg) of beads in a washed cotton bag, having a thread count of 50 per square inch (8/cm²) (warp and woof) and immerse the bag in a container of water for 30 seconds. Remove the bag and force the excess water from the sample by squeezing the bag. Suspend and allow them to drain for two hours at room temperature 70 to 72 °F (21 to 22 °C). After draining, mix the sample in the bag by shaking thoroughly. Transfer a sample slowly to a clean, dry glass funnel having a stem 4 inches (100 mm) in length, with a 3/8-inch (10 mm) inside diameter stem entrance opening, and a minimum exit opening of 1/4 inches (6 mm). Ensure that the entire sample flows freely through the funnel without stoppage. When first introduced to the funnel, if the beads clog, it is permissible to tap the funnel to initiate flow.

Use materials certified according to Supplement 1089.

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 804
FIBER OPTIC CABLE AND COMPONENTS**

July 19, 2013

- 804.01 Description**
- 804.02 General**
- 804.03 Materials**
- 804.04 Warranties**
- 804.05 Fiber Optic Cable**
- 804.06 Fan-Out Kit**
- 804.07 Drop Cable**
- 804.08 Fiber Optic Patch Cord**
- 804.09 Fiber Termination Panel**
- 804.10 Fusion Splice**
- 804.11 Fiber Optic Connectors**
- 804.12 Splice Enclosure**
- 804.13 Fiber Optic Media Converter**
- 804.14 Testing**
- 804.15 Packaging and Shipping**
- 804.16 Fiber Optic Training**
- 804.17 Method of Measurement**
- 804.18 Basis of Payment**

804.01 Description

This work consists of furnishing and installing fiber optic cable and components. This specification describes the requirements for communication system cables, splicing, associated interface devices, and power cables.

804.02 General

All materials and equipment furnished shall be new, of first quality, of latest design and be completely free of defects in material and poor workmanship. All materials, cables, fiber and hardware shall be of the same type and manufacturer to assure uniformity, interchangeability of components, single responsibility and most satisfactory service. Each major component shall have the manufacturer's name, type or style, model number and serial number on a weatherproof decal or tag permanently attached to the equipment. All fibers in the cable shall be usable fibers and shall be free of surface imperfections, material and inclusions in order to meet or exceed one hundred percent (100%) of the optical, mechanical, and environmental requirements contained in this specification.

A. Applicable Documents

All work described in this section shall meet or exceed the applicable provisions of the following industry documents:

1. U.S Department of Agriculture, Rural Electrification Administration Specification for Totally Filled Optical Fiber Cable, PE-90
2. EIA/TIA-455-a, Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components
3. EIA/TIA-455-25a, Repeated Impact Testing Of Fiber Optic Cables and Cable Assemblies
4. EIA-455-28b, Method for Measuring Dynamic Tensile Strength of Optical Fibers
5. EIA-455-33a, Fiber Optic Cable Tensile Loading and Bending Test
6. EIA-455-34, Interconnection Device Insertion Loss Test
7. EIA-455-41, Compressive Loading Resistance of Fiber Optic Cables
8. EIA/TIA-455-81a, Compound Flow (Drip) Test for Filled Fiber Optic Cable
9. EIA/TIA-455-82b, Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable
10. EIA-455-89a, Fiber Optic Cable Jacket Elongation and Tensile Strength
11. EIA-455-95, Absolute Optical Power Test for Optical Fibers and Cables
12. EIA-455-104, Fiber Optic Cable Cyclic Flexing Test
13. EIA/TIA-598, Color Coding of Fiber Optic Cables
14. EIA/ANSI-472 Generic Requirement for Optical Fiber and Optical Fiber Cables
15. ANSI/ICEA S-87-640
16. ANSI/TIA/EIA-526-7: OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

804.03 Materials

Furnish materials conforming to: 904.01. Provide all materials required for the installation and splicing of the specified communications cables, power cables, and associated interface devices. All materials, cables, fiber and hardware shall be commercially-available items.

804.04 Manufacturer Warranties

Provide a three (3) year manufacturer's warranty to all items contained in this specification with the exception of fiber optic cable, which shall be warranted by the manufacturer for a period of one (1) year. This one (1) year transferrable warranty shall cover the cable against significant degradation of the fiber caused by cable defects incurred either during the manufacturing or installation process.

804.05 Fiber Optic Cable

Fiber optic cable shall be loose tube, single-mode dielectric cable.

In instances where new fiber optic cable is being spliced to existing fiber optic cable, THE NEW CABLE SHALL MATCH the existing type of fiber optic cable, unless it does not meet the following specifications:

1. ITU-T G.652 (Categories A, B, C and D)
2. IEC Specification 60793-2-50 Type B1.3
3. TIA/EIA 492-CAAB
4. Telecordia GR-20

Provide written manufacturer certification that the offered cable complies with all optical, electrical and mechanical requirements set forth in this and all referenced specifications. Any deviation of the offered cable from the requirements set forth herein shall be conspicuously noted by colored highlights and/or callout bubbles in the submitted material documentation. All cables shall be free of material or manufacturing defects and dimensional non-uniformity that would:

1. Interfere with the cable installation using acceptable installation practices.
2. Degrade the transmission performance and environmental resistance after installation.
3. Inhibit proper connection to interfacing elements.
4. Otherwise yield an inferior or inoperative installation.

Certain mechanical requirements such as central anti-buckling members and other items necessary to comply with the maximum bend requirements in 904.01 may be omitted, if approved by the Engineer.

A. Cable Wraps

Cable Wraps

Furnish and install cable wraps (markers) on the fiber optic cable installed in each pull box (median and round). The wraps shall be 4 inches long “snap on type”, UV stabilized, and solid color throughout. The wording shall include no advertising logo or message.

Color and text shall be as follows:

For ODOT cable: yellow background with black print text “ODOT fiber optic cable – ITS 614-387-4113”. The cable wraps shall also include the fiber count of the appropriate fiber it is placed upon.

B. Cable Installation

When ordering optical fiber cable, extreme caution shall be exercised so as to ensure that no additional splicing, beyond that indicated in the plans, shall be required. Should the Contractor believe additional splices are required; this matter shall be immediately brought to the attention of the Engineer for resolution. The contractor shall be certified by the cable manufacturer to perform installation with the cable manufacturers recommended procedures including, but not limited to the following:

1. Proper attachment to the cable strength elements for pulling during installation.
2. Cable tensile limitations and the tension monitoring procedures.
3. Cable bending radius limitations.

Contractor shall present certification to Engineer prior to installing any cable.

Comply with the cable manufacturer's specifications at all times. To accommodate long continuous installation lengths, bi-directional pulling of the optical fiber cable is permissible and shall be implemented as follows:

1. From the midpoint of a pull station, pull the fiber optic cable into the conduit from the shipping reel in accordance with the manufacturer's specifications.
2. When this portion of the pull is complete, the remainder of the cable shall be removed from the reel to make the inside end available for pulling in the opposite direction.

3. This is accomplished by hand pulling the cable from the reel and laying it into large "figure eight" loops on the ground. The purpose of the figure eight pattern is to avoid cable tangling and kinking.
4. The figure eight loops shall be laid carefully one upon the other (to prevent subsequent tangling) and shall be in a protected area.
5. The inside reel end of the cable shall be available for installation.
6. Should it be necessary to set up a winch at an intermediate manhole or pull box, the required length of cable shall be pulled to that point and brought out of the manhole and coiled into a figure eight.
7. The figure eight is then turned over to gain access to the free cable end. This can then be reinserted into the duct system for installation into the next section.

Ensure that the minimum bending radius of the optical fiber cable is not compromised when preparing this stored cable slack. Installation shall involve the placement of optical fiber cables in an inner duct. Ensure that inner ducts are secured to prevent movement during the cable installation process.

The sheath termination hardware on the optical fiber cables shall not be pulled over any sheave blocks.

When power equipment is used to install optical fiber cabling, the pulling speed shall not exceed 100 feet per minute. The pulling tension and bending radii limitation for optical fiber cables shall not be exceeded under any circumstances. Large diameter wheels, pulling sheaves, and cable guides shall be used to maintain the appropriate bending radius. Tension monitoring shall be provided at all times during the pulling operation and shall be accomplished using commercial dynamometers, load cell instruments, or shearing pins.

B.1. Slack Installation

Proper storage of slack cable, both long term and short term, will be required. Slack cable shall not be left lying free on the ground or floor of a building except during the actual pulling process. The cable shall be neatly coiled, adhering to the bend radius requirements, on racks or bays, as directed by the Engineer. Submit certified shop drawings of the materials and installation of the anchored mounting channels to be installed in pull boxes and aerial hardware according to 625.06. The cost for the fiber optic cable used in the slack installation (both aerial and underground) and mounting hardware shall be included in this pay item and shall be paid per location per cable.

B.1.A. Underground Slack Installation

In underground installations, coil 150 feet of fiber slack in each 48" or 32" pullbox. Should the Contractor believe that this amount of slack is not capable of being stored, the Engineer shall provide direction.

B.1.B. Aerial Slack Installation

Where slack installation is designated, but a splice enclosure is not designated, provide a 100 feet in-line aerial mounted slack cable installation.

Where an aerial splice enclosure is shown, provide 50 feet of aerial mounted slack for each cable entering the splice enclosure. Where the fiber cable is being brought aerially into an underground installation, provide 40 feet of slack for each cable run entering the designated pull box.

804.06 Fan-Out Kit

Only four (4) drop cable fibers are required for the full duplex daisy-chain fiber optic communication design; the remaining fibers are typically unused spares. Fan out and apply connectors to all unused drop cable fibers and insert them into the termination panel. Color coded, Pre-connectorized, pre-tested pigtailed may also be used. Connectors attached to fibers from the fan-out kit shall be incidental to the fan-out kit.

804.07 Drop Cable

Drop cables are used to connect the fiber trunk cable to termination point. Unused drop cable fibers shall be left for future use. Spare drop cable fibers at the splice enclosure end shall be placed inside of the enclosure with sufficient excess to provide two service loops.

Spare drop cable fibers at the device end shall be inserted into the fan-out kit, connectorized and inserted in the termination panel.

Drop cables routed down through a pole from aerial interconnect shall be provided with strain relief (cable support assembly). Cost of the cable support assembly shall be incidental to the bid item price of the drop cable. A minimum of 15 feet (4.5 meters) slack drop cable shall be provided in each device cabinet or termination panel location. Slack drop cable shall be coiled and bound to the cabinet or wall via tie wrap or other approved means. Any means of securing the slack cable shall NOT apply stress to the drop cable. Tie wraps shall be loosely wrapped around the cable.

804.08 Fiber Optic Patch Cord

Patch cords for connections to/from fan-out kits and/or fiber termination panels shall be equipped with approved connectors on both ends of the patch cord. The optical connectors on the other end of these patch cords shall be compatible with the connectors furnished on the optical device transmit and receive cards. Patch cords shall be of a length that minimizes the amount of slack that needs to be stored in the cabinet.

804.09 Fiber Termination Panel

Provide a termination panel in a place that provides the most room for making connections, minimizes fiber bending, and does not subject fibers to interference from door openings or routine maintenance operations inside the cabinet space.

A. NEMA Cabinet

Termination panel shall be attached to the inside wall of the cabinet.

B. Caltrans Signal Cabinet (332, 336)

Termination panel shall utilize standard 19-inch rack mount panels.

C. Caltrans (334) or AASHTO/ITE/NEMA ITS Cabinet

Termination panel shall utilize standard 19-inch rack mount panels.

An emergency restoration kit shall be provided with each fiber termination panel to perform temporary splices. This kit shall include all necessary materials to perform a minimum of 5 mechanical splices. Tools, such as cleavers, strippers, etc, shall be provided by the owning agency. Each mechanical splice kit shall be capable of achieving not more than 0.5dB loss at any wavelength and contain LC/SC/ST type connectors. This kit shall be incidental to each termination panel. The emergency restoration kit shall be of the same manufacturer as the cable being installed.

804.10 Fusion Splicing

All permanent optical splices shall be of the core alignment fusion type method. Splicing shall occur only at locations identified in the plans or approved by the Engineer. The splicing of fibers shall be between fibers of identical color contained in fiber buffer tubes of identical color (splice through in-kind fibers inside of in-kind buffer tubes), or as specified in the plans. All splicing equipment shall be in good working order, properly calibrated, and meeting all industry standards and safety regulations. Cable preparation, closure installation, and splicing shall be accomplished in accordance with accepted and approved industry standards. Upon completion of the splicing operation, all waste material shall be deposited in suitable containers, removed from the job site, and disposed of in an environmentally acceptable manner. No individual splice loss measured in a single direction shall exceed 0.05 dB.

804.11 Fiber Optic Connectors

In the event that particular components proposed in the system are not compatible or cannot fit within the cabinets with the proposed type connectors, the contractor shall detail a plan to use other connectors to the Engineer for approval. The plan shall include the type of connector, except for the pigtails connecting to the components requiring different connectors, and new proposed cabinet layout. The contractor shall be compensated for any change in materials and any labor involved. Optical fiber connectors shall satisfy all of the interface parameters of equipment components as may be defined by the transmission equipment specifications.

Pigtails shall have sufficient length to extend from the fiber splice closure to the termination panel, allowing for routing, securing, and slack. The connector shall be pre-terminated on the fiber cable or pigtail and core-aligned fusion spliced to the fiber trunk cable.

No-epoxy, no-polish quick mount single-mode UPC connectors shall be provided.

804.12 Splice Enclosure

At splice locations, a ring cut methodology shall be used, as described below. Trunk cable jacketing shall be cut back a sufficient distance to allow unused trunk fiber tubes to be stored uncut/unopened with two service loops inside the enclosure. The trunk cable tube that contains the interconnect fibers shall be opened to expose the inner fibers. The remaining trunk cable fibers in the opened tube shall remain uncut and stored in the splice tray with a minimum of two service loops. The only trunk cable fibers that are to be cut are the trunk cable fibers being spliced into the drop cable. Cost for the splices shall be incidental to the fiber optic cable being spliced. If all fiber optic cable is existing, then splices will be itemized separately. If the contractor must cut the cable at the splice enclosure location, the additional splices for through fibers shall be included in the cost of the splice enclosure.

804.13 Fiber Optic Media Converter

Traffic signal controllers and/or cabinets and ITS cabinets are to be equipped with media converters. Install and activate each media converter in the controller housing or cabinet.

804.14 Testing

All testing listed below shall be incidental to the cost of the fiber optic cable and shall be completed and approved, prior to acceptance of the fiber optic cable by the Engineer.

A. Optical Fiber Cable Factory and Reel Testing

Obtain a factory test data sheets for each reel of optical fiber cable delivered. The tests shall be performed by the factory at 1550 nm and shall include directional Optical Time Domain Reflectometer (OTDR) traces and test data for each fiber in the cable. Each fiber on the reel shall be tested at 1550 nm prior to installation to ensure no damage occurs to the fiber in transit and that the length of cable is correct. These two test results shall be provided to the Engineer prior to installation as part of final acceptance of the section of cable for payment.

All cabled optical fibers > 1000 meters in length shall be attenuation tested. The attenuation of each fiber shall be provided with each cable reel. Supply the Engineer with the factory, and pre-installation test results documenting that the cables meet all relevant EIA specifications.

Single-mode fibers utilized in the cables specified herein shall be subjected to and successfully pass a tensile proof stress test equivalent to 100 kpsi (0.70 gN/m²) for 1.0 second.

Fibers shall contain no factory splices.

B. Post-Installation Testing

Test all continuous fiber with a light source utilizing procedures as stated in ANSI/TIA/EIA-526-7: MEASUREMENT OF OPTICAL POWER LOSS OF INSTALLED SINGLE-MODE FIBER CABLE PLANT - OFSTP-7. Testing procedures shall utilize – one jumper reference. Bidirectional testing of optical fibers shall be performed.

Coordinate with the Engineer for specific locations for the testing. Provide the Engineer written notification a minimum 14 calendar days before testing the fiber optic cable. Testing shall not begin unless receiving written authorization and fiber locations and test points from the Engineer.

Tests shall be performed as listed below:

1. All single mode fiber cables shall be tested at both 1310 nm and 1550 nm after installation.

Fibers will be considered acceptable if the Optical Time Domain Reflectometer (OTDR) trace for that fiber shows an end to end loss of less than $xx \text{ dB} + yy (0.05)\text{dB} + zz (0.2)\text{dB}$ (where yy is the number of splices (a number to be provided by the Engineer), zz is the number of connector pairs and xx is calculated using the following formula: $xx = \text{distance} \times \text{fiber attenuation/unit distance at the required wavelength}$). In addition, no splice may show a loss of greater than 0.05 dB and no connector pairs

may show a loss of greater than 0.2 dB, regardless of the total accumulated end-to-end loss. Any additional tests required by the ANSI/TIA/EIA standard shall also be performed and also included in the written test report.

2. Test each fiber strand from both ends of the fiber utilizing an OTDR at the wavelengths specified above. Overall, the OTDR test results shall be made up of the wavelength of the conducted test, the link length, attenuation, cable identification, and the locations of the near end, the far end and each splice point or points of discontinuity. Electronic format results for each fiber strand shall be submitted as part of the final documentation, prior to acceptance. All test results shall be turned over to the Engineer in electronic format provided by the manufacturer of the test equipment used by the contractor to perform the tests. Those results must be provided such that they can be viewable without the use of special software or additional equipment, unless the software or equipment is also delivered to the Engineer. If software is provided, a separate pdf document showing all fiber test results must be submitted to be placed in the project file. Any software or equipment so delivered will become the permanent property of the maintaining agency and will not be returned.
3. If the cable fails to meet the above requirements, it shall be replaced by the Contractor at the Contractor's expense. Test results shall include a record of wavelength, fiber type, fiber and bundle number, test equipment and model number, date reference setup, and operator (crew members). In the event that test results are not satisfactory, make adjustments, replacements, and changes as necessary and then repeat the test or tests that disclosed faulty or defective material, equipment, or installation method. Additional tests shall be performed as the Engineer deems necessary. Tests related to connected equipment of others shall be done only with the permission and presence of the Contractor involved. Perform only that testing required to prove that the fiber connections are correct.

804.15 Packaging and Shipping

The completed cable shall be packaged for shipment on wooden reels.

The cable and reel shall be wrapped in a water resistant covering. Each end of the cable shall be securely fastened to the reel to prevent the cable from coming loose during transit. At least six feet of cable length on each end of the cable shall be accessible for testing. Both ends of the cable shall be sealed to prevent the ingress of moisture. Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, and the actual length of cable on the reel, the Contractor's name, the contract number, and the reel number. A shipping record shall also be included in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, etc.), cable identification number and any other pertinent information. The minimum diameter of the reel shall be at least thirty times the diameter of the cable. The optical fiber cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel shall be rolled to prevent loosening of the cable. Installation procedures and technical support information shall be furnished at the time of delivery.

804.16 Fiber Optic Training

Provide both formal classroom and "in-field" operations and maintenance training for up to twenty (20) designated personnel on the fiber optic cable system and its components. All training shall be coordinated at a mutually agreed upon time and location. All training material generated for each course shall contain "hand-outs" for each attendee. These hand-outs shall serve not only as subject guidance, but as quick-reference material for future use. All course material, in reproducible form, shall be delivered to the Engineer immediately following course completion. Two (2) DVD copies of the training program shall be provided. The schedule for such training shall be submitted to the Engineer for approval at least two (2) weeks prior to the proposed starting date.

A. Classroom Training

Personnel shall be trained to install, splice, and test fiber optic cable. This training shall be a minimum of 32 hours. The 32 hours of fiber optic training shall be a four (4) day course taught by personnel from the manufacturer of the fiber optic cable. Topics in the course shall include: safety, theory, fiber types, cable placement techniques, fiber optic sheath removal, hardware types, fault location with an Optical Time Domain Reflectometer (OTDR), Dense Wave Division Multiplexing (DWDM), splicing and termination methods and applications, theory and principles of splicing, fusion splicing, mechanical splicing, cable preparation procedures for installing optical connectors, installing connectors, mocking up a typical traffic control system, cable system testing and documentation, attenuation test procedures, and overall cable system maintenance. This course shall include lectures, demonstrations, and hands-on experience with the equipment. Students shall be given hand-outs to use as guides for field applications.

B. Field Training

Field training shall be provided. This training shall consist of the following as a minimum: eight (8) hours of fiber optic communications plant trouble shooting including fault location using an optical power meter/light source and using an Optical Time Domain Reflectometer (OTDR) cable tester, four (4) hours of field splicing (which shall include re-enterable rotary mechanical splicing (for emergency temporary repair) and fusion splicing techniques), and four (4) hours of training on the installation, maintenance, and replacement of fiber interconnect centers.

C. Course Outline And Workbooks

For both types of training, four (4) copies of all proposed training material shall be submitted for approval, which shall include course curriculums, draft manuals, and resumes of instructors. Submittals shall be made to the Engineer at least four (4) weeks prior to the scheduled starting date. For the classroom training, provide for each participant a course workbook, which shall be provided in loose-leaf format in a three (3) ring binder.

804.17 Method of Measurement

The Department will measure Fiber Optic Cable by the number of feet, excluding slack, and will include the costs for equipment, labor and miscellaneous materials.

The Department will measure Fan-Out Kit by the number of each, and will include all costs for material, equipment, tools and labor to provide and install the fan-out kit.

The Department will measure Drop Cable by the number of each, and will include all costs for material, equipment, tools and labor to provide and install the drop cable.

The Department will measure Fiber Optic Patch Cord by the number of each, and will include supplying and installing connectors on all ends of the patch cord.

The Department will measure Fiber Termination Panel by the number of each, and will include all materials, tools and labor to provide and install a termination panel.

The Department will measure Fusion Splice by the number of each, and will include all costs for equipment, material and labor to provide a permanent fused splice including splice protection.

The Department will measure Fiber Optic Connector by the number of each.

The Department will measure Splice Enclosure by the number of each, and will include aerial or pull box wall mounting brackets as required.

The Department will measure Slack Installation by the number of each, and will include all materials, equipment and labor to provide a slack installation.

The Department will measure Fiber Optic Media Converter by the number of each.

The Department will measure Fiber Optic Fusion Splicer by the number of each.

The Department will measure Fiber Optic Optical Time Domain Reflectometer (OTDR) by the number of each.

The Department will measure Fiber Optic Cleaver by the number of each.

The Department will measure Fiber Optic Power Meter by the number of each.

The Department will measure Fiber Optic Visual Fault Locator by the number of each.

The Department will measure Fiber Optic Training by the number of each.

804.18 Basis of Payment

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

Item	Unit	Description
804	Foot	Fiber Optic Cable, _____ Fiber
804	Each	Fan-Out Kit, _____ Fiber
804	Foot	Drop Cable, _____ Fiber
804	Each	Fiber Optic Patch Cord, _____ Fiber
804	Each	Fiber Termination Panel, _____ Fiber
804	Each	Fusion Splice
804	Each	Fiber Optic Connector
804	Each	Splice Enclosure
804	Each	Slack Installation
804	Each	Fiber Optic Media Converter
804	Each	Fiber Optic Fusion Splicer
804	Each	Fiber Optic, Optical Time Domain Reflectometer (OTDR)
804	Each	Fiber Optic Cleaver
804	Each	Fiber Optic Power Meter
804	Each	Fiber Optic Visual Fault Locator
804	Each	Fiber Optic Training

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 811
CONDUIT AND DRAINAGE STRUCTURES**

January 18, 2013

- 811.01 Conduit Description**
- 811.02 Conduit Materials**
- 811.03 Conduit Definitions**
- 811.04 Conduit Material Provisions**
- 811.05 Submittals**
- 811.06 Conduit Excavation**
- 811.07 Conduit Bedding**
- 811.08 Laying Conduit**
- 811.09 Joining Conduit**
- 811.10 Exterior Coatings and Membrane Waterproofing**
- 811.11 Conduit Backfilling**
- 811.12 Conduit Placement and Compaction Requirements**
- 811.13 Clearing Site and Restoring Damaged Surfaces**
- 811.14 Field Paving of New or Existing Conduit**
- 811.15 Conduit Method of Measurement**
- 811.16 Conduit Basis of Payment**
- 811.17 Structure Description**
- 811.18 Structure Materials**
- 811.19 Structure Construction Methods, General**
- 811.20 Structure Excavation and Backfill**
- 811.21 Structure Brick and Block Masonry**
- 811.22 Precast Structure Concrete Modular Construction**
- 811.23 Structure Concrete (Cast-In-Place)**
- 811.24 Structure Method of Measurement**
- 811.25 Structure Basis of Payment**

811.01 Conduit Description. This work consists of constructing or reconstructing long span structures, pipe culverts, sewers, and drains (referred to below as Type A, Type B, Type C, Type D, Type E, and Type F conduits formerly referred to as 603) per the 2010 CMS.

Use removed or excavated materials in the Work when the material conforms to the specifications; if not, then recycle or dispose of the material according to 105.16 and 105.17.

811.02 Conduit Materials. Furnish materials conforming to:

- Soil and granular embankment..... 203.02.R
- Structural backfill, Types 1 and 2 703.11

The Engineer will allow Type 3 structural backfill, conforming to 703.11, to be used as bedding below the pipe only when pumping operations do not control severe ground water problems. Place at least 12 inches (300 mm) of Type 1 structural backfill on top of the Type 3 structural backfill to prevent piping.

- Embankment..... 203.02.R

Concrete for collars and encasement, Class C.....	499 and 511
Concrete for field paving using aggregate No. 7, 8, or 78, Class C	499 and 511
Reinforcing steel (collars and encasement)	509.02
Mortar.....	602
Non-shrink mortar	705.22
Bituminous pipe joint filler	706.10
Resilient and flexible gasket joints for:	
Concrete sewer and culvert	706.11
Vitrified clay, B & S.....	706.12
Preformed butyl rubber joint filler	706.14
4x4 - W1.4 x W1.4 galvanized welded wire fabric for field paving	709.08
Type 2 membrane waterproofing	711.25
Type 3 membrane waterproofing	711.29
Fabric wrap, Type	712.09
Joint wrap	ASTM C 877, Type III
Buried Liner Waterproofing Membrane.	711.22

Furnish pipe of the size and kind specified in the Proposal and conforming to applicable subsections of 706 and 707. The metric equivalent pipe size may vary with material type for the same English size pipe. The difference in sizes shall not be construed as an exclusion of a material type. The kinds of pipe allowed for each of the designated types of conduit are as follows:

Type A Conduits - Culverts:

Non-reinforced concrete pipe, Class 3 ...	706.01
Reinforced concrete pipe.....	706.02
Reinforced concrete pipe, epoxy coated.	706.03
Reinforced concrete elliptical pipe.....	706.04
Precast reinforced concrete box sections	706.05
Precast reinforced concrete 3-sided flat topped culverts	706.051
Precast reinforced concrete arch sections	706.052
Precast reinforced concrete round sections	706.053
Vitrified clay pipe (extra strength only)	706.08
Corrugated steel conduits	707.01 or 707.02
Structural plate corrugated steel structures	707.03
Precoated, galvanized steel culverts.....	707.04
Bituminous coated corrugated steel pipe and pipe arches with paved invert	707.05 or 707.07
Corrugated aluminum alloy pipe	707.21 or 707.22
Aluminum alloy structural plate conduits.....	707.23

Corrugated steel box culverts	707.15
Corrugated aluminum box culverts	707.25

Type B Conduits - Storm sewers or sanitary under pavement:

Non-reinforced concrete pipe, Class 3 ...	706.01
Reinforced concrete pipe.....	706.02
Reinforced concrete elliptical pipe.....	706.04
Precast reinforced concrete box sections	706.05
Vitrified clay pipe (extra strength only) .	706.08
Mortar lined corrugated steel pipe.....	707.11
Corrugated steel spiral rib pipe	707.12
Bituminous lined corrugated steel pipe.....	707.13 or 707.14
Corrugated aluminum spiral rib pipe.....	707.24
Corrugated polyethylene smooth lined pipe	707.33
Polyvinyl chloride corrugated smooth interior pipe.....	707.42
Polyvinyl chloride profile wall pipe.....	707.43
Polyvinyl chloride solid wall pipe.....	707.45
Polyvinyl chloride drain waste and vent pipe	707.46
Polyvinyl chloride ABS composite pipe	707.47
Polyvinyl chloride large-diameter solid wall pipe	707.48
ABS drain waste and vent pipe	707.51
ABS sewer pipe.....	707.52
Ductile iron pipe (sanitary).....	748.01
Polyvinyl chloride pipe (sanitary)	748.02

Type C Conduits - Storm sewers or sanitary not under pavement:

Non-reinforced concrete pipe	706.01
Reinforced concrete pipe.....	706.02
Reinforced concrete elliptical pipe.....	706.04
Precast reinforced concrete box sections	706.05
Vitrified clay pipe.....	706.08
Mortar lined corrugated steel pipe.....	707.11
Corrugated steel spiral rib pipe	707.12
Bituminous lined corrugated steel pipe.....	707.13 or 707.14
Corrugated aluminum spiral rib pipe.....	707.24
Corrugated polyethylene smooth lined pipe	707.33
Polyvinyl chloride corrugated smooth interior pipe.....	707.42
Polyvinyl chloride profile wall pipe.....	707.43
Polyvinyl chloride solid wall pipe.....	707.45
Polyvinyl chloride drain waste and vent pipe	707.46
Polyvinyl chloride ABS composite	

pipe	707.47
Polyvinyl chloride large-diameter	
solid wall pipe	707.48
ABS drain waste and vent pipe	707.51
ABS sewer pipe	707.52
Ductile iron pipe (sanitary).....	748.01
Polyvinyl chloride pipe (sanitary)	748.02

Type D Conduits - Drive pipes and bikeways:

Non-reinforced concrete pipe, Class 3 ...	706.01
Reinforced concrete pipe.....	706.02
Reinforced concrete elliptical pipe.....	706.04
Vitrified clay pipe	
(extra strength only)	706.08
Corrugated steel conduits	707.01 or 707.02
Structural plate corrugated	
steel structures	707.03
Corrugated aluminum	
alloy pipe	707.21 or 707.22
Aluminum alloy structural	
plate conduits.....	707.23
Corrugated polyethylene	
smooth lined pipe	707.33
Polyvinyl chloride corrugated	
smooth interior pipe.....	707.42
Polyvinyl chloride profile wall pipe.....	707.43
Polyvinyl chloride solid wall pipe.....	707.45
Polyvinyl chloride large-diameter	
solid wall pipe	707.48

Type E Conduits - Miscellaneous small drain connections and headers:

Non-reinforced concrete pipe.....	706.01
Reinforced concrete pipe.....	706.02
Reinforced concrete elliptical pipe.....	706.04
Concrete drain tile, extra quality	706.07
Vitrified clay pipe.....	706.08
Clay drain tile, extra quality	706.09
Corrugated steel conduit.....	707.01 or 707.02
Corrugated aluminum	
alloy pipe	707.21 or 707.22
Corrugated polyethylene	
drainage pipe	707.32
Corrugated polyethylene	
smooth lined pipe	707.33
Smooth-wall polyvinyl chloride	
underdrain pipe (non-perforated)	707.41
Polyvinyl chloride corrugated	
smooth interior pipe.....	707.42
Polyvinyl chloride profile wall pipe.....	707.43
Polyvinyl chloride solid wall pipe.....	707.45

Polyvinyl chloride drain waste and vent pipe	707.46
Polyvinyl chloride ABS composite pipe	707.47
Polyvinyl chloride large-diameter solid wall pipe	707.48
ABS drain waste and vent pipe	707.51
ABS sewer pipe.....	707.52

Type F Conduits - Conduits on steep slopes; underdrain outlets:

Corrugated steel conduits (steep slope conduit)	707.05, Type C or 707.07
Corrugated aluminum alloy pipe (steep slope conduit).....	707.21 or 707.22
Corrugated polyethylene smooth lined pipe (underdrain outlets)	707.33
Smooth-wall polyvinyl chloride underdrain pipe (non-perforated).....	707.41
Polyvinyl chloride corrugated smooth interior pipe (underdrain outlets).....	707.42
Polyvinyl chloride solid wall pipe (underdrain outlets)	707.45

811.03 Conduit Definitions. For the purposes of this specification, the following definitions are used:

- A. Long span structure includes all of the following material kinds: 706.05, 706.051, 706.052, 706.053, 707.15, and 707.25.
- B. Plastic pipe includes all of the following materials kinds: 707.31, 707.32, 707.33, 707.41, 707.42, 707.43, 707.44, 707.45, 707.46, 707.47, 707.51, 707.52, and 748.02.
- C. Corrugated metal pipe includes all of the following material kinds: 707.01, 707.02, 707.03, 707.04, 707.05, 707.07, 707.11, 707.12, 707.13, 707.14, 707.21, 707.22, 707.23, and 707.24.
- D. Iron pipe includes the following material kind: 748.01.
- E. Rigid Pipe includes all of the following material kinds: 706.01, 706.02, 706.03, 706.04, 706.08, 706.09, and 748.06.
- F. Conduit includes long span structures, pipe, culverts, sewers, drains, or any other item specified herein.
- G. Backfill is soil, granular embankment, or structural backfill placed above the bedding to the elevation as describe.
- H. A cut situation is an existing field situation when the top of the conduit is below the existing ground where an embankment may be constructed.
- I. A fill situation is an existing field situation when the top of the conduit is above the existing ground where an embankment is to be constructed.
- J. A fill situation, meets the requirements of a cut if the fill is constructed to at least 2 feet (600 mm) above the top of the conduit before placing the conduit.
- K. The conduit rise is the vertical distance from outside wall to outside wall or outside corrugation measured at the middle of the conduit.

- L. The conduit span is the horizontal distance from outside wall to outside wall or outside corrugation measured at the widest point of the conduit.
- M. The conduit spring line is equal to the rise divided by two.
- N. Trench width is the horizontal distance between the vertical walls of the trench measured in feet.

811.04 Conduit Material Provisions. The local will allow any of the following alternate material provisions:

- A. The Contractor may use Type 1 or 2 structural backfill if granular or soil embankment is required or allowed.
- B. Supply pipe of the required size or one size larger.
- C. If 707.05 or 707.07 conduit is specifically itemized or specified in the Proposal, the Contractor may provide conduit conforming to 707.04 and having a bituminous paved invert. Provide the same corrugation profile and sheet thickness listed in the Proposal.
- D. The Contractor may furnish higher strength concrete or plastic pipe of the same type where lower strength pipe is specified.
- E. The Contractor may furnish a thicker metal pipe of the same corrugation profile and type where a lesser thickness is permitted or specified.
- F. For metal pipe 54 inch (1350 mm) diameter or larger and pipe-arch, ensure the manufacturer provides match marked ends and a layout drawing.

811.05 Submittals. Prepare shop drawings and calculations when required below. Have a Registered Engineer prepare, sign, seal and date all calculations. Have another Registered Engineer check all drawings and calculations, sign, and seal and date all calculations. Submit load rating calculations to the Office of Structural Engineering for all structures with a 10 foot span and greater in accordance to the most current version of ODOT's Bridge Design Manual. Submit two copies of the shop drawings and calculations to the Engineer. The Engineer will submit one copy to the Local Authority according to the following:

- A. If Reinforced Concrete Circular Pipe, 706.02, requires a "Special Design" with a specified D-load requirement above the minimum D-load, submit shop drawings and design calculations. Design the pipe to meet the D-load requirements required to meet the performance of this specification. Include the following information in the submittal: all structural design and loading information, all material specifications, all dimensions, and the installation plan.
- B. Precast reinforced concrete 3-sided flat topped culverts, precast reinforced concrete arch culverts, or precast reinforced concrete round sections, (706.051, 706.052, or 706.053) must submit structural analysis methods, structural design criteria and calculations, structure details, and shop drawings. Include details for a precast slab bottom if required.
- C. Submit hydraulic calculations if requesting approval to substitute a precast reinforced concrete 3-sided flat topped culvert (706.051), a reinforced concrete arch culvert (706.052), or a precast reinforced concrete round section (706.053) for one another. The proposed culvert must meet or exceed the same hydraulic requirements as the specified culvert and minimum cover requirements. If the specified culvert is on pedestal walls, include the shop drawings for the pedestal wall design in the submittal because 3-sided flat topped culverts, arch culverts, and round sections require different pedestal wall designs.

D. Submit hydraulic calculations if requesting approval to substitute either a precast reinforced concrete 3-sided flat topped culvert, a precast reinforced concrete arch culvert, or a precast reinforced concrete round section (706.051, 706.052, or 706.053) placed on a precast or cast-in-place slab bottom for a precast reinforced concrete box culvert (706.05). The proposed culvert must meet the same hydraulic requirements as the specified box culvert and minimum cover requirements. The Local Authority may allow the bottom slab to be cast-in-place but will not issue a time extension for any delays resulting from the use of a cast-in-place bottom slab.

811.06 Conduit Excavation. Measure trench width at the span of the conduit. Center the trench excavation about the centerline of the conduit.

Use Method A for a cut situation, and use Method B for a fill situation.

A. Method A. Excavate the trench for the conduit. Provide vertical trench walls.

If long span culvert is used, provide a minimum trench width of the span plus 2 feet (0.6 m) on each side.

If rigid pipe is used, provide a minimum trench width of the span times 1.33.

If plastic or corrugated metal pipe is used, provide a minimum trench width of the span times 1.25 plus 1 foot (0.3 m).

If plastic pipe is used and the ID is 8 inch (200 mm) or less furnish a minimum trench width of the OD.

Increase these minimums to a width that allows the jointing of the conduit, and the placement and compaction of the backfill.

B. Method B. Construct the embankment to a height at least equal to half of the rise and to a width on each side of the conduit two times the span of the conduit before excavating for the conduit. Excavate the trench in the constructed embankment to a width conforming to Method A above.

Furnish a firm foundation for the conduit bed for its full length. The Engineer will require the removal of unsuitable material below the conduit bedding or below the bottom of the conduit if bedding is not required for the width of the trench. Replace the unsuitable material with structural backfill. Remove rock or shale in the conduit foundation for at least 6 inches (150 mm) below the bottom of the bedding. Replace the rock or shale with structural backfill. Unless in the contract documents, the Local Authority will pay for this work according to 109.05.

If the Engineer changes the flow line by more than one foot (0.3m), the Local Authority will pay according to 109.05.

The Contractor may jack or tunnel the pipe with the written permission of the Director.

811.07 Conduit Bedding. Type 1 bedding consists of structural backfill extending at least 6 inches (150 mm) below the bottom of the conduit for the full width of the trench. Compact the bedding according to 811.11.

Use Type 1 bedding for 706.05, or 706.051, 706.052, and 706.053 on slab bottoms. Also use Type 1 bedding for 707.03, 707.15, and 707.25 on corrugated invert plates.

Type 2 bedding consists of structural backfill extending at least 3 inches (75 mm) for all 706 rigid pipe conduits and 6 inches (150 mm) for all other conduits below the bottom of the conduit for the full width of the trench. Extend the bedding up around the pipe for a depth of not less than 30 percent of the rise of the conduit. Shape the bedding to fit the conduit with recesses shaped to receive the bell of bell-and-spigot pipe. Leave the bedding below the middle one-third of the pipe span un-compacted. Compact the remaining bedding according to 811.11.

Use Type 2 bedding for Types A, B, C, and D conduits except for long span structures and for conduits that require Type 3 bedding.

Type 3 bedding consists of a natural foundation with recesses shaped to receive the bell of bell-and-spigot pipe. Scarify and loosen the middle one-third of the pipe span.

Use Type 3 bedding for Type C and Type D conduits of the following materials: 706.01, 706.02, or 706.03.

Type 4 bedding consists of a natural foundation shaped to fit the conduit with recesses shaped to receive the bell of bell-and-spigot pipe.

Use Type 4 bedding for Types E and F conduits.

811.08 Laying Conduit. Lay the conduit in the center of the trench starting at the outlet end with the bell or groove-end laid upgrade. Ensure that the conduit is in contact with the bedding throughout its full length such that line and grade is maintained. Lay metal conduits according to one of the following methods:

A. If the seam is longitudinally either riveted or welded, place the seam or weld at the spring line.

B. If the metal pipe is fabricated helically (having a continuous seam running around the outside of the pipe), arrange the corrugations so the helix angle or twist is rotating downstream in the direction of the flow to increase hydraulic performance.

Maintain flows at all times until the new facilities are completed and in service. Maintain the flows through existing facilities to be replaced unless a temporary bypass conduit is used.

Construct the inlet and outlet ends of all conduit runs with pipe ends as normally fabricated by the manufacturer. If field cutting is necessary, locate the cut end at an interior joint within the run and provide a cradle, collar, or band to ensure a stable joint.

Construct a concrete collar on the last joint if field cutting is necessary to meet a structure or headwall.

Erect 707.03, 707.15, 707.23, and 707.25 conduits according to 522.03. Where two plate thicknesses are specified, locate the thicker plates at the bottom and corner plates in pipe-arch structures, and the bottom row, if centered, or bottom two rows, if not centered, in round structures.

Set the 706.051 units on the concrete footing shown on the plans. Unless otherwise shown on the plans, provide a 3-inch (75 mm) deep keyway centered on the precast leg. The width of the keyway shall be 6 inches (150 mm) greater than the thickness of the precast leg. Place the units in a 1/2-inch (13 mm) bed of mortar. If proper line and grade of the structure cannot be maintained on the bed of mortar, set the units on 5 × 5-inch (125 × 125 mm) masonite or steel shims. Fill the entire keyway joint with mortar.

Set the 706.052 units on the concrete footing shown on the plans. Unless otherwise shown on the plans, provide a 3-inch (75 mm) deep keyway centered on the precast leg. The width of the keyway shall be 6 inches (150 mm) greater than the thickness of the precast leg. Place the units on 5 × 5-inch (125 × 125 mm) masonite or steel shims to provide a minimum 1/2-inch (13 mm) gap between the footing and bottom of the unit's bottom leg. Fill the entire keyway joint with mortar.

Set the 706.053 arches on the concrete footing shown on the plans. Unless otherwise shown on the plans, provide an 8-inch (200 mm) deep keyway for spans up to 24 feet (7.3 m) and a 10-inch (250 mm) deep keyway for all spans greater than 24 feet (7.3 m). Center the keyway on the precast arch base. The width of the keyway must be 8 inches (200 mm) greater than the thickness of the precast arch base. For non-vertical leg arches set on pedestal walls, a one-sided keyway is acceptable if the required pedestal wall design thickness is not sufficient for a full keyway. Place masonite or steel shims to provide a minimum of 1.5-inch (38 mm) gap between the footing and the bottom of

the precast arch base. Fill the entire keyway joint with mortar. Provide 5000 psi (34.5 MPa) mortar. For arches that gain structural continuity by a cast-in-place closure at the project site, provide concrete with the same compressive strength as the precast arch.

If reinforced concrete pipe has elliptical reinforcing, the top and bottom of the pipe are clearly marked on the pipe. Handle and place reinforced concrete pipe with elliptical reinforcement and reinforced concrete horizontal elliptical pipe with single cage reinforcement with the reinforcement markings along a vertical plane as marked on the pipe. Handle and place reinforced concrete pipe with auxiliary supports (S-stirrups) with the centerline of the auxiliary support system (S-stirrups) in a vertical plane as marked on the pipe.

For 706.05, 706.051, 706.052, or 706.053 structures fill the lifting devices with mortar. Cover the exterior of the lifting devices with joint-wrap material if outside the limits of the membrane waterproofing. Use joint-wrap with a minimum width of 9 inches (225 mm). Use only lifting devices that do not require a hole through the structure.

For all 707 conduit, use only lifting devices that do not require a hole through the structure.

Immediately after placing conduit, construct the end treatments at both the outlet and inlet ends. These end treatments include headwalls, concrete riprap, rock channel protection, sod or other erosion control items.

811.09 Joining Conduit. Join the conduit sections so that the ends are fully entered and the inner surfaces are flush and even. Furnish sealed, banded, or bolted joints for Types A, B, C, D, and F conduits. Provide open joints for Type E conduits wrapped with 4-inch (100 mm) wide tarred paper or tarred burlap with pack soil placed around this material to hold it in place during backfilling.

The Engineer may allow joint materials other than those listed below, provided the Contractor demonstrates the proposed material makes durable sealed joints.

Furnish joints that do not allow infiltration of backfill material into the conduit or use a fabric wrap on the outside of the conduit.

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

A. Joints.

1. Metal Pipe.

If using corrugated metal pipe, provide coupling bands conforming to 707.01 or 707.02. These bands will have the same coating as the pipe being joined and use gasketed coupling bands or fabric wrap the coupling bands when using structural backfill Type 2 for the bedding or backfill. A maximum difference between adjacent pipe sections of 1/2 inch (15 mm) will be allowed before coupling bands are placed. Securely strut the end of each pipe section for pipe diameters 54 inches (1350 mm) or greater that have a wall thickness of less than 0.109 inch (2.77 mm). Install the ties or strapping in the first or second valley of the annular corrugations on each end of each piece of pipe. Install two struts per end such that they are perpendicular to one another and cross at their midpoints. Strut by using wire ties or other approved methods. Remove the strutting after securing the coupling bands.

Bell and spigot joints conforming to 707.12 may be used for corrugated steel spiral rib conduits. Ensure the spigot and bell ends are clean and free from dirt or debris prior to assembly. Place a gasket in the first corrugation of the spigot end and thoroughly lubricate the gasket and the bell end of the receiving conduit prior to assembly. Ensure the spigot is securely driven home into the bell upon final assembly.

2. Rigid Pipe.

a. For 706.01, 706.02, or 706.04, 706.05, or 706.08 that require sealed joints, use any of the following methods:

i. Apply 706.10 to the pipe in sufficient quantity to completely fill the joint once the pipe is placed in its final position at a gap of 1 inch (25.4 mm) or less. After placing the pipe in its final position, point and trowel the 706.10 to form a smooth transition on the inside and a complete seal on the outside.

ii. Apply 706.14 to the pipe in sufficient quantity to seal the joint but not necessarily fill the joint once the pipe is placed in its final position at a gap of 1 inch (25.4 mm) or less. Immediately before installing 706.14, clean the joint free of all debris then prime both sides of the joint with an asphalt based primer according to the 706.14 manufacturer's recommendations.

iii. Provide 706.11 or 706.12 as specified.

b. For 706.03 conduit, use fibrated coal tar joint compound applied according to the manufacturer's recommendations.

c. If resilient and flexible gasket joints conforming to 706.11 or 706.12 are specified on sanitary sewer conduits, test the joints for infiltration or exfiltration according to ASTM C 969. If any section of conduit fails to meet the test requirements, make corrections until the test requirements for the section are met.

B. Filling Joints. After placing 706.05, 706.051, or 706.052 in their final position with a maximum joint gap of 1 inch (25.4 mm), clean the joint gap or joint of all debris and perform the following:

1. For 706.05 joints, fill the top exterior joint gap and the bottom and side interior joint gap with mortar. Next, for any exterior joint not covered by membrane waterproofing, cover the exterior joint with a 9-inch (225 mm) wide strip of joint wrap. Center the joint wrap on the joint. Use a continuous length of joint wrap sufficient to extend from the bottom of the vertical face on one side to the bottom vertical face on the other side.

2. For 706.051, fill the top keyway joint with 705.22. The side or leg joints shall also be filled with 705.22 for the keyway type joint or filled per 706.05 for a tongue and groove type joint. Clean the joint of all debris immediately before installing the joint filling material. Wet all surfaces of the keyway joint, but do not allow free standing water in the joint. Prepare, place, and cure the 705.22 according to the manufacturer's recommendations. Next cover the exterior joint with a 12-inch (300 mm) wide strip of joint wrap. Center the joint wrap on the joint. Use a continuous length of joint wrap sufficient to extend from the bottom of the vertical face on one side to the bottom vertical face on the other side. Apply membrane waterproofing to the precast sections after they are installed.

3. For 706.052 and 706.053, install a 7/8 × 1 3/8-inch (24 × 34 mm) 706.14 joint filler along the outside joint chamfer. Use a continuous length of joint filler sufficient to extend from the bottom of the vertical face on one side to the bottom vertical face on the other side. Before installing the joint filler, prime the joint chamfer with a primer according to manufacturer's recommendations. For 706.052 and 706.053, cover all exterior joints with a 12-inch (300 mm) wide strip of joint wrap centered on the joint. Use a continuous length of joint wrap sufficient to extend from the bottom of the vertical face on one side of the structure to the bottom vertical face on the other side. Next, apply all waterproofing as shown on the plans. Apply membrane waterproofing to the precast sections after they are installed.

C. Sealing Concrete Surfaces. For 706.05, 706.051, 706.052, or 706.053 apply an approved epoxy-urethane sealer per the plans to all top surfaces not covered by membrane waterproofing. Extend the sealer 1 foot (0.3 m) below the backfill on all sides of the culvert sections including the joint.

The Engineer and Contractor will visually inspect all conduit and joints before any backfill is placed. Rejoin, re-lay, or replace all conduit out of joint tolerance, alignment, settled, or damaged.

811.10 Exterior Coatings and Membrane Waterproofing. If shown on the plans, externally apply membrane waterproofing to 706.05, 706.051, 706.052 or 706.053. Apply the membrane waterproofing to the top surface and extend it vertically down both sides of the structure. Clean the concrete surfaces when the membrane waterproofing does not adhere to the structure. Apply the membrane waterproofing to all surfaces that will be in contact with the backfill. Apply the waterproofing according to the appropriate requirements of Item 512.

Apply waterproofing to 707.03, 707.15, 707.23, and 707.25 conduits with less than eight feet (2.4 m) of cover by one of the following methods.

A. Coat the exterior of the conduit above the limits of the bedding and within the limits of backfill. Ensure that all plate seams and bolts are thoroughly sealed. The coating material and application shall conform to AASHTO M 243. Allow asphalt mastic material to dry 48 hours and tar base material to dry 28 hours before placing the conduit backfill. Rib stiffeners do not need to be coated.

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

811.11 Conduit Backfilling. Place backfill to the limits described and according to the compaction requirements. Place the backfill in the trench and embankment outside the trench uniformly on both sides of the conduit for all conduit installations.

A. General. The Contractor may operate small compaction equipment with less than a total weight of 1 ton (0.9 metric ton) over the conduit to compact the backfill. Do not use hoe packs on top of the conduit until 2 feet (0.6 m) of backfill is compacted on top of the conduit. The Contractor may operate compaction equipment with less than a total weight of 8 tons (7 metric tons), but more than 1 ton (0.9 metric ton), over the conduit after placing and compacting 2 feet (0.6 m) of backfill. Do not operate equipment with a total weight of 8 tons (7 metric tons) or more, until placing and compacting a cover of 4 feet (1.2 m) over the top of the conduit. The above restrictions apply when working within one span on each side of the conduit, or 6 feet (1.8 m), whichever is less. As shown on the plans, encase conduits with the specified thickness of Class C concrete.

B. Long Span.

1. For all long span structures except 706.053 in cut, place and compact structural backfill over the top of the section to a minimum depth 4 feet (1.2 m) or to the subgrade elevation whichever is less and for a width of 2 feet (0.6 m) on each side of the section. Use soil, granular embankment, or structural backfill to construct the adjacent embankment and for the remaining depth to the subgrade. Construct the adjacent material according to Item 203.

2. For all long span structures except 706.053 in fill, place and compact structural backfill over the top of the section to a minimum depth of 2 feet (0.6 m) or to the subgrade elevation whichever is less and for a width of 2 feet (0.6 m) on each side of the section. Use soil, granular embankment, or structural backfill to construct the adjacent embankment and for the remaining depth to the subgrade. Construct the adjacent material according to Item 203.

3. For 706.053 structures in cut or fill, place and compact structural backfill on both sides of the structure to the following minimum limits: vertically from the base up to a height of 75 percent of the rise; horizontally on each side of the structure to a sloping line that begins 2 feet (0.6 m) from the base of the structure and slopes up and away from the structure at a 1H:1V slope (45 degree angle). Use soil, granular embankment, or structural backfill to construct the adjacent embankment and for the remaining depth to the subgrade. Construct the adjacent material according to Item 203.

C. Type A and B. Backfill Types A and B conduits except for long span structures as follows

1. In a cut situation, place and compact structural backfill above the bedding for the full depth of the trench. Within the trench and more than 4 feet (1.2 m) above the top of the conduit, if the trench can accommodate compaction equipment, the Contractor may construct Item 203 Embankment. For plastic pipe with an ID 8 inch (200 mm) or less, place and compact structural backfill above the bedding for the full depth of the trench.

2. In a fill situation, place and compact structural backfill above the bedding for the full depth of the trench specified in 811.06.B. Above these limits, uniformly place the lesser of one pipe span or 4 feet (1.2 m) of structural backfill on each side of the conduit and to a depth of 2 feet (0.6 m) above the top of the conduit. Construct the embankment outside the limits of the backfill. For plastic pipe with an ID 8 inch (200 mm) or less, place and compact structural backfill above the bedding for the full depth of the trench.

D. Type C and D. Backfill Type C and D conduits as follows:

1. In a cut situation, for plastic pipe, place and compact structural backfill above the bedding and to 6 inches (150 mm) over the top of the pipe. All other conduit material types place and compact backfill. For plastic pipe with an ID 8 inch (200 mm) or less, place and compact structural backfill above the bedding for the full depth of the trench.

2. In a fill situation, for plastic pipe, place and compact structural backfill above the bedding for the full depth of the trench specified in 811.06.B. Above these limits, uniformly place the lesser of one pipe span or 4 feet (1.2 m) of structural backfill on each side of the conduit and vertically to the top of the conduit. Then place for a depth of 6 inches (150 mm) structural backfill over the top of the pipe equal to the trench width centered on the pipe center line. Construct the embankment outside the limits of the backfill. All other conduit material types place and compact backfill. For plastic pipe with an ID 8 inch (200 mm) or less, place and compact structural backfill above the bedding for the full depth of the trench.

E. Type E. Place and compact backfill above the bedding to a height equal to two-thirds of the conduit rise then place and lightly compact backfill for a depth of 12 inches (0.3 m) above the pipe. Place no stones larger than 4 inches (100 mm) that will be part of the embankment in contact with the pipe.

F. Type F. Place and compact backfill above the bedding. Backfill Type F conduits for underdrain outlets according to 605.03.C.

811.12 Conduit Placement and Compaction Requirements. Place soil, granular embankment, or Structural Backfill Type 1 or 2 in lifts not to exceed 8 inches (200 mm). The Local Authority will perform all compaction testing according to Supplement 1015. The compaction requirements per material type are as follows:

A. For soil embankment, compact each lift until 96 percent of AASHTO T 99 is achieved.

B. For granular embankment and Structural Backfill, Type 1 or 2, compact each lift of material according to 811.12.E using mechanical devices, hoe packs, jumping jacks, hand devices, vibrating plates, or other equipment that meets the restrictions in 811.11. Provide compaction equipment that compacts the material under the haunch of the pipe. If the compaction equipment cannot fully compact the material under the haunch, supplement the compaction equipment by using shovel slicing, spud bars, or mechanical spud bars to compact the material under the haunch of the pipe. Use shovel slicing and spud bars in conjunction with the compaction operations to compact the material and to manipulate the material under the haunch of the pipe.

C. For Structural Backfill Type 2, compact each lift of material according to 811.12.E using flood compaction or mechanical devices, hoe packs, jumping jacks, hand devices, vibrating plates, or other

equipment that meets the restrictions in 811.11. Provide compaction equipment that compacts the material under the haunch of the pipe. If the compaction equipment cannot fully compact the material under the haunch, supplement the compaction equipment by using shovel slicing, spud bars, or mechanical spud bars to compact the material under the haunch of the pipe. Use shovel slicing and spud bars in conjunction with the compaction operations to compact the material and to manipulate the material under the haunch of the pipe

D. Place Structural Backfill Type 3 in layers not to exceed 12 inches (300 mm) loose depth. Vibrate, tamp, or compact to approximately 85 percent of the original layer thickness.

E. At the beginning of the work, construct a test section in the conduit trench. The Engineer will use at least 96 percent of the test section maximum dry density for acceptance of the production areas. Use at least the same number of passes or compactive effort used to construct the test section to compact the production areas. Use compaction equipment with a total weight or centrifugal force of at least 1/2 ton (0.5 metric tons). Supply the manufacture's specification for the compaction equipment. Except when using a hoe pack, use at least six passes with the compaction equipment in the production areas.

The Engineer may reduce the minimum passes if the passes are detrimental to compaction.

Construct a new test section if the pipe type, bedding material, backfill material, or trench conditions change.

F. If using trench boxes with either Type A or B conduits, configure the trench box so that the bedding and backfill material is compacted directly against the trench walls.

G. The Engineer may adjust the lift thickness to obtain the required compaction, fill all the voids, achieve the proper seating of the backfill material, and achieve the stability of the backfill material and the pipe. Do not use equipment or methods that compromise the structural integrity of the pipe.

811.13 Clearing Site and Restoring Damaged Surfaces. Immediately after completion of the placing and compacting of the backfill remove and dispose of all surplus material according to 811.01 and clear the site and restore all required surfaces

811.14 Field Paving of New or Existing Conduit. Field pave the bottom of the conduit with concrete as shown on the plans.

For new pipe installations, do not pave until at least 4 feet (1.2 m) of fill is placed on top of the conduit, or the top of subgrade is reached. If the paving is placed before completion of the entire fill, clean any gaps between the conduit and concrete paving, then fill with heated bituminous material conforming to 705.04.

Reinforce the paving with 4 × 4-W1.4 × W1.4 galvanized welded wire fabric (or comparable). Provide a mesh with a width 4 inches (100 mm) less than the finished paving. Securely fasten the mesh to the conduit near each edge and at the center of the mesh at points not more than 4 feet (1.2 m) apart along the flow line of the culvert. Repair any damage to the galvanizing or other coating material caused by placement or by tack welding. Use wire brushing and paint with zinc rich paint to make the repairs.

For aluminum structural plate, securely fasten the mesh to the circumferential seam bolts with galvanized tie wire.

Provide a paving that is 3 inches (75 mm) thick measured from the top of the corrugations of the conduit to a height equal to 1/3 of the rise. Provide galvanized reinforcing steel support chairs beneath the mesh where necessary. Give special care to the mesh during concrete placement. After placing the concrete, strike it off with a template to produce the proper radius, and finish with a float to produce a smooth finish. Cure the concrete according to 451.10.

811.15 Conduit Method of Measurement. The Local Authority will measure conduit by the number of feet (meters), measured from center-to-center of appurtenant small structures or between open ends inclusive of lengths of pipe bends and branches. The Local Authority will not deduct for catch basins, inlets, or manholes that are 6 feet (2 m) or less across, measured in the direction of flow. Where the location of an appurtenance or an open end is changed with the approval of the Engineer to accommodate full conduit sections, the Local Authority will measure the length placed. Conduits placed on slopes steeper than 3:1 or with beveled or skewed ends will be measured along the invert.

When the pay item calls for concrete encasement, payment for furnishing and placing the concrete encasement and for any additional excavation required shall be included in the unit bid price for the pertinent conduit. When the pay item calls for a new conduit to be field paved, payment for the field paving, including all work and materials necessary for the item, shall be included in the unit bid price for the pertinent conduit.

The Local Authority will measure field paving of existing pipe by the number of feet (meters).

811.16 Conduit Basis of Payment. The Local Authority will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
811	Foot (Meter)	___" (___ mm) Conduit, Type ___
811	Foot (Meter)	___ × ___ Conduit, Type ___
811	Foot (Meter)	___" (___ mm) Conduit Reconstructed, Type ___
811	Foot (Meter)	Type ___ Precast Reinforced Concrete Flat Topped Three-Sided Culvert, ___' (___ mm) Span × ___' (___ mm) Rise
811	Foot (Meter)	Type ___ Precast Reinforced Concrete Arch Sections, ___' (___ mm) Span × ___' (___ mm) Rise
811	Foot (Meter)	Type ___ Precast Reinforced Concrete Round Sections, ___' (___ mm) Span × ___' (___ mm) Rise
811	Foot (Meter)	___' (___ mm) Rise × ___' (___ mm) Span Conduit, Type A Corrugated Steel Box Culvert, ___' (___ mm) Minimum Cover, ___' (___ mm) Maximum Cover
811	Foot (Meter)	___' (___ mm) Rise × ___' (___ mm) Span Conduit, Type ___ Corrugated Aluminum Box Culvert, ___' (___ mm) Minimum Cover, ___' (___ mm) Maximum Cover

- 811 Foot (Meter) _____" (____ mm) Conduit,
Type _____, with Field
Paving of Pipe
- 811 Foot (Meter) _____" (____ mm) Conduit,
Type _____, Field Paving of Existing Pipe
- 811 Foot (Meter) Conduit, Type F for underdrain outlets

811.17 Structure Description. This work consists of constructing or reconstructing manholes, catch basins, inlets, inspection wells, junction chambers or precast reinforced concrete outlets of the type and sizes specified; or adjusting existing castings to grade, as specified (formerly referred to as 604) per the 2010 CMS.

Use removed or excavated materials in the Work when the material conforms to the specifications; if not, then recycle or dispose of the material according to 105.16 and 105.17.

811.18 Structure Materials. Furnish materials conforming to:

- Structure concrete, Class C. 499, 511
- Brick and masonry units..... 704
- Precast reinforced concrete manhole,
catch basin, and inlet sections 706.13
- Precast reinforced concrete outlet 706.15
- Prefomed expansion joint fillers 705.03
- Epoxy coated reinforcing steel .509.02, 709.00
- Cast frames, grates,
and covers..... 711.12, 711.13, or 711.14
- Welded frames and grates 513.17, 711.01
- Steps 711.13, 711.30, or 711.31
- Structural backfill,
Types 1, 2 and 3 703.11
- Resilient and flexible gasket joints..... 706.11
- Curing materials 705.05, 705.07
- Mortar..... 602
- Non-shrink Mortar..... 705.22

811.19 Structure Construction Methods, General. Construct the specified structures according to the plans. Place inlets, catch basins, inspection wells, junction chambers or precast outlets at the locations and elevations shown in the plans according to the standard construction drawings or as directed by the Engineer. Place manhole castings at the elevation and station with offset to the center of the casting or as directed by the Engineer. Place the manhole base at the elevation and station with offset to agree with the pipe station, offset and pipe invert elevation according to the standard construction drawings or as directed by the Engineer. Use flat slab top manholes as shown on the standard construction drawing. Do not remove the flat slab top manhole lifting devices.

If the Engineer changes the structure elevation by more than 1 foot (0.3 m), the Local Authority will pay according to 109.05.

Thoroughly mortar with a flush mortar joint the underdrain outlet pipe to the precast reinforced concrete outlet. Furnish and place lateral sewer connections including drops and leads except pipe included in Item 811 Conduits.

Locate or cut conduits as shown on the standard construction drawings so they do not protrude inside the structure walls.

Take adequate precautions to prevent structure concrete or mortar cement from freezing. Preheat the brick, concrete block, or precast concrete structure throughout the entire mass to a temperature between 50 to 80 °F (10 to 27 °C) before placing mortar if the ambient temperature is 40 °F (4 °C) or less.

Set iron frames, tops, and covers of the type shown on the plans in a mortar bed with a flush mortar joint.

Prevent earth or debris resulting from construction operations from entering the manholes, catch basins, junction chamber, inlets, and precast reinforced concrete outlets. Remove any debris.

A. Reconstruction to grade

1. Carefully remove and clean the existing castings.
2. Remove the existing walls of manholes down to the spring line or below as necessary.
3. Remove existing walls of catch basins and inlets below the window openings, grates, or any points of wall failure.
4. Using the salvaged casting, reconstruct the structure to the new grade, conforming as nearly as practicable to the existing dimension and type of construction.

B. Adjustment to grade

1. Carefully remove and clean the existing frame, adjust the height of supporting walls, and reset the existing frame in a bed of concrete mortar or structure concrete to the new grade.
2. Carefully remove the existing cover or grate and install a casting or an acceptable adjusting device on file at the Laboratory or an adjusting device approved by the Engineer to the new grade and install per the manufacturer's recommendations.

811.20 Structure Excavation and Backfill. Excavate to dimensions that provide ample room for construction.

The Engineer will require the removal of unsuitable material below the structure bedding. Replace unsuitable material with 811.12 Structural Backfill. When the Engineer requires the removal and replacement of unsuitable material below the bedding for precast structures and below the structure for cast-in-place structures, the Local Authority will provide compensation according to the Contract or by Supplemental Agreement.

Ensure that the backfilling follows the completion of the work as closely as the type of construction will permit. Do not disturb the structure while backfilling. Backfill structures located within the pavement area with structural backfill to the subgrade according to 811.11, Type A or B conduit. Backfill structures outside of the pavement area according to 811.11, Type C conduit.

811.21 Structure Brick and Block Masonry. Thoroughly wet brick and concrete block masonry units before laying in the mortar, and lay the brick and masonry units with a flush mortar joint.

Take adequate precautions to prevent concrete and mortar from freezing. Do not set brick and masonry units having a temperature of 40 °F (4 °C) or less with mortar until heated. When required, heat to ensure that a temperature of 50 to 80 °F (10 to 27 °C) is obtained throughout the entire mass of the material.

Cure the exposed surfaces of all brick and block masonry by covering with wet burlap for 48 hours or by applying curing membrane according to Item 511.

811.22 Precast Structure Concrete Modular Construction. Furnish precast structures according to the contract documents. Extra openings or excessive diameter of openings are cause for rejection of the precast structure. Furnish precast bases on a compacted structural backfill bed

having a minimum thickness of 3 inches (75 mm). Ensure that the structural backfill bed is level and uniformly support the entire area of the base.

After placing the pipe, grout all openings between the pipe and structure less than 4 inches (100 mm) with mortar and grout all openings between the pipe and structure greater than 4 inches (100 mm) with non-shrink mortar. Seal all joints between modules with materials specified in 811.11 for Type A, B, C, D, or F conduit.

Cure median inlets with the same materials and methods specified in 622.07.

The manufacturer of precast modular items must be certified according to Supplement 1073.

811.23 Structure Concrete (Cast-In-Place). Place and furnish structure concrete as shown on the plans.

811.24 Structure Method of Measurement. The Local Authority will measure Manholes, Inlets, Catch Basins, Monument Assemblies, Reference Monuments, Inspection Wells, Junction Chambers, and Precast Reinforced Concrete Outlets, whether new, reconstructed, or adjusted to grade, by the number of each type of structure complete and accepted.

811.25 Structure Basis of Payment. The Local Authority will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
811	Each	Manhole
811	Each	Inlet
811	Each	Catch Basin
811	Each	Inspection Wells
811	Each	Junction Chambers
811	Each	Manhole, Catch Basin or Inlet Reconstructed to Grade
811	Each	Manhole, Catch Basin, Inlet, or Monument Box Adjusted to Grade
811	Each	Precast Reinforced Concrete Outlet

Designer Notes:

This specification is NOT permitted for use on ODOT projects.

Use for Local Projects Only.

Designer is responsible for furnishing conduit meeting structural, hydraulic and durability design.

Refer to archived L&D Vol. 2, for Height of Cover Figures.

Refer to SCD DM-1.4 for Conduit Installation.

This Supplemental Specification slated to be rescinded in January 2015.

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 816
VIDEO DETECTION SYSTEM**

January 20, 2012

- 816.01 Description**
- 816.02 Materials**
- 816.03 Documentation and Testing**
- 816.04 Installation Requirements**
- 816.05 Training**
- 816.06 Method of Measurement**
- 816.07 Basis of Payment**

816.01 Description. This work consists of furnishing and installing video detection equipment complete and ready for service.

816.02 Materials. The video detection system shall consist of power supply, hard-wired video cameras, all necessary video and power cabling with end connectors, mounting brackets, surge protection as recommended by the manufacturer, video detection processors/extension modules capable of processing the number of camera and phase combination video sources shown on the project plans. Provide sufficient number of cameras to process vehicle presence, passage and system detection zones as shown on the project plans.

Furnish materials from the Department’s Qualified Products List (QPL) conforming to the following:

Video Detection System.....907

816.03 Documentation and Testing. All product documentation shall be written in the English language. Provide one bound copy and one PDF version of the user’s manual.

Perform functional tests and 10-day performance test according to 632.28.

816.04 Installation Requirements. Run all cables serving the cameras unspliced between the camera and controller cabinet, with ten feet of slack provided in the controller cabinet.

816.05 Training. Furnish two days of training in the operation, setup and maintenance of the video detection system installed as part of the Contract. Furnish all handouts, manuals and product information. For the training, use the same models of equipment furnished for the project. The maintaining agency shall furnish the facilities in which the training will take place.

Furnish all media and test equipment needed to present the training.

Coordinate video detection training with the Engineer a minimum of 30 days in advance of proposed date of training.

816.06 Method of Measurement. The Department will measure Video Detection System by each intersection shown on the plans, in place, complete and ready for service and will include all materials, testing, labor and software.

The Department will measure Training on a lump sum basis, and will include providing the instruction materials, instructor travel expenses and test or media equipment for presenting the training material.

816.07 Basis of Payment. The Department will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
816	Each	Video Detection System
816	Lump	Training for Video Detection System

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 832
TEMPORARY SEDIMENT AND EROSION CONTROL**

January 17, 2014

- 832.01 Description**
- 832.02 Definitions**
- 832.03 SCD References**
- 832.04 Requirements and Provisions**
- 832.05 Locate and Furnish BMP**
- 832.06 Causeways and Access Fills (Stream and River Crossings and Fills)**
- 832.07 Causeway and Access Fills Construction and Payment**
- 832.08 Maintenance**
- 832.09 Storm Water Pollution Prevention Plan**
- 832.10 SWPPP Acceptance**
- 832.11 Inspections and SWPPP Updates**
- 832.12 Compensation**
- 832.13 Method of Measurement**
- 832.14 Basis of Payment**

832.01 Description. This work consists of locating, furnishing, installing, and maintaining temporary sediment and erosion control Best Management Practices (BMP) for earth disturbing activity areas, developing a Storm Water Pollution Prevention Plan, and filing a Co-Permittee form as required. Furnish a Storm Water Pollution Prevention Plan if required prior to any earth disturbing activity. Furnish and install temporary sediment and erosion control best management practices in compliance with all NPDES and surface water permits. Amend the Storm Water Pollution Prevention Plan in accordance with the OEPA NPDES Permit. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal, State, or local agencies, adhere to the more restrictive laws, rules, or regulations.

832.02 Definitions

BMP. Temporary sediment and erosion control best management practices designed and installed by methods compliant with the Ohio NPDES Permit (Appendix E of this specification Part III. G. 2.), by this specification and location shown on the SWPPP. .

C&MS. Construction and Material Specifications of the Ohio Department of Transportation dated as shown on the plans.

CECI. Contractor's Erosion Control Inspector. Must have active CESSWI or CPESC certification.

CESSWI. Certified Erosion, Sediment, and Storm Water Inspector sponsored by the Soil and Water Conservation Society and International Erosion Control Association. Information on certified individuals is available at www.cesswi.org.

CPESC. Certified Professional in Erosion and Sediment Control as sponsored by the Soil and Water Conservation Society and International Erosion Control Association. Information on certified individuals is available at www.cpesc.net.

Co-Permittee. A requirement of OEPA NPDES Permit (Appendix E of this specification, Part I. F. Notice of Intent Requirements).

EDA. Earth Disturbing Activity is any activity that exposes bare ground or an erodible material to storm water, including any “Disturbance” as defined in OEPA NPDES Permit, Part VII, Definition H.

Contractor EDA. Any EDA that is not shown on the plans as part of the project. EDA not shown on the plans and occurring within the project limits is also Contractor EDA.

Project EDA. Any EDA that is shown on the plans as part of the project.

Total EDA. Combined Project EDA and Contractor EDA.

EPA. Environmental Protection Agency.

Isolated Wetland Permit. Ohio EPA permit allowing the discharge of fill material into an isolated wetland.

NOI. Notice of Intent.

NOT. Notice of Termination.

NPDES. National Pollutant Discharge Elimination System.

OEPA. Ohio Environmental Protection Agency.

OEPA NPDES Permit. Ohio EPA Storm Water Construction General Permit (OHC 000004) Appendix E of this specification.

OES. Office of Environmental Services-ODOT.

OHWM. The line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas or defined in accordance with the most current version of 33 CFR 328.

Operator. As defined in OEPA NPDES Permit (Appendix E of this specification, Part VII. Definitions, Q.)

OWPCA. Ohio Water Pollution Control Act (Ohio Revised Code 6111.01 et seq.).

PCN. Pre-Construction Notification for 404 permit.

SCD. Standard Construction Drawing.

SWPPP. Storm Water Pollution Prevention Plan.

USACE. United States Army Corps of Engineers.

404 Permit. USACE permit authorizing discharge of fill material into Waters of the US, per Section 404 of the Clean Water Act.

401 Water Quality Certification (401 WQC). Ohio EPA permit authorizing discharge of fill material, per Section 401 of the Clean Water Act.

Waters of the United States. Defined in Code of Federal Regulations, 33 CFR Part 328.

832.03 SCD References. Construct the following features according to the SCDs as listed on the plan title sheet.

Construction Fence	DM-4.3
Dikes	DM-4.3
Filter Fabric Ditch Check	DM-4.4
Inlet Protection.....	DM-4.4
Perimeter Filter Fabric Fence	DM-4.4
Rock Channel Protection Type C or D with/without Filter	DM-4.3/4.4
Sediment Basins and Dams	DM-4.3
Slope Drains.....	DM-4.3
Construction Entrance (Type 1 Driveway).....	BP 4.1

832.04 Requirements and Provisions. Furnish a SWPPP to represent compliance with OEPA NPDES Permit (See Appendix E), related rules, specifications, SCD, and permits. The Department will furnish the Contractor a copy of the NOI and the OEPA approval letter at or before the Pre-Construction meeting.

Locate, furnish, install, and maintain temporary sediment and erosion control Best Management Practices (BMP) that are compliant with the Clean Water Act (33 USC Section 1251 et seq.), the OWPCA, the 404 permit, the 401 WQC, the Isolated Wetland Permit, local government agency requirements, specifications, SCD, and other related rules and permits.

File a Co-Permittee form when the project requires a Notice of Intent (NOI) to the Ohio EPA.. Information about the Co-Permittee form can be found at http://epa.ohio.gov/Portals/35/storm/StormWater_Co-Permittee_NOI.pdf For a copy of the Co-Permittee form see Appendix D. When a co-permittee form is required, furnish the Department with a copy of the OEPA Co-permittee NOI approval letter at or before the Pre-Construction meeting.

Post Construction controls described in Appendix E (Part III.G.2.e) are not temporary erosion control features. Construction requirements and compensation for post construction controls are

detailed in the project plans. Provide protective measures that ensures sediment, debris and any contamination will not enter the Post Construction controls. All costs associated with these protective measures are included in the compensation for post construction controls.

The following provisions survive the completion and/or termination of the contract.

Provision 1. If a governmental agency or a local governmental authority finds a violation of the above noted requirements, or that the BMP are incomplete, or that the SWPPP is incomplete or that the implementation of the SWPPP is not being performed correctly or completely, full responsibility is borne by the Contractor to make all corrections.

Provision 2. If a governmental agency or a local governmental authority furnishes an assessment, damage judgment or finding, fine, penalty, or expense for a violation of the above noted requirements, or that the BMP are incomplete, or that the SWPPP is incomplete or that the implementation of the SWPPP is not being performed correctly or completely, the Contractor will reimburse the Department within 10 Calendar Days of the amount for any of the above. The Department may withhold the amount of money requested for the above from the Contractor's next pay estimate and deliver that sum to the governmental agency or local governmental authority issuing the assessment, damage judgment or finding, fine, penalty or expense.

Provision 3. The Contractor agrees to indemnify and hold harmless the Department, and will reimburse the Department for any assessments, damage judgment or finding, fine, penalty, or expense as a result of the failure of performing this portion of the Contract. The Department may withhold the amount of any assessments, damage judgment or finding, fine, penalty or expense from the Contractor's next pay estimate.

Provision 4. If a governmental agency or a local governmental authority furnishes a stop work order for any of the following: a violation of the above noted requirements; BMP are incomplete; SWPPP is incomplete; implementation of the SWPPP is not being performed correctly or completely, the Department will find the Contractor in default.

Provision 5. If the Department or any government regulatory agency finds a violation of the above noted requirements, or that the BMP are incomplete, or that the SWPPP is incomplete or that the implementation of the SWPPP is not being performed correctly or completely, the Contractor shall correct and mitigate the conditions within 48 hours of notification by the Department or regulatory agency. Failure to correct non-compliant site conditions may result in the Department suspending work for the entire project until the corrections are performed. Repeated non-compliance with the SWPPP or failure to regularly update the SWPPP as needed to match the site conditions may result in removal of the Contractors Superintendent in accordance with C&MS 108.05.

EDA Requirements. Furnish appropriate BMP for all EDA. Unless otherwise indicated, BMP will be compensated provided that the BMP are designed, installed and maintained appropriately. For projects that do not require a SWPPP as indicated in the table below, furnish a written plan for acceptance by the Engineer that identifies the location, extent and purpose of the BMP proposed. Compensation will not be provided for the written plan.

An estimated amount is established in the proposal for BMP to be used for project EDA and estimated Contractor EDA as outlined below:

Scenarios for Routine Maintenance Projects
(as identified on the Plan Title Sheet)

Project EDA (acres)	Estimated Contractor EDA (acres) ^[1]		
	EDA = 0	0 < EDA < 1	1 ≤ EDA < 5
EDA = 0	A	B	C
0 < EDA < 5	B	B	C

Scenarios for Non Routine Maintenance Projects

Project EDA (acres)	Estimated Contractor EDA (acres) ^[1]		
	EDA = 0	0 < EDA < 1	EDA ≥ 1
EDA = 0	A	B	D
0 < EDA < 1	E	^[2]	F
EDA ≥ 1	F	F	F

- [1] If the actual Contractor EDA in the SWPPP exceeds the estimated Contractor EDA on the Title Sheet resulting in a Total EDA > 1 acre (0.4 ha), use Scenario D.
- [2] If project EDA and estimated Contractor EDA are less than 1 acre (0.4 ha), use Scenario E. If Project EDA and Estimated Contractor EDA are greater than 1 acre (0.4 ha), use Scenario F. If the actual Contractor EDA exceeds the estimated Contractor EDA and results in the Total EDA exceeding 1 acre (0.4 ha), use Scenario D.

Scenario A:	No requirements for SWPPP, NOI and NOT.
Scenario B:	Furnish BMP for Contractor EDA. No SWPPP, NOI or NOT are required. BMP used for Contractor EDA will not be compensated.
Scenario C:	Furnish a BMP, SWPPP, NOI, and NOT for Contractor EDA only. BMP used for Contractor EDA, SWPPP, NOI and NOT will not be compensated.
Scenario D:	Furnish a NOI, SWPPP with BMP, and a NOT for all EDA areas. The NOI, SWPPP, BMP, and the NOT will not be compensated.
Scenario E:	Furnish BMP for all EDA. No SWPPP, NOI or NOT are required. BMP used for the Project EDA will be compensated.
Scenario F:	Furnish a SWPPP with BMP for all EDA areas and file a Co-Permittee form. The SWPPP and these BMP will be compensated. The Department will furnish a NOI and NOT.

832.05 Locate and Furnish BMP. Locate and furnish the BMP in accordance with the OEPA NPDES Permit and the SWPPP.

The Department may accept other materials or alternative controls as BMP provided the Contractor submits a written proposal for the alternatives to the Engineer. Alternative controls, upon acceptance by the Engineer, will be compensated per unit price for the BMP as shown in Appendix F.

Furnish filter fabric ditch checks, inlet protection, perimeter filter fabric fence, sediment basins and dams, dikes, slope drains, construction entrances, erosion control mat and rock channel protection materials as specified on the SCD.

A. Perimeter Controls. Use perimeter filter fabric fence to capture construction related sediment carried in sheet flow runoff. Restrict the use of perimeter filter fabric fence to the extent allowed in the OEPA NPDES Permit.

Use dikes to divert and control surface water and sediment flow to prevent discharge of construction related sediment from the project.

Install perimeter filter fabric fence and dikes before any clearing and grubbing operations.

Ensure that the ponding of water behind the perimeter filter fabric fence or dike will not damage property or threaten human health and safety.

B. Inlet Protection. Construct the inlet protection for existing inlets at the beginning of construction and for new inlets immediately after completing the sump. Ensure that the ponding of water behind the inlet will not damage property or threaten human health and safety.

C. Construction Seeding and Mulching. Furnish commercial fertilizer, seed, and mulch materials conforming to C&MS Item 659. Apply seed and straw mulch materials according to C&MS Item 659 as modified below.

Apply straw mulch at a rate of 3 tons per acre (0.7 metric ton/1000 m²). Seed and mulch during construction. This BMP may only be installed after March 15 and before October 15. Use wood fiber or compost mulch only with concurrence of the Department. Fertilize construction seeding areas at one-half the application rate specified in C&MS Item 659. If project conditions prevent fertilizing the soil and preparing the seed bed, then the fertilizing and preparation requirements of C&MS Item 659 may be waived. Do not place construction seed or fertilizer on frozen ground. Apply seed for this BMP at the rates shown below:

Seed Mixture		Number of Bales
Fawn Tall Fescue	3.0 lb/1000 ft ² (15 kg/1000 m ²)	2 / 1000 ft ² (0.01 ha)
	and	
Annual Ryegrass	2 lb/1000 ft ² (10 kg/1000 m ²)	

D. Construction Mulch. Construction Mulch is the application of straw mulch applied directly to the disturbed soil surface. Use straw according to C&MS Item 659. C&MS 659 wood fiber or compost mulch may only be used with concurrence of the Department. Apply Construction Mulch only to disturbed areas which will remain idle for 14 days or less or areas of exposed subgrade that require temporary stabilization. Use a mechanical crimping implement or other suitable implement accepted by the Engineer when installing Construction Mulch on exposed subgrade. Apply Construction Mulch at a rate of 3 tons per acre (0.7 metric ton/1000 m²).

E. Winter Seeding and Mulching. Apply seed and straw mulch materials according to C&MS Item 659 as modified above. Apply straw mulch at a rate of 3 tons per acre (0.7 metric ton/1000 m²). Winter Seed and Mulch is required for EDA operations occurring between October 15 and March 15 and can only be installed during that time. When straw mulch is used in this BMP, it is required to be crimped in place. Crimped mulch is required to be anchored into the soil surface with a mechanical crimping implement or other suitable implement accepted by the Engineer. Bonded Fiber Matrix may be used instead of straw mulch. All mulch and BFM used in this BMP must be capable of providing sufficient durable protective cover that provides OEPA NPDES Permit compliant erosion control for a minimum of 6 months. Provide maintenance of the BMP throughout the 6 month period. The Department will not provide compensation for reapplication or repair of this BMP during the 6 month period. The use of other seed and/or mulch materials in this time period requires specific Department approval. The use of winter seeding and mulching is not an acceptable practice for protecting the subgrade surface.

F. Slope Protection. Place dikes, install slope drains, and construct ditches to divert water from bare non-vegetated areas and to protect cut and fill slopes. Protect the side slopes from erosion by placing dikes at the top of fill slopes prior to construction of the slope. Construct ditches and dikes prior to construction of cut slopes to divert runoff away from the slope. Ensure that all sediment-laden discharges from slope protection are directed into an appropriate sediment control BMP.

Furnish Construction Slope Protection at the required locations as the slopes are constructed. Furnish all permanent slope protection as shown in the construction plans when final grade is complete.

G. Ditch Checks and Ditch Protection. Place filter fabric ditch checks or rock checks across a ditch and perpendicular to the flow. Use rock checks to protect the ditch from erosion. Use filter fabric ditch checks to filter sediment from the flowing water only when appropriate and when sediment dams/basins are considered a safety hazard or infeasible as determined by the Engineer

Place ditch checks as soon as the ditch is cut. If working on a ditch, replace the ditch checks by the end of the workday.

Install filter fabric ditch checks for drainage areas less than or equal to 2 acres (0.8 ha) as shown in the SCD. Install rock checks for drainage areas between 2 to 5 acres (0.8 to 2.0 ha) as shown in the SCD.

Install ditch checks in conjunction with Sediment Basins and Dams when appropriate.

Furnish Construction Ditch Protection at the required locations as the ditches are cut. Furnish all permanent ditch protection as shown in the construction plans when final grade is complete.

H. Sediment Basins and Dams. Design and construct Sediment Basins and Dams in accordance with and as described in the OEPA NPDES Permit for “sediment settling ponds”. Design and construct Sediment Basins and Dams at concentrated and critical flow locations to settle out sediment before the water leaves the EDA area. Do not construct Sediment Basins and Dams in any jurisdictional waterways .

All sediment basins requiring a dewatering device (riser and outlet pipe) shall incorporate a surface water dewatering device as described in the OEPA NPDES Permit. The Department will provide compensation for appropriately sized outlet pipes and surface dewatering device as described in Appendix F.

Compensation will not be provided for dewatering devices not included in the SWPPP and appropriately sized by the PE/CPESC. Compensation will be provided once for each dewatering device purchased exclusively for the project.

Complete the construction of the Sediment Basins and Dams before starting EDA operations.

When needed or when directed by the Engineer, install construction fence around the Sediment Basins and Dams.

I. River, Stream, and Water Body Protection. Provide appropriate river, stream and water body protection to all surface waters on and, adjacent to the project. River, Stream, and Water Body Protection may include diverting project water flow using dikes and slope protection. The Contractor may use a combination of BMP. Show all surface waters located within & adjacent to Project and Contractor EDA on the SWPPP.

J. Stream Relocation, Temporary Channels and Ditches that carry Waters of the United States. Perform this work in compliance with the OEPA NPDES Permit and any other applicable permits (i.e. 404/401 Permits). Stabilize Stream Relocation, Temporary Channels and Ditches with Construction Slope Protection or 70 percent grass growth before diverting flow into the new channel.

K. Concrete washout areas BMP. Compensation for this BMP is incidental to the concrete work.

L. Construction Entrances. Furnish Construction Entrance materials conforming to C&MS 712.09 Type B Filter Blankets for Rock Channel Protection and C&MS 703.01, Size Number 1 and 2, CCS aggregate. Furnish Construction Entrance protection at the locations shown on the SWPPP and as required below:

1. At locations where construction vehicles enter or leave EDA areas.
2. At all points of egress to public roads.
3. At all access locations where runoff from the construction access road is not protected by sediment controls.

Provide the appropriate size culvert as needed to prevent water from flowing onto paved surfaces and from overtopping the construction entrance surface. Identify the culvert size on the SWPPP. Install a maximum of three Construction Entrances per mile along the length of the project. The length of the project is the plan length along the project's longest axis. Additional construction entrances in excess of the maximum require acceptance from the Engineer.

Locate and identify all Construction Entrances on the SWPPP.

Provide a configuration consisting of 6 inches of aggregate over geotextile fabric. Provide geometry according to a Type 1 Driveway as shown in the SCD. Provide a minimum 10 foot width and length measuring a minimum of 150 feet and not exceeding 200 feet from edge of pavement.

Construction Entrance removal includes the appropriate disposal of geotextile fabric and pipe. Aggregate may be incorporated into embankment work when approved by the Department.

M. Project fueling and refueling BMP locations. Compensation for this BMP is incidental to the project.

The SWPPP shall include BMP to prevent and respond to spills or leaks as required by the OEPA NPDES Permit.

The Contractor will provide a separate Spill Prevention Control & Countermeasure Plan if required for the project as described in 40 CFR Part 112. The Contractor will not be compensated for the SPCC Plan.

N. All other BMP that are required and not specifically referenced in Appendix F will not be paid as a separate item, but will be included by the Contractor as part of the total project cost.

832.06 Causeways and Access Fills (Stream and River Crossings and Fills). Forging of jurisdictional waters, including all streams and rivers is not allowed. Evaluate the 404/401 permits to determine whether or not causeway and access fills are permitted in the contract. If a causeway and access fills have been permitted, construct fill(s) per the 404/401 permits, and the application submitted for those permits. Only the footprint area (acreage) of temporary fill, and volume of temporary fill as permitted and contained in the permit application will be allowed. The footprint area (acreage) of temporary fill, and volume of temporary fill may be furnished in the construction plans. The construction plans may furnish additional information or restrictions for causeways or access fills. If the Contractor proposes a causeway and access fill(s) which has not been permitted through the 404/401 permit process, the Contractor is required to coordinate the request for the causeway and access fill(s) with the project engineer and OES. The Department makes no guarantee to granting the request. The causeway and access fills request will be coordinated by OES with the USACE and OEPA where applicable.

Supply the project engineer/OES with the following information:

- A. A plan and profile drawing showing the causeway and access fills with OHWM elevation.
- B. Volume of temporary fill below the OHWM.
- C. The surface area of temporary fill below the OHWM.
- D. A restoration plan for the area affected by the causeway and access fills.
- E. Time frames for placement and removal of the causeway and access fills.
- F. Temporary Access Fill Checklist

The time frame allowed for the coordination of the causeway and access fill(s) will be 60 days, at a minimum, and the causeway and access fill(s) will not occur prior to the 404 Permit being authorized by the USACE and Ohio EPA, if an individual 401 is required. All coordination with the USACE and/or OEPA will be performed through OES.

832.07 Causeway and Access Fills Construction and Payment. Begin planning and installing causeways and access fills as early in construction as possible to avoid conflicts with 404/401 permits or other environmental commitments that have been included in the construction plans.

Access fills in streams or rivers may include, but are not limited to, cofferdams, access pads, temporary bridges, etc.

Make every attempt to minimize disturbance to water bodies during construction, maintenance and removal of the causeway and access fills. Construct the causeway and access fills as narrow as practical and perpendicular to the stream banks. Make the causeway and access fills in shallow areas rather than deep pools where possible. Minimize clearing, grubbing, and excavation of stream banks, bed, and approach sections. Construct the causeway and access fills as to not erode stream banks or allow sediment deposits in the channel.

Prior to the initiation of any in-stream work, establish a monument upstream of proposed temporary crossing or temporary construction access fill to visually monitor the water elevation in the waterway where the fill is permitted. Maintain the monument throughout the project. Provide a visual mark on the monument that identifies the elevation 1 foot above the Ordinary High Water Mark (OHWM). If the OHWM is not shown on the plans, the Department will establish the OHWM based on the definition of OHWM (832.02) or the peak discharge from the 2 year event, using the method described in the most current version of the Department's Location and Design Manual Volume II.

Ensure that the monument can be read from the bank of the waterway. Have this elevation set and certified by an Ohio Registered Surveyor.

Temporary causeway and access fill placed by the contractor above the OHWM are not subject to the 404/401 permit constraints.

Should the water elevation of the waterway, exceed the elevation 1 foot above OHWM, the Department will compensate the Contractor for repair of any resulting damage to the permitted temporary access fill up to the elevation of 1 foot above the OHWM. The Department will not pay for repair and maintenance of temporary access structures that are related to the construction access fill.

If the pool elevation of the waterway exceeds the 1 foot above the OHWM elevation as read from the monument, the contractor is entitled to an excusable, non-compensable delay in accordance with Section 108.06 of the Construction & Materials Specifications.

All costs associated with furnishing and maintaining the above referenced monument is incidental to the work.

Construct the causeway and access fills to a water elevation at least 1 foot (0.3 m) above the OHWM. If the causeway fills more than one-third the width of the stream, then use culvert pipes to allow the movement of aquatic life. Maintain normal downstream flows. Ensure that any ponding of water behind the causeway and access fills will not damage property or threaten human health and safety.

The following minimum requirements apply to causeways where culverts are used.

- A. Furnish culverts on the existing stream bottom.
- B. Avoid a drop in water elevation at the downstream end of the culvert.
- C. Furnish culverts with a diameter at least two times the depth of normal stream flow measured at the causeway centerline or with a minimum diameter of 18 inches (0.5 m) whichever is greater.
- D. Furnish a sufficient number of culverts normal to the flow to completely cross the channel from stream bank to stream bank with no more than 10 feet (3 m) between each culvert.

For all fill and surface material placed in the channel, around the culverts, or on the surface of the causeway and access fills furnish clean, non-erodible, nontoxic dumped rock fill, Type B, C, or D, as specified in C&MS 703.19.B. Extend rock fill up the slope from original stream bank for 50 feet (10 m) to catch and remove erodible material from equipment.

When the work requiring the causeway and access fills all portions of the causeway (including all rock and culverts) and access fills will be removed in its entirety. The material will not be disposed in other waters of the US or isolated wetland. The stream bottom affected by the causeway and access fills will be restored to its pre-construction elevations. The causeway and access fills will not be paid as a separate item but will be included by the Contractor as part of the total project cost.

All environmental protection and control associated with the 404/401 permit activities are incidental to the work within the boundaries of the 404/401 permit or as otherwise identified in the 404/401 permit application.

832.08 Maintenance. Properly maintain all BMP throughout all phases and sequencing of construction activities. Dispose of silt removed from BMP according to C&MS 105.16. When the Contractor properly places the erosion control Items then the Department will pay for the cost to maintain or replace these items of work by the following:

If a recorded rain event is greater than 0.5 inches (13mm), the Department will pay to replace all BMP that have failed during the event at the unit price for those BMP including Sediment Removal as described in Appendix F.

Example: A 0.6 inch rain event damaged a 300 ft. segment of a 900 ft. run of filter fabric fence. The damaged segment was repaired and the sediment was removed. How do we pay for the 300 ft of repair and sediment removed?

Pay for 300 ft. of new Item Perimeter Filter Fabric Fence and Item Miscellaneous Sediment Removal.

If a recorded rain event is less than or equal to 0.5 inches (13mm), the Department will pay to remove the sediment per the unit price for Sediment Removal as described in Appendix F. No compensation will be provided for BMP that fail during rain events of less than equal to 0.5 inches (13mm).

For all Perimeter Filter Fabric Fence, Filter Fabric Ditch Checks, Rock Checks, and Inlet Protection, Dikes, remove trapped sediment and any other debris which has accumulated when sediment reaches a height of one-half the BMP. Compensation will be paid at the unit price for Miscellaneous Sediment Removal as described in Appendix F.

When the sediment fills the sediment storage zone (as described in the OEPA NPDES Permit) of a Sediment Basin or Dam, remove deposited sediment per the unit price for Basin Sediment Removal as described in Appendix F. Remove Sediment Basins and Dams after the contributing drainage area has been stabilized.

When erodible materials accumulate at the surface of the construction entrance, furnish additional stone as needed to prevent tracking. Compensation for additional stone needed to maintain the Construction Entrance will be paid at the unit price for Construction Entrance. If tracking occurs, restore and clean the affected roadway surface at no additional cost to the Department.

Remove all BMP before the project is accepted. Dispose of the removed materials including sediment according to C&MS 105.16 and C&MS 105.17. Maintain the BMP until the up-slope permanent grass coverage is greater than 70% and the site reaches final stabilization in accordance with the OEPA NPDES Permit (See Appendix E, Part VII, J). At this stage, remove the BMP.

832.09 Storm Water Pollution Prevention Plan. If required, prepare the SWPPP as outlined in this specification. All activity identified by the SWPPP that is not specifically identified as a pay item elsewhere shall be included in the Lump Sum price bid for the SWPPP. At a minimum, the design and information requirements that must be included in the SWPPP are as follows:

- A. Provide a site specific SWPPP designed and sealed by a Professional Engineer who holds a current CPESC certification.
- B. Location of the required BMP for both on and off project EDA areas.
- C. Furnish quantity totals for all BMP required for the execution of the proposed plan.
- D. Location of a minimum of 100 feet (30 m) from the water's edge of any stream, ephemeral stream, wetland, or body of water:
 1. Concrete or asphalt plant areas
 2. Material and equipment staging or storage areas
 3. Dewatering Areas
 4. Concrete truck wash out BMP areas
 5. Construction access BMP locations
 6. Vehicle fueling and refueling locations
- E. Furnish an implementation schedule for each construction sequence.
- G. Furnish the total EDA areas in acres and identify each drainage area (watershed) impacted by the proposed construction.

- H. Locate all slopes that will be inactive for 14 calendar days or longer.
- I. Furnish the names of the individuals on site who will serve as the PE/CPESC SWPPP designer and CECI.
- J. Describe the type of construction activities that will be taking place.
- K. Furnish an estimated quantity for Basin Sediment Removal and Miscellaneous Sediment Removal for removing sediment from Sediment Basins and Dams, inlet protection, ditch checks, rock checks, perimeter filter fabric fence, and all other types of filter fabrics, straw or hay bales, or any other BMP.
- L. Furnish signatures of all contractors and subcontractors involved in BMP practices (see Appendix B).

If there are plan sheets which meet any of the requirements in Appendix E, use that information. Design files may be furnished to the awarded Contractor in electronic form upon request.

832.10 SWPPP Acceptance. Furnish the initial SWPPP to the Department for acceptance. The Department will allow work to begin upon receiving an acceptable SWPPP. See Appendix C for a sample acceptance form. The Department may assess critically the following:

- A. The type and location of BMP with totals.
- B. The SWPPP is for this project.
- C. There is no language in the SWPPP about any BMP being directed for use by the Engineer.
- D. The total estimated BMP quantities agree with the (per Each) “Erosion Control” amount identified in the proposal.
- E. The SWPPP accounts for the various phases of construction and the associated degree of earthwork disturbance over the life of the project.
- F. The SWPPP delineates overall watershed areas and individual BMP watersheds. Enough detail is shown in the SWPPP to verify that the BMP are appropriate for the application. If topographic mapping contained in the plans is not sufficient to identify and delineate the watersheds associated with the work, provide the appropriate mapping. .
- G. All perimeter filter fabric fence is identified in the SWPPP and supporting runoff calculations are attached.

- H. The SWPPP identifies the locations and specific geometry of the required Sediment Basins and Dams and related control structures. Provide the following information for each Sediment Basin and Sediment Dam:
1. Calculations demonstrating compliance with the 48 hour draw down time (if required by the OEPA NPDES Permit),
 2. Size of the contributing drainage area,
 3. Volume of the Sediment Storage Zone
 4. Volume of the Dewatering Zone (if required by the OEPA NPDES Permit),
 5. Basin excavation quantity or dam embankment quantity
 6. Quantity of rock channel protection
 7. Riser Pipe and outlet structure details (if required by the OEPA NPDES Permit).

Revise the accepted SWPPP as needed to maintain compliance with OEPA NPDES Permit. Revisions and amendments (See Appendix E, Part III, D) to the accepted SWPPP will be at no additional cost to the Department.

832.11 Inspections and SWPPP Updates. Perform the required OEPA NPDES Permit inspections and prepare inspection reports (see Appendix E).

The inspections must be performed by one of the following parties:

- A. The PE/CPESC who signed and sealed the SWPPP.
- B. The CPESC inspector who is under the supervision of the Engineer who signed and sealed the SWPPP.
- C. The CESSWI inspector who is under the supervision of the Engineer who signed and sealed the SWPPP.

Prepare the inspection reports for projects that have a SWPPP. Submit inspection reports to the Engineer every 7 days and within 24 hours of a 0.5 inch (13 mm) or greater rainfall event throughout the life of the contract. The inspection frequency may be reduced per the Ohio NPDES Permit Part III.G.2.i.

The reporting CECI will update, amend and revise the SWPPP as the contractor's operations and site conditions warrant. Identify all revisions and updates to the SWPPP and indicate what measures will be taken to maintain OEPA NPDES Permit compliance in the report. Include the following in the inspection report; the OEPA NPDES Permit inspection checklist (see appendix E, Part III.G.2.i), a map identifying all BMP needed, installed, maintained or removed since the last inspection report, certification that all construction activities are compliant with the SWPPP and the signature of the CECI responsible for the inspection. Provide a record of all written questions and comments from the Engineer related to the SWPPP. Include all responses to the Engineer's questions and comments in the inspection report. The signature of the PE/CPESC who sealed the SWPPP is required as part of the inspection report, on a monthly basis or when modifications to the SWPPP design are made. Include the certification requirements according to OEPA NPDES Permit (Part V. H.) with all reporting sign offs.

A BMP Inventory form is furnished in Appendix A to assist in documenting and recording the BMP quantities for payment. The BMP inventory form in Appendix A is not a substitute for the inspection report described above.

The CECI is required to notify the Department within 24 hours of any compliance deficiencies or verified complaints related to the SWPPP or OEPA NPDES Permit. Within 48 hours of the Department's or CECI's notice of deficiency, the contractor is required to construct, install, repair or correct the BMP measures needed to resume OEPA NPDES Permit compliance.

832.12 Compensation. The Department will furnish Item 832 Each, Erosion Control with an amount in the proposal to pay for BMP work. The fixed amount shown in the proposal is included (as any other bid items) in the Total Bid Amount. This fixed amount is the Department's estimate of the total cost of BMP work required to be performed for the project. If the BMP work exceeds this amount, the BMP work will still be paid at the pre-determined prices. All BMP work will be paid at the proposal pre-determined unit price times the correctly installed BMP number of units. The payment due will be deducted from Item 832 Each, Erosion Control. C&MS Table 104.02-2 does not apply to reductions in this contract item.

The Lump Sum amount bid for the SWPPP includes all work associated with development, design, NPDES required inspection, modification, revision, updates, amendments and reporting related to the SWPPP. Changes made to the SWPPP, but not caused by the Department, are the financial responsibility of the Contractor. Additional compensation will only be permitted for Department accepted amendments to the SWPPP resulting from revisions to the contract documents as per sections 104.02.B, 104.02.D and 104.02.F. Provide the additional costs for the amended SWPPP to the Department prior to beginning the associated revised work. All costs associated with providing and maintaining the required CPESC and CESSWI personnel, conducting the NPDES required inspections, and support engineering services are included in the contract Lump Sum bid for SWPPP. The Department will only pay for one accepted SWPPP regardless of the number of Construction phases, revisions, amendments or project redesigns.

832.13 Method of Measurement

The Department will measure the SWPPP as a Lump Sum.

The Department will measure Construction Seeding and Mulching by the number of square yards (square meters).

The Department will measure Slope Drains by the number of feet (meters) of conduit.

The Department will measure Sediment Basins by the number of cubic yards (cubic meters) of excavation.

The Department will measure Sediment Basin surface dewatering device by each.

The Department will measure Sediment Dams by the number of cubic yards (cubic meters) of embankment.

Any pipe required for the outlet structure of a sediment basin or dam is incidental to the unit price paid for Sediment Basins and Dams.

The Department will measure Perimeter Filter Fabric Fence, and Construction Fence by the number of feet (meters).

The Department will measure Filter Fabric Ditch Check by the number of feet (meters).

The Department will measure Inlet Protection by the number of feet (meters).

The Department will measure Dikes by the number of cubic yards (cubic meters) of embankment.

The Department will measure Construction Ditch Protection and Construction Slope Protection by the number of square yards (square meters).

The Department will measure Rock Channel Protection, Type C or D (with or without filter) by the number of cubic yards (cubic meters).

The Department will measure Sediment Removal by the number of cubic yards (cubic meters).

The Department will measure Construction Mulching by the number of square yards (square meters) regardless if the application is crimped or not.

The Department will measure Winter Seeding and Mulching by the number of square yards (square meters).

The Department will measure Construction Entrance protection by the number of cubic yards (cubic meters)

832.14 Basis of Payment

The Department will pay the contract Lump Sum price bid for the SWPPP.

The Department will make partial payments for the Storm Water Pollution Prevention Plan according to C&MS Section 109.09 and as modified by the following schedule:

The Department will release 60 percent of the lump sum amount bid for Storm Water Pollution Prevention Plan to the Contractor with the first regular estimate payable after the Engineer has accepted the Storm Water Pollution Prevention Plan submission.

The Department will release 30 percent of the lump sum amount bid for Storm Water Pollution Prevention Plan to the Contractor with the first regular estimate payable after 50 percent of the project is complete.

The Department will release the remaining 10 percent of the lump sum amount bid for Storm Water Pollution Prevention Plan to the Contractor with the first regular estimate payable after 90 percent of the project is complete.

The Department will pay for appropriate, properly installed and accepted BMP per Item 832 Each, Erosion Control. BMP compensation will be based on the unit prices shown in Appendix F.

The Department will not pay for BMP Items which are required as a result of the Contractor's negligence, carelessness, or failure to install permanent controls.

The Department will not pay for BMP that does not provide effective sediment and erosion control for the EDA.

The Department will not pay for any causeway and access fills.

The Department will not pay to replace BMP that have failed as a result of improper maintenance or installation.

The Department will not pay for concrete washout area BMP. Concrete washout area BMP are considered incidental to the concrete work.

The Department will not pay for BMP which are required as a part of the work and are not specifically identified as a separate item. Compensation for BMP that are required for NPDES Permit compliance and are not included in Appendix F of this specification are considered incidental to the work.

Item	Unit	Description
832	Lump Sum	Storm Water Pollution Prevention Plan
832	Each	Erosion Control

Appendix A

**Weekly and Rain Event Erosion Control
BMP Inventory**

Contractor _____

Project No. _____ Co-Rt-Sec _____ Date _____

R=Replacement W=Working M=Maintenance I=Install D=Delete Rain Amt

Station to Station	Side	Offset	Balloon Ref.	Perimeter Control	Inlet Protection	Constr. Speed	Dikes Fill Slopes	Dikes Cut Slopes	Slope Drains	FF Ditch Checks	Rock Ditch Checks	Sediment Basins	Stream Relocate	Stream Crossing	Date work was Complete

Notes:

This form is furnished to assist in documenting and recording the BMP quantities for payment.
This form is not a substitute for the inspection report described in 832.11.

Appendix C

Sample SWPPP Acceptance Form

The Department has received the SWPPP for Project: _____

Co-Rt-Sec: _____

The submittal is dated: _____

The Department Accepts the Submittal.

Project Engineer, Project Supervisor

Date



Co-Permittee Notice of Intent for Coverage Under Ohio EPA Storm Water Construction General Permit

Submission of this NOI constitutes notice that the party identified in Section I of this form intends to be authorized by Ohio's NPDES general permit for storm water associated with construction activity. Becoming a permittee obligates a discharger to comply with the terms and conditions of the permit. **NOTE: All necessary information must be provided on this form. Read the accompanying instructions *carefully* before completing the form. Do not use correction fluid on this form. Forms transmitted by fax will not be accepted. There is no fee associated with submitting this form.**

I. Applicant Information/Mailing Address

Company (Applicant) Name: _____
 Mailing (Applicant) Address: _____
 City: _____ State: _____ Zip Code: _____
 Contact Person: _____ Phone: _____ Fax: _____
 Contact E-Mail Address: _____

II. Facility/Site Location Information

Existing Ohio EPA Facility Permit Number: __ GC __ _ _ _ _ * __ G OR OHR1 __ _ _ _ _
 Initial Permittee Name: _____ Phone: _____
 Facility/Site Name: _____
 City: _____ Township(s): _____
 County(ies): _____ State: Ohio Zip Code: _____
 Facility Contact Person: _____ Phone: _____ Fax: _____
 Facility Contact E-Mail Address: _____

III. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Applicant Name: _____ Title: _____
 Applicant Signature: _____ Date: _____

OHIO E.P.A.
APR 11 2013
ENTERED DIRECTOR'S JOURNAL

Issuance Date: April 11, 2013
Effective Date: April 21, 2013
Expiration Date: April 20, 2018



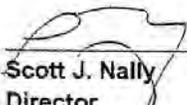
OHIO ENVIRONMENTAL PROTECTION AGENCY

GENERAL PERMIT AUTHORIZATION FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et. seq. hereafter referred to as "the Act") and the Ohio Water Pollution Control Act [Ohio Revised Code ("ORC") Chapter 6111], dischargers of storm water from sites where construction activity is being conducted, as defined in Part I.B of this permit, are authorized by the Ohio Environmental Protection Agency, hereafter referred to as "Ohio EPA," to discharge from the outfalls at the sites and to the receiving surface waters of the state identified in their Notice of Intent ("NOI") application form on file with Ohio EPA in accordance with the conditions specified in Parts I through VII of this permit.

It has been determined that a lowering of water quality of various waters of the state associated with granting coverage under this permit is necessary to accommodate important social and economic development in the state of Ohio. In accordance with OAC 3745-1-05, this decision was reached only after examining a series of technical alternatives, reviewing social and economic issues related to the degradation, and considering all public and intergovernmental comments received concerning the proposal.

This permit is conditioned upon payment of applicable fees, submittal of a complete NOI application form and written approval of coverage from the director of Ohio EPA in accordance with Ohio Administrative Code ("OAC") Rule 3745-38-02.



Scott J. Nally
Director

I certify this to be a true and accurate copy of the official documents as filed in the records of the Ohio Environmental Protection Agency.

By: Joseph Cassider Date: 4-11-13

TABLE OF CONTENTS

PART I. COVERAGE UNDER THIS PERMIT

- A. Permit Area
- B. Eligibility
- C. Requiring an individual permit or an alternative general permit
- D. Permit requirements when portions of a site are sold
- E. Authorization
- F. Notice of Intent Requirements

PART II. NON-NUMERIC EFFLUENT LIMITATIONS

- A. Erosion and Sediment Controls
- B. Soil Stabilization
- C. Dewatering
- D. Pollution Prevention Measures
- E. Prohibited Discharges
- F. Surface Outlets

PART III. STORM WATER POLLUTION PREVENTION PLAN (SWP3)

- A. Storm Water Pollution Prevention Plans
- B. Timing
- C. SWP3 Signature and Review
- D. Amendments
- E. Duty to inform contractors and subcontractors
- F. Total Maximum Daily Load (TMDL) allocations
- G. SWP3 Requirements

PART IV. NOTICE OF TERMINATION REQUIREMENTS

- A. Failure to notify
- B. When to submit an NOT
- C. How to submit an NOT

PART V. STANDARD PERMIT CONDITIONS

- A. Duty to comply
- B. Continuation of the expired general permit
- C. Need to halt or reduce activity not a defense
- D. Duty to mitigate
- E. Duty to provide information
- F. Other information
- G. Signatory requirements
- H. Certification
- I. Penalties for falsification of monitoring systems
- J. Oil and hazardous substance liability
- K. Property rights
- L. Severability
- M. Transfers
- N. Environmental laws
- O. Proper operation and maintenance
- P. Inspection and entry

PART VI. REOPENER CLAUSE

PART VII. DEFINITIONS

PART I. COVERAGE UNDER THIS PERMIT

A. Permit Area.

This permit covers the entire State of Ohio.

B. Eligibility.

1. Construction activities covered. Except for storm water discharges identified under Part I.B.2, this permit may cover all new and existing discharges composed entirely of storm water discharges associated with construction activity that enter surface waters of the state or a storm drain leading to surface waters of the state.

For the purposes of this permit, construction activities include any clearing, grading, excavating, grubbing and/or filling activities that disturb the threshold acreage described in the next paragraph. Discharges from trench dewatering are also covered by this permit as long as the dewatering activity is carried out in accordance with the practices outlined in Part III.G.2.g.iv of this permit.

Construction activities disturbing one or more acres of total land, or will disturb less than one acre of land but are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land will be eligible for coverage under this permit. The threshold acreage includes the entire area disturbed in the larger common plan of development or sale.

This permit also authorizes storm water discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

- a. The support activity is directly related to a construction site that is required to have NPDES permit coverage for discharges of storm water associated with construction activity;
 - b. The support activity is not a commercial operation serving multiple unrelated construction projects and does not operate beyond the completion of the construction activity at the site it supports;
 - c. Appropriate controls and measures are identified in a storm water pollution prevention plan (SWP3) covering the discharges from the support activity; and
 - d. The support activity is on or contiguous with the property defined in the NOI (offsite borrow pits and soil disposal areas, which serve only one project, do not have to be contiguous with the construction site).
2. Limitations on coverage. The following storm water discharges associated with construction activity are not covered by this permit:
 - a. Storm water discharges that originate from the site after construction activities have been completed, including any temporary support activity, and the site has achieved

- final stabilization. Industrial post-construction storm water discharges may need to be covered by an NPDES permit;
- b. Storm water discharges associated with construction activity that the director has shown to be or may reasonably expect to be contributing to a violation of a water quality standard; and
 - c. Storm water discharges authorized by an individual NPDES permit or another NPDES general permit;
3. Waivers. After March 10, 2003, sites whose larger common plan of development or sale have at least one, but less than five acres of land disturbance, which would otherwise require permit coverage for storm water discharges associated with construction activities, may request that the director waive their permit requirement. Entities wishing to request such a waiver must certify in writing that the construction activity meets one of the two waiver conditions:
- a. Rainfall Erosivity Waiver. For a construction site to qualify for the rainfall erosivity waiver, the cumulative rainfall erosivity over the project duration must be five or less and the site must be stabilized with a least a 70 percent vegetative cover or other permanent, non-erosive cover. The rainfall erosivity must be calculated according to the method in U.S. EPA Fact Sheet 3.1 Construction Rainfall Erosivity Waiver dated January 2001 and be found at: http://epa.ohio.gov/portals/35/permits/USEPAfact3-1_s.pdf. If it is determined that a construction activity will take place during a time period where the rainfall erosivity factor is less than five, a written waiver certification must be submitted to Ohio EPA at least 21 days before construction activity is scheduled to begin. If the construction activity will extend beyond the dates specified in the waiver certification, the operator must either: (a) recalculate the waiver using the original start date with the new ending date (if the R factor is still less than five, a new waiver certification must be submitted) or (b) submit an NOI application form and fee for coverage under this general permit at least seven days prior to the end of the waiver period; or
 - b. TMDL (Total Maximum Daily Load) Waiver. Storm water controls are not needed based on a TMDL approved or established by U.S. EPA that addresses the pollutant(s) of concern or, for non-impaired waters that do not require TMDLs, and equivalent analysis that determines allocations for small construction sites for the pollutant(s) of concern or that determines that such allocations are not needed to protect water quality based on consideration of existing in-stream concentrations, expected growth in pollutant contributions from all sources, and a margin of safety. The pollutant(s) of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the construction activity. The operator must certify to the director of Ohio EPA that the construction activity will take place, and storm water discharges will occur, within the drainage area addressed by the TMDL or equivalent analysis. A written waiver certification must be submitted to Ohio EPA at least 21 days before the construction activity is scheduled to begin.

4. Prohibition on non-storm water discharges. All discharges covered by this permit must be composed entirely of storm water with the exception of the following: discharges from firefighting activities; fire hydrant flushings; potable water sources including waterline flushings; irrigation drainage; lawn watering; routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; springs; uncontaminated ground water from trench or well point dewatering and foundation or footing drains where flows are not contaminated with process materials such as solvents. Dewatering activities must be done in compliance with Part II.C and Part III.G.2.g.iv of this permit. Discharges of material other than storm water or the authorized non-storm water discharges listed above must comply with an individual NPDES permit or an alternative NPDES general permit issued for the discharge.

Except for flows from firefighting activities, sources of non-storm water listed above that are combined with storm water discharges associated with construction activity must be identified in the SWP3. The SWP3 must identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

5. Spills and unintended releases (Releases in excess of Reportable Quantities). This permit does not relieve the permittee of the reporting requirements of Title 40 of the Code of Federal Regulations ("CFR") Part 117 and 40 CFR Part 302. In the event of a spill or other unintended release, the discharge of hazardous substances in the storm water discharge(s) from a construction site must be minimized in accordance with the applicable storm water pollution prevention plan for the construction activity and in no case, during any 24-hour period, may the discharge(s) contain a hazardous substance equal to or in excess of reportable quantities.

40 CFR Part 117 sets forth a determination of the reportable quantity for each substance designated as hazardous in 40 CFR Part 116. The regulation applies to quantities of designated substances equal to or greater than the reportable quantities, when discharged to surface waters of the state. 40 CFR Part 302 designates under section 102(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, those substances in the statutes referred to in section 101(14), identifies reportable quantities for these substances and sets forth the notification requirements for releases of these substances. This regulation also sets forth reportable quantities for hazardous substances designated under section 311(b)(2)(A) of the Clean Water Act (CWA).

- C. **Requiring an individual NPDES permit or an alternative NPDES general permit.**

1. The director may require an alternative permit. The director may require any operator eligible for this permit to apply for and obtain either an individual NPDES permit or coverage under an alternative NPDES general permit in accordance with OAC Rule 3745-38-04. Any interested person may petition the director to take action under this paragraph.

The director will send written notification that an alternative NPDES permit is required. This notice shall include a brief statement of the reasons for this decision, an application

form and a statement setting a deadline for the operator to file the application. If an operator fails to submit an application in a timely manner as required by the director under this paragraph, then coverage, if in effect, under this permit is automatically terminated at the end of the day specified for application submittal.

2. Operators may request an individual NPDES permit. Any owner or operator eligible for this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator shall submit an individual application with reasons supporting the request to the director in accordance with the requirements of 40 CFR 122.26. If the reasons adequately support the request, the director shall grant it by issuing an individual NPDES permit.
 3. When an individual NPDES permit is issued to an owner or operator otherwise subject to this permit or the owner or operator is approved for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of approval for coverage under the alternative general permit, whichever the case may be.
- D. Permit requirements when portions of a site are sold**

If an operator obtains a permit for a development, and then the operator (permittee) sells off lots or parcels within that development, permit coverage must be continued on those lots until a Notice of Termination (NOT) in accordance with Part IV.B is submitted. For developments which require the use of centralized sediment and erosion controls (i.e., controls that address storm water runoff from one or more lots) for which the current permittee intends to terminate responsibilities under this permit for a lot after sale of the lot to a new owner and such termination will either prevent or impair the implementation of the controls and therefore jeopardize compliance with the terms and conditions of this permit, the permittee will be required to maintain responsibility for the implementation of those controls. For developments where this is not the case, it is the permittee's responsibility to temporarily stabilize all lots sold to individual lot owners unless an exception is approved in accordance with Part III.G.4. In cases where permit responsibilities for individual lot(s) will be terminated after sale of the lot, the permittee shall inform the individual lot owner of the obligations under this permit and ensure that the Individual Lot NOI application is submitted to Ohio EPA.

E. Authorization

1. Obtaining authorization to discharge. Operators that discharge storm water associated with construction activity must submit an NOI application form in accordance with the requirements of Part I.F of this permit to obtain authorization to discharge under this general permit. As required under OAC Rule 3745-38-06(E), the director, in response to the NOI submission, will notify the applicant in writing that he/she has or has not been granted general permit coverage to discharge storm water associated with construction activity under the terms and conditions of this permit or that the applicant must apply for an individual NPDES permit or coverage under an alternate general NPDES permit as described in Part I.C.1.
2. No release from other requirements. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations. Other permit requirements commonly associated with construction activities

include, but are not limited to, section 401 water quality certifications, isolated wetland permits, permits to install sanitary sewers or other devices that discharge or convey polluted water, permits to install drinking water lines, single lot sanitary system permits and disturbance of land which was used to operate a solid or hazardous waste facility (i.e., coverage under this NPDES general permit does not satisfy the requirements of OAC Rule 3745-27-13 or ORC Section 3734.02(H)). The issuance of this permit is subject to resolution of an antidegradation review. This permit does not relieve the permittee of other responsibilities associated with construction activities such as contacting the Ohio Department of Natural Resources, Division of Water, to ensure proper well installation and abandonment of wells.

F. Notice of Intent Requirements

1. **Deadlines for notification.**
 - a. **Initial coverage:** Operators who intend to obtain initial coverage for a storm water discharge associated with construction activity under this general permit must submit a complete and accurate NOI application form and appropriate fee at least 21 days prior to the commencement of construction activity. If more than one operator, as defined in Part VII of this general permit, will be engaged at a site, each operator shall seek coverage under this general permit. Coverage under this permit is not effective until an approval letter granting coverage from the director of Ohio EPA is received by the applicant. Where one operator has already submitted an NOI prior to other operator(s) being identified, the additional operator shall request modification of coverage to become a co-permittee. In such instances, the co-permittees shall be covered under the same facility permit number. No additional permit fee is required.
 - b. **Individual lot transfer of coverage:** Operators must each submit an individual lot notice of intent (Individual Lot NOI) application form (no fee required) to Ohio EPA at least seven days prior to the date that they intend to accept responsibility for permit requirements for their portion of the original permitted development from the previous permittee. The original permittee may submit an Individual Lot NOT at the time the Individual Lot NOI is submitted. Transfer of permit coverage is not granted until an approval letter from the director of Ohio EPA is received by the applicant.
2. **Failure to notify.** Operators who fail to notify the director of their intent to be covered and who discharge pollutants to surface waters of the state without an NPDES permit are in violation of ORC Chapter 6111. In such instances, Ohio EPA may bring an enforcement action for any discharges of storm water associated with construction activity.
3. **Where to submit an NOI.** Operators seeking coverage under this permit must submit a signed NOI form, provided by Ohio EPA, to the address found in the associated instructions.
4. **Additional notification.** NOIs and SWP3s are considered public documents and shall be made available to the public in accordance with Part III.C.2. The permittee shall make NOIs and SWP3s available upon request of the director of Ohio EPA, local agencies approving sediment and erosion control plans, grading plans or storm water management plans, local governmental officials, or operators of municipal separate storm sewer systems (MS4s) receiving drainage from the permitted site. Each operator

that discharges to an NPDES permitted MS4 shall provide a copy of its Ohio EPA NOI submission to the MS4 in accordance with the MS4's requirements, if applicable.

5. **Re-notification.** Existing permittees having coverage under the previous generations of this general permit (OHC000003, OHC000002 and OHR100000) shall have continuing coverage under OHC000004 with the submittal of a timely renewal application. Existing permittees will receive a renewal application and instructions for how to continue coverage under OHC000004. Within 90 days of receiving a renewal application from Ohio EPA, existing permittees shall submit the completed renewal application expressing their intent for continued coverage. In accordance with Ohio Administrative Code (OAC) 3745-38-02(E)(2)(a)(i), a renewal application fee will only apply to existing permittees having general permit coverage for 5 or more years as of the effective date of this general permit. Permit coverage will be terminated if Ohio EPA does not receive the renewal application within this 90 day period.

Part II. NON-NUMERIC EFFLUENT LIMITATIONS

You shall comply with the following non-numeric effluent limitations for discharges from your site and/or from construction support activities. Part III of this permit contains the specific design criteria to meet the objectives of the following non-numeric effluent limitations.

- A. **Erosion and Sediment Controls.** You shall design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, such controls shall be designed, installed and maintained to:
 1. Control storm water volume and velocity within the site to minimize soil erosion;
 2. Control storm water discharges, including both peak flowrates and total storm water volume, to minimize erosion at outlets and to minimize downstream channel and streambank erosion;
 3. Minimize the amount of soil exposed during construction activity;
 4. Minimize the disturbance of steep slopes;
 5. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls shall address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting storm water runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site;
 6. If feasible, provide and maintain a 50-foot undisturbed natural buffer around surface waters of the state, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration. If it is infeasible to provide and maintain an undisturbed 50-foot natural buffer, you shall comply with the stabilization requirements found in Part II.B for areas within 50 feet of a surface water; and
 7. Minimize soil compaction and, unless infeasible, preserve topsoil.

- B. Soil Stabilization.** Stabilization of disturbed areas shall, at a minimum, be initiated in accordance with the time frames specified in the following tables.

Table 1: Permanent Stabilization

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more	Within seven days of the most recent disturbance
Any areas within 50 feet of a surface water of the state and at final grade	Within two days of reaching final grade
Any other areas at final grade	Within seven days of reaching final grade within that area

Table 2: Temporary Stabilization

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a surface water of the state and not at final grade	Within two days of the most recent disturbance if the area will remain idle for more than 14 days
For all construction activities, any disturbed areas that will be dormant for more than 14 days but less than one year, and not within 50 feet of a surface water of the state	Within seven days of the most recent disturbance within the area For residential subdivisions, disturbed areas must be stabilized at least seven days prior to transfer of permit coverage for the individual lot(s).
Disturbed areas that will be idle over winter	Prior to the onset of winter weather

Where vegetative stabilization techniques may cause structural instability or are otherwise unobtainable, alternative stabilization techniques must be employed. Permanent and temporary stabilization are defined in Part VII.

- C. Dewatering.** Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls.
- D. Pollution Prevention Measures.** Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented and maintained to:
1. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters shall be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;

2. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to storm water; and
 3. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.
- E. Prohibited Discharges.** The following discharges are prohibited:
1. Wastewater from washout of concrete, unless managed by an appropriate control;
 2. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
 3. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
 4. Soaps or solvents used in vehicle and equipment washing.
- F. Surface Outlets.** When discharging from sediment basins utilize outlet structures that withdraw water from the surface, unless infeasible. (Note: Ohio EPA believes that the circumstances in which it is infeasible to design outlet structures in this manner are rare. Exceptions may include time periods with extended cold weather during winter months. If you have determined that it is infeasible to meet this requirement, you shall provide documentation in your SWP3 to support your determination.)

PART III. STORM WATER POLLUTION PREVENTION PLAN (SWP3)

A. Storm Water Pollution Prevention Plans.

A SWP3 shall be developed for each site covered by this permit. For a multi-phase construction project, a separate NOI shall be submitted when a separate SWP3 will be prepared for subsequent phases. SWP3s shall be prepared in accordance with sound engineering and/or conservation practices by a professional experienced in the design and implementation of standard erosion and sediment controls and storm water management practices addressing all phases of construction. The SWP3 shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with construction activities. The SWP3 shall be a comprehensive, stand-alone document, which is not complete unless it contains the information required by Part III.G of this permit. In addition, the SWP3 shall describe and ensure the implementation of best management practices (BMPs) that reduce the pollutants in storm water discharges during construction and pollutants associated with post-construction activities to ensure compliance with ORC Section 6111.04, OAC Chapter 3745-1 and the terms and conditions of this permit.

B. Timing

A SWP3 shall be completed prior to the timely submittal of an NOI and updated in accordance with Part III.D. Upon request and good cause shown, the director may waive the requirement to have a SWP3 completed at the time of NOI submission. If a waiver has been granted, the

SWP3 must be completed prior to the initiation of construction activities. The SWP3 must be implemented upon initiation of construction activities.

If you wish to continue coverage from the previous generations of this permit (OHR100000, OHC000002 and OHC000003) you shall review and update your SWP3 to ensure that this permit's requirements are addressed within 180 days after the effective date of this permit. If it is infeasible for you to comply with a specific requirement in this permit because (1) the provision was not part of the permit you were previously covered under (OHR100000, OHC000002 and OHC000003), and (2) because you are prevented from compliance due to the nature or location of earth disturbances that commenced prior to the effective date of this permit, you shall include documentation within your SWP3 of the reasons why it is infeasible for you to meet the specific requirement. (Note: Ohio EPA believes examples of OHC000004 permit conditions that would be infeasible for permittees renewing coverage to comply with include: (1) Post-Construction Storm Water Management requirements, if general permit coverage was obtained prior to April 21, 2003, and (2) Sediment settling pond design requirements, if the general permit coverage was obtained prior to the effective date of this permit and the sediment settling pond has been installed.)

C. SWP3 Signature and Review.

1. Plan Signature and Retention On-Site. The SWP3 shall include the certification in Part V.H, be signed in accordance with Part V.G., and be retained on site during working hours.
2. Plan Availability
 - a. On-site: The plan shall be made available immediately upon request of the director or his authorized representative and MS4 operators or their authorized representative during working hours. A copy of the NOI and letter granting permit coverage under this general permit also shall be made available at the site.
 - b. By written request: The permittee must provide the most recent copy of the SWP3 within 10 days upon written request by any of the following:
 - i. The director or the director's authorized representative;
 - ii. A local agency approving sediment and erosion plans, grading plans or storm water management plans; or
 - iii. In the case of a storm water discharge associated with construction activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the operator of the system.
 - c. To the public: All NOIs, general permit approval for coverage letters, and SWP3s are considered reports that shall be available to the public in accordance with the Ohio Public Records law. The permittee shall make documents available to the public upon request or provide a copy at public expense, at cost, in a timely manner. However, the permittee may claim to Ohio EPA any portion of an SWP3 as confidential in accordance with Ohio law.

3. **Plan Revision.** The director or authorized representative may notify the permittee at any time that the SWP3 does not meet one or more of the minimum requirements of this part. Within 10 days after such notification from the director or authorized representative (or as otherwise provided in the notification), the permittee shall make the required changes to the SWP3 and, if requested, shall submit to Ohio EPA the revised SWP3 or a written certification that the requested changes have been made.

D. Amendments

The permittee shall amend the SWP3 whenever there is a change in design, construction, operation or maintenance, which has a significant effect on the potential for the discharge of pollutants to surface waters of the state or if the SWP3 proves to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity. Amendments to the SWP3 may be reviewed by Ohio EPA in the same manner as Part III.C.

E. Duty to inform contractors and subcontractors

The permittee shall inform all contractors and subcontractors not otherwise defined as "operators" in Part VII of this general permit who will be involved in the implementation of the SWP3 of the terms and conditions of this general permit. The permittee shall maintain a written document containing the signatures of all contractors and subcontractors involved in the implementation of the SWP3 as proof acknowledging that they reviewed and understand the conditions and responsibilities of the SWP3. The written document shall be created and signatures shall be obtained prior to commencement of work on the construction site.

F. Total Maximum Daily Load (TMDL) allocations

If a TMDL is approved for any waterbody into which the permittee's site discharges and requires specific BMPs for construction sites, the director may require the permittee to revise his/her SWP3.

G. SWP3 Requirements

Operations that discharge storm water from construction activities are subject to the following requirements and the SWP3 shall include the following items:

1. **Site description.** Each SWP3 shall provide:
 - a. A description of the nature and type of the construction activity (e.g., low density residential, shopping mall, highway, etc.);
 - b. Total area of the site and the area of the site that is expected to be disturbed (i.e., grubbing, clearing, excavation, filling or grading, including off-site borrow areas);
 - c. An estimate of the impervious area and percent imperviousness created by the construction activity;

- d. A calculation of the runoff coefficients for both the pre-construction and post-construction site conditions;
- e. Existing data describing the soil and, if available, the quality of any discharge from the site;
- f. A description of prior land uses at the site;
- g. An implementation schedule which describes the sequence of major construction operations (i.e., designation of vegetative preservation areas, grubbing, excavating, grading, utilities and infrastructure installation) and the implementation of erosion, sediment and storm water management practices or facilities to be employed during each operation of the sequence;
- h. The name and/or location of the immediate receiving stream or surface water(s) and the first subsequent named receiving water(s) and the areal extent and description of wetlands or other special aquatic sites at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project. For discharges to an MS4, the point of discharge to the MS4 and the location where the MS4 ultimately discharges to a stream or surface water of the state shall be indicated;
- i. For subdivided developments where the SWP3 does not call for a centralized sediment control capable of controlling multiple individual lots, a detail drawing of a typical individual lot showing standard individual lot erosion and sediment control practices.

This does not remove the responsibility to designate specific erosion and sediment control practices in the SWP3 for critical areas such as steep slopes, stream banks, drainage ways and riparian zones;
- j. Location and description of any storm water discharges associated with dedicated asphalt and dedicated concrete plants covered by this permit and the best management practices to address pollutants in these storm water discharges;
- k. A copy of the permit requirements (attaching a copy of this permit is acceptable);
- l. A cover page or title identifying the name and location of the site, the name and contact information of all construction site operators, the name and contact information for the person responsible for authorizing and amending the SWP3, preparation date, and the estimated dates that construction will start and be complete;
- m. A log documenting grading and stabilization activities as well as amendments to the SWP3, which occur after construction activities commence; and
- n. Site map showing:

- i. Limits of earth-disturbing activity of the site including associated off-site borrow or spoil areas that are not addressed by a separate NOI and associated SWP3;
 - ii. Soils types for all areas of the site, including locations of unstable or highly erodible soils;
 - iii. Existing and proposed contours. A delineation of drainage watersheds expected during and after major grading activities as well as the size of each drainage watershed, in acres;
 - iv. Surface water locations including springs, wetlands, streams, lakes, water wells, etc., on or within 200 feet of the site, including the boundaries of wetlands or stream channels and first subsequent named receiving water(s) the permittee intends to fill or relocate for which the permittee is seeking approval from the Army Corps of Engineers and/or Ohio EPA;
 - v. Existing and planned locations of buildings, roads, parking facilities and utilities;
 - vi. The location of all erosion and sediment control practices, including the location of areas likely to require temporary stabilization during the course of site development;
 - vii. Sediment and storm water management basins noting their sediment settling volume and contributing drainage area. Ohio EPA recommends the use of data sheets (see ODNR's Rainwater and Land Development manual for examples) to provide data for all sediment traps, sediment basins and storm water management treatment practices noting important inputs to design and resulting parameters such as their contributing drainage area, disturbed area, water quality volume, sedimentation volume, practice surface area, facility discharge and dewatering time, outlet type and dimensions;
 - viii. The location of permanent storm water management practices to be used to control pollutants in storm water after construction operations have been completed;
 - ix. Areas designated for the storage or disposal of solid, sanitary and toxic wastes, including dumpster areas, areas designated for cement truck washout, and vehicle fueling;
 - x. The location of designated construction entrances where the vehicles will access the construction site; and
 - xi. The location of any in-stream activities including stream crossings.
2. Controls. In accordance with Part II.A, the SWP3 shall contain a description of the controls appropriate for each construction operation covered by this permit and the operator(s) shall implement such controls. The SWP3 shall clearly describe for each

major construction activity identified in Part III.G.1.g: (a) appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented; and (b) which contractor is responsible for implementation (e.g., contractor A will clear land and install perimeter controls and contractor B will maintain perimeter controls until final stabilization). The SWP3 shall identify the subcontractors engaged in activities that could impact storm water runoff. The SWP3 shall contain signatures from all of the identified subcontractors indicating that they have been informed and understand their roles and responsibilities in complying with the SWP3. Ohio EPA recommends that the primary site operator review the SWP3 with the primary contractor prior to commencement of construction activities and keep a SWP3 training log to demonstrate that this review has occurred.

Ohio EPA recommends that the erosion, sediment, and storm water management practices used to satisfy the conditions of this permit should meet the standards and specifications in the most current edition of Ohio's Rainwater and Land Development (see definitions) manual or other standards acceptable to Ohio EPA. The controls shall include the following minimum components:

- a. Non-Structural Preservation Methods. The SWP3 shall make use of practices which preserve the existing natural condition as much as feasible. Such practices may include: preserving existing vegetation and vegetative buffer strips, phasing of construction operations in order to minimize the amount of disturbed land at any one time and designation of tree preservation areas or other protective clearing or grubbing practices. For all construction activities immediately adjacent to surface waters of the state, the permittee shall comply with the buffer non-numeric effluent limitation in Part II.A.6, as measured from the ordinary high water mark of the surface water.
- b. Erosion Control Practices. The SWP3 shall make use of erosion controls that are capable of providing cover over disturbed soils unless an exception is approved in accordance with Part III.G.4. A description of control practices designed to restabilize disturbed areas after grading or construction shall be included in the SWP3. The SWP3 shall provide specifications for stabilization of all disturbed areas of the site and provide guidance as to which method of stabilization will be employed for any time of the year. Such practices may include: temporary seeding, permanent seeding, mulching, matting, sod stabilization, vegetative buffer strips, phasing of construction operations, use of construction entrances and the use of alternative ground cover.
 - i. **Stabilization.** Disturbed areas shall be stabilized in accordance with Table 1 (Permanent Stabilization) and Table 2 (Temporary Stabilization) in Part II.B of this permit.
 - ii. **Permanent stabilization of conveyance channels.** Operators shall undertake special measures to stabilize channels and outfalls and prevent erosive flows. Measures may include seeding, dormant seeding (as defined in the most current edition of the Rainwater and Land Development manual), mulching, erosion control matting, sodding, riprap, natural channel design with bioengineering techniques or rock check dams.

- c. Runoff Control Practices. The SWP3 shall incorporate measures which control the flow of runoff from disturbed areas so as to prevent erosion from occurring. Such practices may include rock check dams, pipe slope drains, diversions to direct flow away from exposed soils and protective grading practices. These practices shall divert runoff away from disturbed areas and steep slopes where practicable. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.
- d. Sediment Control Practices. The plan shall include a description of structural practices that shall store runoff allowing sediments to settle and/or divert flows away from exposed soils or otherwise limit runoff from exposed areas. Structural practices shall be used to control erosion and trap sediment from a site remaining disturbed for more than 14 days. Such practices may include, among others: sediment settling ponds, silt fences, earth diversion dikes or channels which direct runoff to a sediment settling pond and storm drain inlet protection. All sediment control practices must be capable of ponding runoff in order to be considered functional. Earth diversion dikes or channels alone are not considered a sediment control practice unless those are used in conjunction with a sediment settling pond.

The SWP3 shall contain detail drawings for all structural practices.

- i. **Timing.** Sediment control structures shall be functional throughout the course of earth disturbing activity. Sediment basins and perimeter sediment barriers shall be implemented prior to grading and within seven days from the start of grubbing. They shall continue to function until the up slope development area is restabilized. As construction progresses and the topography is altered, appropriate controls shall be constructed or existing controls altered to address the changing drainage patterns.
- ii. **Sediment settling ponds.** A sediment settling pond is required for any one of the following conditions:
- Concentrated storm water runoff (e.g., storm sewer or ditch);
 - Runoff from drainage areas, which exceed the design capacity of silt fence or other sediment barriers;
 - Runoff from drainage areas that exceed the design capacity of inlet protection; or
 - Runoff from common drainage locations with 10 or more acres of disturbed land.

The permittee may request approval from Ohio EPA to use alternative controls if the permittee can demonstrate the alternative controls are equivalent in effectiveness to a sediment settling pond.

In accordance with Part II.F, if feasible, sediment settling ponds shall be dewatered at the pond surface using a skimmer or equivalent device. The sediment settling pond volume consists of both a dewatering zone and a sediment storage zone. The volume of the dewatering zone shall

be a minimum of 1800 cubic feet (ft³) per acre of drainage (67 yd³/acre) with a minimum 48-hour drain time for sediment basins serving a drainage area over 5 acres. The volume of the sediment storage zone shall be calculated by one of the following methods:

Method 1: The volume of the sediment storage zone shall be 1000 ft³ per disturbed acre within the watershed of the basin. OR

Method 2: The volume of the sediment storage zone shall be the volume necessary to store the sediment as calculated with RUSLE or a similar generally accepted erosion prediction model.

The accumulated sediment shall be removed from the sediment storage zone once it's full. When determining the total contributing drainage area, off-site areas and areas which remain undisturbed by construction activity shall be included unless runoff from these areas is diverted away from the sediment settling pond and is not co-mingled with sediment-laden runoff. The depth of the dewatering zone shall be less than or equal to five feet. The configuration between inlets and the outlet of the basin shall provide at least two units of length for each one unit of width (> 2:1 length:width ratio); however, a length to width ratio of 4:1 is recommended. When designing sediment settling ponds, the permittee shall consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design. The use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal is encouraged.

- iii. **Silt Fence and Diversions.** Sheet flow runoff from denuded areas shall be intercepted by silt fence or diversions to protect adjacent properties and water resources from sediment transported via sheet flow. Where intended to provide sediment control, silt fence shall be placed on a level contour downslope of the disturbed area. This permit does not preclude the use of other sediment barriers designed to control sheet flow runoff. The relationship between the maximum drainage area to silt fence for a particular slope range is shown in the following table:

Silt Fence Maximum Drainage Area Based on Slope

Maximum drainage area (in acres) to 100 linear feet of silt fence	Range of slope for a particular drainage area (in percent)
0.5	< 2%
0.25	≥ 2% but < 20%
0.125	≥ 20% but < 50%

Placing silt fence in a parallel series does not extend the size of the drainage area. Storm water diversion practices shall be used to keep runoff away from disturbed areas and steep slopes where practicable. Such devices, which include swales, dikes or berms, may receive storm water runoff from areas up to 10 acres.

- iv. **Inlet Protection.** Other erosion and sediment control practices shall minimize sediment laden water entering active storm drain systems, unless the storm drain system drains to a sediment settling pond. All inlets receiving runoff from drainage areas of one or more acres will require a sediment settling pond.
 - v. **Surface Waters of the State Protection.** If construction activities disturb areas adjacent to surface waters of the state, structural practices shall be designed and implemented on site to protect all adjacent surface waters of the state from the impacts of sediment runoff. No structural sediment controls (e.g., the installation of silt fence or a sediment settling pond) shall be used in a surface water of the state. For all construction activities immediately adjacent to surface waters of the state, the permittee shall comply with the buffer non-numeric effluent limitation in Part II.A.6, as measured from the ordinary high water mark of the surface water. Where impacts within this buffer area are unavoidable, due to the nature of the construction (e.g., stream crossings for roads or utilities), the project shall be designed such that the number of stream crossings and the width of the disturbance within the buffer area are minimized.
 - vi. **Modifying Controls.** If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the permittee shall replace or modify the control for site conditions.
- e. **Post-Construction Storm Water Management Requirements.** So that receiving stream's physical, chemical and biological characteristics are protected and stream functions are maintained, post-construction storm water practices shall provide perpetual management of runoff quality and quantity. To meet the post-construction requirements of this permit, the SWP3 shall contain a description of the post-construction BMPs that will be installed during construction for the site and the rationale for their selection. The rationale shall address the anticipated impacts on the channel and floodplain morphology, hydrology, and water quality. Post-construction BMPs cannot be installed within a surface water of the state (e.g., wetland or stream) unless it's authorized by a CWA 401 water quality certification, CWA 404 permit, or Ohio EPA non-jurisdictional wetland/stream program approval. Note: localities may have more stringent post-construction requirements.

Detail drawings and maintenance plans shall be provided for all post-construction BMPs. Maintenance plans shall be provided by the permittee to the post-construction operator of the site (including homeowner associations) upon completion of construction activities (prior to termination of permit coverage). For sites located within a community with a regulated municipal separate storm sewer system (MS4), the permittee, land owner, or other entity with legal control of the property may be required to develop and implement a maintenance plan to comply with the requirements of the MS4. Maintenance plans shall ensure that pollutants collected within structural post-construction practices, be disposed of in accordance with local, state, and federal regulations. To ensure that storm water management systems function as they were designed and constructed, the post-construction operation and maintenance plan shall be a stand-alone

document, which contains: (1) a designated entity for storm water inspection and maintenance responsibilities; (2) the routine and non-routine maintenance tasks to be undertaken; (3) a schedule for inspection and maintenance; (4) any necessary legally binding maintenance easements and agreements; and (5) a map showing all access and maintenance easements. Permittees are not responsible under this permit for operation and maintenance of post-construction practices once coverage under this permit is terminated.

Post-construction storm water BMPs that discharge pollutants from point sources once construction is completed, may in themselves, need authorization under a separate NPDES permit (one example is storm water discharges from regulated industrial sites).

Construction activities that do not include the installation of any impervious surface (e.g., soccer fields), abandoned mine land reclamation activities regulated by the Ohio Department of Natural Resources, stream and wetland restoration activities, and wetland mitigation activities are not required to comply with the conditions of Part III.G.2.e of this permit. Linear construction projects, (e.g., pipeline or utility line installation), which do not result in the installation of additional impervious surface, are not required to comply with the conditions of Part III.G.2.e of this permit. However, linear construction projects shall be designed to minimize the number of stream crossings and the width of disturbance and achieve final stabilization of the disturbed area as defined in Part VII.J.1.

Large Construction Activities. For all large construction activities (involving the disturbance of five or more acres of land or will disturb less than five acres, but is a part of a larger common plan of development or sale which will disturb five or more acres of land), the post construction BMP(s) chosen shall be able to detain storm water runoff for protection of the stream channels, stream erosion control, and improved water quality. The BMP(s) chosen must be compatible with site and soil conditions. Structural post-construction storm water treatment practices shall be incorporated into the permanent drainage system for the site. The BMP(s) chosen must be sized to treat the water quality volume (WQ_v) and ensure compliance with Ohio's Water Quality Standards in OAC Chapter 3745-1. The WQ_v shall be equivalent to the volume of runoff from a 0.75-inch rainfall and shall be determined according to the following equation:

$$WQ_v = C * P * A / 12$$

where:

WQ_v = water quality volume in acre-feet

C = runoff coefficient appropriate for storms less than 1 inch

(Either use the following formula: $C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$,

where i = fraction of post-construction impervious surface or use Table 1)

P = 0.75 inch precipitation depth

A = area draining into the BMP in acres

Table 1
Runoff Coefficients Based on the Type of Land Use

Land Use	Runoff Coefficient
Industrial & Commercial	0.8
High Density Residential (>8 dwellings/acre)	0.5
Medium Density Residential (4 to 8 dwellings/acre)	0.4
Low Density Residential (<4 dwellings/acre)	0.3
Open Space and Recreational Areas	0.2

Where the land use will be mixed, the runoff coefficient should be calculated using a weighted average. For example, if 60% of the contributing drainage area to the storm water treatment structure is Low Density Residential, 30% is High Density Residential, and 10% is Open Space, the runoff coefficient is calculated as follows $(0.6)(0.3) + (0.3)(0.5) + (0.1)(0.2) = 0.35$.

An additional volume equal to 20 percent of the WQ_v shall be incorporated into the BMP for sediment storage. Ohio EPA recommends that BMPs be designed according to the methodology included in the most current edition of the Rainwater and Land Development manual or in another design manual acceptable for use by Ohio EPA.

The BMPs listed in Table 2 below shall be considered standard BMPs approved for general use. However communities with a regulated MS4 may limit the use of some of these BMPs. BMPs shall be designed such that the drain time is long enough to provide treatment, but short enough to provide storage for successive rainfall events and avoid the creation of nuisance conditions. The outlet structure for the post-construction BMP shall not discharge more than the first half of the WQ_v or extended detention volume (EDv) in less than one-third of the drain time. The EDv is the volume of storm water runoff that must be detained by a structural post-construction BMP. The EDv is equal to 75 percent of the WQ_v for wet extended detention basins, but is equal to the WQ_v for all other BMPs listed in Table 2.

**Table 2
Structural Post-Construction BMPs & Associated
Drain (Drawdown) Times**

Best Management Practice	Drain Time of WQv
Infiltration Basin or Trench ¹	48 hours
Permeable Pavement – Infiltration ¹	48 hours
Permeable Pavement – Extended Detention	24 hours
Dry Extended Detention Basin ²	48 hours
Wet Extended Detention Basin ³	24 hours
Constructed Wetland (above permanent pool) ⁴	24 hours
Sand & Other Media Filtration ⁵	24 hours
Bioretention Area/Cell ^{5,6}	24 hours
Pocket Wetland ⁷	24 hours

- ¹ Practices that are designed to fully infiltrate the WQv (basin, trench, permeable pavement) shall empty within 48 hours to provide storage for the subsequent storm events.
- ² Dry basins must include forebay and micropool each sized at 10% of the WQv.
- ³ Provide both a permanent pool and an EDv above the permanent pool, each sized at 0.75 WQv.
- ⁴ Extended detention shall be provided for the WQv above the permanent water pool.
- ⁵ The surface ponding area (WQv) shall completely empty within 24 hours so that there is no standing water. Shorter drawdown times are acceptable as long as design criteria in Ohio's Rainwater and Land Development manual have been met.
- ⁶ This would include Grassed Linear Bioretention which was previously called Enhanced Water Quality Swale.
- ⁷ Pocket wetlands must have a wet pool equal to the WQv, with 25% of the WQv in a pool and 75% in marshes. The EDv above the permanent pool must be equal to the WQv.

The permittee may request approval from Ohio EPA to use alternative structural post-construction BMPs if the permittee can demonstrate that the alternative BMPs are equivalent in effectiveness to those listed in Table 2 above. Construction activities shall be exempt from this condition if it can be demonstrated that the WQv is provided within an existing structural post-construction BMP that is part of a larger common plan of development or if structural post-construction BMPs are addressed in a regional or local storm water management plan. A municipally operated regional storm water BMP can be used as a post-construction BMP provided that the BMP can detain the WQv from its entire drainage area and release it over a 24 hour period.

Transportation Projects. The construction of new roads and roadway improvement projects by public entities (i.e., the state, counties, townships, cities, or villages) may implement post-construction BMPs in compliance with the current version (as of the effective date of this permit) of the Ohio Department of Transportation's "Location and Design Manual, Volume Two Drainage Design" that has been accepted by Ohio EPA as an alternative to the conditions of this permit.

Offsite Mitigation of Post-Construction. Ohio EPA may authorize the offsite mitigation of the post-construction requirements of Part III.G.2.e of this permit on a case by case basis provided the permittee clearly demonstrates the BMPs listed in Table 2 are not feasible and the following criteria is met: (1) a maintenance agreement or policy is established to ensure operations and treatment in perpetuity; (2) the offsite location discharges to the same HUC-14 watershed unit; and (3) the mitigation ratio of the WQv is 1.5 to 1 or the WQv at the point of retrofit, whichever is greater. Requests for offsite mitigation must be received prior to receipt of the NOI applications.

Redevelopment Projects Sites that have been previously developed where no post-construction BMPs were installed shall either ensure a 20 percent net reduction of the site impervious area, provide for treatment of at least 20 percent of the WQv, or a combination of the two. A one-for-one credit towards the 20 percent net reduction of impervious area can be obtained through the use of green roofs. Where projects are a combination of new development and redevelopment, the total WQv that must be treated shall be calculated by a weighted average based on acreage, with the new development at 100 percent WQv and redevelopment at 20 percent WQv.

Non-Structural Post-Construction BMPs The size of the structural post-construction can be reduced by incorporating non-structural post-construction BMPs into the design. Practices such as preserving open space will reduce the runoff coefficient and, thus, the WQv. Ohio EPA encourages the implementation of riparian and wetland setbacks. Practices which reduce storm water runoff include green roofs, rain barrels, conservation development, smart growth, low-impact development, and other site design techniques. For examples, see the Ohio Lake Erie Commission's Balanced Growth Program at <http://balancedgrowth.ohio.gov/>.

In order to promote the implementation of such practices, the Director may consider the use of non-structural practices to demonstrate compliance with Part III.G.2.e of this permit for areas of the site not draining into a common drainage system of the site, i.e., sheet flow from perimeter areas such as the rear yards of residential lots, for low density development scenarios, or where the permittee can demonstrate that the intent of pollutant removal and stream protection, as required in Part III.G.2.e of this permit is being addressed through non-structural post-construction BMPs based upon review and approval by Ohio EPA.

Use of Alternative Post-Construction BMPs This permit does not preclude the use of innovative or experimental post-construction storm water management technologies. However, the Director may require these practices to be tested using the protocol outlined in the Technology Acceptance Reciprocity Partnership's (TARP) Protocol for Stormwater Best Management Practice Demonstrations or other approvable protocol. For guidance, see the following:

- <http://www.nistormwater.org>
- <http://www.mastep.net/>

The Director may require discharges from such structures to be monitored to ensure compliance with Part III.G.2.e of this permit. Permittees shall request

approval from Ohio EPA to use alternative post-construction BMPs if the permittee can demonstrate that the alternative BMPs are equivalent in effectiveness to those listed in Table 2 above. To demonstrate this equivalency, the permittee shall show that the alternative BMP has a minimum total suspended solids (TSS) removal efficiency of 80 percent under both laboratory and field conditions. Tests shall be conducted by an independent, third party tester. Also, the WQV discharge rate from the practice shall be reduced to prevent stream bed erosion and protect the physical and biological stream integrity unless there will be negligible hydrological impact to the receiving surface water of the state. The discharges will have a negligible impact if the permittee can demonstrate that one of the following four conditions exist:

- i. The entire WQV is recharged to groundwater;
- ii. The larger common plan of development or sale will create less than one acre of impervious surface;
- iii. The project is a redevelopment project within an ultra-urban setting (i.e., a downtown area or on a site where 100 percent of the project area is already impervious surface and the storm water discharge is directed into an existing storm sewer system); or
- iv. The storm water drainage system of the development discharges directly into a large river (fourth order or greater) or to a lake and where the development area is less than 5 percent of the watershed area upstream of the development site, unless a TMDL identified water quality problems into the receiving surface waters of the state.

The Director shall only consider the use of alternative BMPs on projects where the permittee can demonstrate that the implementation of the BMPs listed in Table 2 is infeasible due to physical site constraints that prevent the ability to provide functional BMP design. Alternative practices may include, but are not limited to, underground detention structures, vegetated swales and vegetated filter strips designed using water quality flow, natural depressions, rain barrels, green roofs, rain gardens, catch basin inserts, and hydrodynamics separators. The Director may also consider non-structural post-construction approaches where no local requirements for such practices exist.

Small Construction Activities For all small land disturbance activities (which disturb one or more, but less than five acres of land and is not a part of a larger common plan of development or sale which will disturb five or more acres of land), a description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed must be included in the SWP3. Structural measures should be placed on upland soils to the degree attainable. Such practices may include, but are not limited to: storm water detention structures (including wet basins); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices). The SWP3 shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed pre-development levels.

- f. Surface Water Protection. If the project site contains any streams, rivers, lakes, wetlands or other surface waters, certain construction activities at the site may be regulated under the CWA and/or state isolated wetland permit requirements. Sections 404 and 401 of the Act regulate the discharge of dredged or fill material into surface waters and the impacts of such activities on water quality, respectively. Construction activities in surface waters which may be subject to CWA regulation and/or state isolated wetland permit requirements include, but are not limited to: sewer line crossings, grading, backfilling or culverting streams, filling wetlands, road and utility line construction, bridge installation and installation of flow control structures. If the project contains streams, rivers, lakes or wetlands or possible wetlands, the permittee shall contact the appropriate U.S. Army Corps of Engineers District Office. (CAUTION: Any area of seasonally wet hydric soil is a potential wetland - please consult the Soil Survey and list of hydric soils for your County, available at your county's Soil and Water Conservation District. If you have any questions about Section 401 water quality certification, please contact the Ohio Environmental Protection Agency, Section 401 Coordinator.)

U.S. Army Corps of Engineers (Section 404 regulation):

- Huntington, WV District (304) 399-5210 (Muskingum River, Hocking River, Scioto River, Little Miami River, and Great Miami River Basins)
- Buffalo, NY District (716) 879-4330 (Lake Erie Basin)
- Pittsburgh, PA District (412) 395-7155 (Mahoning River Basin)
- Louisville, KY District (502) 315-6686 (Ohio River)

Ohio EPA 401/404 and non-jurisdictional stream/wetland coordinator can be contacted at (614) 644-2001 (all of Ohio)

Concentrated storm water runoff from BMPs to natural wetlands shall be converted to diffuse flow before the runoff enters the wetlands. The flow should be released such that no erosion occurs downslope. Level spreaders may need to be placed in series, particularly on steep sloped sites, to ensure non-erosive velocities. Other structural BMPs may be used between storm water features and natural wetlands, in order to protect the natural hydrology, hydroperiod, and wetland flora. If the applicant proposes to discharge to natural wetlands, a hydrologic analysis shall be performed. The applicant shall attempt to match the pre-development hydroperiods and hydrodynamics that support the wetland. The applicant shall assess whether their construction activity will adversely impact the hydrologic flora and fauna of the wetland. Practices such as vegetative buffers, infiltration basins, conservation of forest cover, and the preservation of intermittent streams, depressions, and drainage corridors may be used to maintain wetland hydrology.

- g. Other controls.

- i. **Non-Sediment Pollutant Controls.** In accordance with Part II.E, no solid (other than sediment) or liquid waste, including building materials, shall be discharged in storm water runoff. The permittee must implement all necessary BMPs to prevent the discharge of non-sediment pollutants to the drainage system of the site or surface waters of the state. Under

no circumstance shall wastewater from the washout of concrete trucks, stucco, paint, form release oils, curing compounds, and other construction materials be discharged directly into a drainage channel, storm sewer or surface waters of the state. Also, no pollutants from vehicle fuel, oils, or other vehicle fluids can be discharged to surface waters of the state. No exposure of storm water to waste materials is recommended. The SWP3 must include methods to minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, and sanitary waste to precipitation, storm water runoff, and snow melt. In accordance with Part II.D.3, the SWP3 shall include measures to prevent and respond to chemical spills and leaks. You may also reference the existence of other plans (i.e., Spill Prevention Control and Countermeasure (SPCC) plans, spill control programs, Safety Response Plans, etc.) provided that such plan addresses conditions of this permit condition and a copy of such plan is maintained on site.

- ii. **Off-site traffic.** Off-site vehicle tracking of sediments and dust generation shall be minimized. In accordance with Part II.D.1, the SWP3 shall include methods to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. No detergents may be used to wash vehicles. Wash waters shall be treated in a sediment basin or alternative control that provides equivalent treatment prior to discharge.
- iii. **Compliance with other requirements.** The SWP3 shall be consistent with applicable State and/or local waste disposal, sanitary sewer or septic system regulations, including provisions prohibiting waste disposal by open burning and shall provide for the proper disposal of contaminated soils to the extent these are located within the permitted area.
- iv. **Trench and ground water control.** In accordance with Part II.C, there shall be no turbid discharges to surface waters of the state resulting from dewatering activities. If trench or ground water contains sediment, it shall pass through a sediment settling pond or other equally effective sediment control device, prior to being discharged from the construction site. Alternatively, sediment may be removed by settling in place or by dewatering into a sump pit, filter bag or comparable practice. Ground water which does not contain sediment or other pollutants is not required to be treated prior to discharge. However, care must be taken when discharging ground water to ensure that it does not become pollutant-laden by traversing over disturbed soils or other pollutant sources.
- v. **Contaminated Sediment.** Where construction activities are to occur on sites with contamination from previous activities, operators shall be aware that concentrations of materials that meet other criteria (is not considered a Hazardous Waste, meeting VAP standards, etc.) may still result in storm water discharges in excess of Ohio Water Quality Standards. Such discharges are not authorized by this permit. Appropriate BMPs include, but are not limited to:

- The use of berms, trenches, and pits to collect contaminated runoff and prevent discharges;
- Pumping runoff into a sanitary sewer (with prior approval of the sanitary sewer operator) or into a container for transport to an appropriate treatment/disposal facility; and
- Covering areas of contamination with tarps or other methods that prevent storm water from coming into contact with the material.

Operators should consult with Ohio EPA Division of Surface Water prior to seeking permit coverage.

- h. Maintenance. All temporary and permanent control practices shall be maintained and repaired as needed to ensure continued performance of their intended function. All sediment control practices must be maintained in a functional condition until all up slope areas they control are permanently stabilized. The SWP3 shall be designed to minimize maintenance requirements. The applicant shall provide a description of maintenance procedures needed to ensure the continued performance of control practices.
- i. Inspections. At a minimum, procedures in an SWP3 shall provide that all controls on the site are inspected at least once every seven calendar days and within 24 hours after any storm event greater than one-half inch of rain per 24 hour period. The inspection frequency may be reduced to at least once every month if the entire site is temporarily stabilized or runoff is unlikely due to weather conditions (e.g., site is covered with snow, ice, or the ground is frozen). A waiver of inspection requirements is available until one month before thawing conditions are expected to result in a discharge if all of the following conditions are met: the project is located in an area where frozen conditions are anticipated to continue for extended periods of time (i.e., more than one month); land disturbance activities have been suspended; and the beginning and ending dates of the waiver period are documented in the SWP3. Once a definable area is finally stabilized, the area may be marked on the SWP3 and no further inspection requirements apply to that portion of the site. The permittee shall assign "qualified inspection personnel" to conduct these inspections to ensure that the control practices are functional and to evaluate whether the SWP3 is adequate and properly implemented in accordance with the schedule proposed in Part III.G.1.g of this permit or whether additional control measures are required.

Following each inspection, a checklist must be completed and signed by the qualified inspection personnel representative. At a minimum, the inspection report shall include:

- i. the inspection date;
- ii. names, titles, and qualifications of personnel making the inspection;
- iii. weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
- iv. weather information and a description of any discharges occurring at the time of the inspection;

- v. location(s) of discharges of sediment or other pollutants from the site;
- vi. location(s) of BMPs that need to be maintained;
- vii. location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
- viii. location(s) where additional BMPs are needed that did not exist at the time of inspection; and
- ix. corrective action required including any changes to the SWP3 necessary and implementation dates.

Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of or the potential for pollutants entering the drainage system. Erosion and sediment control measures identified in the SWP3 shall be observed to ensure that those are operating correctly. Discharge locations shall be inspected to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to the receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site vehicle tracking.

The permittee shall maintain for three years following the submittal of a notice of termination form, a record summarizing the results of the inspection, names(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3 and a certification as to whether the facility is in compliance with the SWP3 and the permit and identify any incidents of non-compliance. The record and certification shall be signed in accordance with Part V.G. of this permit.

- i. **When practices require repair or maintenance.** If the inspection reveals that a control practice is in need of repair or maintenance, with the exception of a sediment settling pond, it shall be repaired or maintained within 3 days of the inspection. Sediment settling ponds shall be repaired or maintained within 10 days of the inspection.
 - ii. **When practices fail to provide their intended function.** If the inspection reveals that a control practice fails to perform its intended function and that another, more appropriate control practice is required, the SWP3 shall be amended and the new control practice shall be installed within 10 days of the inspection.
 - iii. **When practices depicted on the SWP3 are not installed.** If the inspection reveals that a control practice has not been implemented in accordance with the schedule contained in Part III.G.1.g of this permit, the control practice shall be implemented within 10 days from the date of the inspection. If the inspection reveals that the planned control practice is not needed, the record shall contain a statement of explanation as to why the control practice is not needed.
3. Approved State or local plans. All dischargers regulated under this general permit must comply, except those exempted under state law, with the lawful requirements of municipalities, counties and other local agencies regarding discharges of storm water from construction activities. All erosion and sediment control plans and storm water

management plans approved by local officials shall be retained with the SWP3 prepared in accordance with this permit. Applicable requirements for erosion and sediment control and storm water management approved by local officials are, upon submittal of a NOI form, incorporated by reference and enforceable under this permit even if they are not specifically included in an SWP3 required under this permit. When the project is located within the jurisdiction of a regulated municipal separate storm sewer system (MS4), the permittee shall certify that the SWP3 complies with the requirements of the storm water management program of the MS4 operator.

4. Exceptions. If specific site conditions prohibit the implementation of any of the erosion and sediment control practices contained in this permit or site specific conditions are such that implementation of any erosion and sediment control practices contained in this permit will result in no environmental benefit, then the permittee shall provide justification for rejecting each practice based on site conditions. Exceptions from implementing the erosion and sediment control standards contained in this permit will be approved or denied on a case-by-case basis.

The permittee may request approval from Ohio EPA to use alternative methods to satisfy conditions in this permit if the permittee can demonstrate that the alternative methods are sufficient to protect the overall integrity of receiving streams and the watershed. Alternative methods will be approved or denied on a case-by-case basis.

PART IV. NOTICE OF TERMINATION REQUIREMENTS

A. Failure to notify.

The terms and conditions of this permit shall remain in effect until a signed Notice of Termination (NOT) form is submitted. Failure to submit an NOT constitutes a violation of this permit and may affect the ability of the permittee to obtain general permit coverage in the future.

B. When to submit an NOT.

1. Permittees wishing to terminate coverage under this permit shall submit an NOT form in accordance with Part V.G. of this permit. Compliance with this permit is required until an NOT form is submitted. The permittee's authorization to discharge under this permit terminates at midnight of the day the NOT form is submitted. Prior to submitting the NOT form, the permittee shall conduct a site inspection in accordance with Part III.G.2.i of this permit and have a maintenance agreement in place to ensure all post-construction BMPs will be maintained in perpetuity.
2. All permittees shall submit an NOT form within 45 days of completing all permit requirements. Enforcement actions may be taken if a permittee submits an NOT form without meeting one or more of the following conditions:
 - a. Final stabilization (see definition in Part VII) has been achieved on all portions of the site for which the permittee is responsible (including, if applicable, returning agricultural land to its pre-construction agricultural use);
 - b. Another operator(s) has assumed control over all areas of the site that have not been finally stabilized;

- c. For residential construction only, temporary stabilization has been completed and the lot, which includes a home, has been transferred to the homeowner. (Note: For individual lots without housing, which are sold by the developer, the individual lot permittee shall implement final stabilization prior to the individual lot permittee terminating permit coverage.); or
- d. An exception has been granted under Part III.G.4.

C. How to submit an NOT.

Permittees shall use Ohio EPA's approved NOT form. The form shall be completed and mailed according to the instructions and signed in accordance with Part V.G of this permit.

PART V. STANDARD PERMIT CONDITIONS.

A. Duty to comply.

The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of ORC Chapter 6111 and is grounds for enforcement action.

Ohio law imposes penalties and fines for persons who knowingly make false statements or knowingly swear or affirm the truth of a false statement previously made.

B. Continuation of an expired general permit.

An expired general permit continues in force and effect until a new general permit is issued.

C. Need to halt or reduce activity not a defense.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to mitigate.

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Duty to provide information.

The permittee shall furnish to the director, within 10 days of written request, any information which the director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the director upon request copies of records required to be kept by this permit.

F. Other information.

When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the NOI, SWP3, NOT or in any other report to the director, he or she shall promptly submit such facts or information.

G. Signatory requirements.

All NOIs, NOTs, SWP3s, reports, certifications or information either submitted to the director or that this permit requires to be maintained by the permittee, shall be signed.

1. These items shall be signed as follows:
 - a. For a corporation: By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
 - i. A president, secretary, treasurer or vice-president of the corporation in charge of a principal business function or any other person who performs similar policy or decision-making functions for the corporation; or
 - ii. The manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
 - b. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or
 - c. For a municipality, State, Federal or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA).
2. All reports required by the permits and other information requested by the director shall be signed by a person described in Part V.G.1 of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a. The authorization is made in writing by a person described in Part V.G.1 of this permit and submitted to the director;

- b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator of a well or well field, superintendent, position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
 - c. The written authorization is submitted to the director.
3. Changes to authorization. If an authorization under Part V.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.G.2 of this permit must be submitted to the director prior to or together with any reports, information or applications to be signed by an authorized representative.

H. Certification.

Any person signing documents under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

I. Oil and hazardous substance liability.

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject under section 311 of the CWA or 40 CFR Part 112. 40 CFR Part 112 establishes procedures, methods and equipment and other requirements for equipment to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into or upon the navigable surface waters of the state or adjoining shorelines.

J. Property rights.

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

K. Severability.

The provisions of this permit are severable and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

L. Transfers.

Ohio NPDES general permit coverage is transferable. Ohio EPA must be notified in writing sixty days prior to any proposed transfer of coverage under an Ohio NPDES general permit. The transferee must inform Ohio EPA it will assume the responsibilities of the original permittee transferor.

M. Environmental laws.

No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

N. Proper operation and maintenance.

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of SWP3s. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.

O. Inspection and entry.

The permittee shall allow the director or an authorized representative of Ohio EPA, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;
2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment); and
4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

P. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

Q. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

R. Bypass

The provisions of 40 CFR Section 122.41(m), relating to "Bypass," are specifically incorporated herein by reference in their entirety. For definition of "Bypass," see Part VII.C.

S. Upset

The provisions of 40 CFR Section 122.41(n), relating to "Upset," are specifically incorporated herein by reference in their entirety. For definition of "Upset," see Part VII.GG.

T. Monitoring and Records

The provisions of 40 CFR Section 122.41(j), relating to "Monitoring and Records," are specifically incorporated herein by reference in their entirety.

U. Reporting Requirements

The provisions of 40 CFR Section 122.41(l), relating to "Reporting Requirements," are specifically incorporated herein by reference in their entirety.

PART VI. REOPENER CLAUSE

If there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with construction activity covered by this permit, the permittee of such discharge may be required to obtain coverage under an individual permit or an alternative general permit in accordance with Part I.C of this permit or the permit may be modified to include different limitations and/or requirements.

Permit modification or revocation will be conducted according to ORC Chapter 6111.

PART VII. DEFINITIONS

- A. "Act" means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, Pub. L. 97-117 and Pub. L. 100-4, 33 U.S.C. 1251 et. seq.
- B. "Best management practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures and other management practices (both structural and non-structural) to prevent or reduce the pollution of surface waters of the state. BMP's also include treatment requirements, operating procedures and practices to control plant and/or construction site runoff, spillage or leaks, sludge or waste disposal or drainage from raw material storage.
- C. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
- D. "Commencement of construction" means the initial disturbance of soils associated with clearing, grubbing, grading, placement of fill, or excavating activities or other construction activities.

- E. "Concentrated storm water runoff" means any storm water runoff which flows through a drainage pipe, ditch, diversion or other discrete conveyance channel.
- F. "Director" means the director of the Ohio Environmental Protection Agency.
- G. "Discharge" means the addition of any pollutant to the surface waters of the state from a point source.
- H. "Disturbance" means any clearing, grading, excavating, filling, or other alteration of land surface where natural or man-made cover is destroyed in a manner that exposes the underlying soils.
- I. "Drainage watershed" means for purposes of this permit the total contributing drainage area to a BMP, i.e., the "watershed" directed to the practice. This would also include any off-site drainage.
- J. "Final stabilization" means that either:
 - 1. All soil disturbing activities at the site are complete and a uniform perennial vegetative cover (e.g., evenly distributed, without large bare areas) with a density of at least 70 percent cover for the area has been established on all unpaved areas and areas not covered by permanent structures or equivalent stabilization measures (such as the use of mulches, rip-rap, gabions or geotextiles) have been employed. In addition, all temporary erosion and sediment control practices are removed and disposed of and all trapped sediment is permanently stabilized to prevent further erosion; or
 - 2. For individual lots in residential construction by either:
 - a. The homebuilder completing final stabilization as specified above or
 - b. The homebuilder establishing temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for and benefits of, final stabilization. (Homeowners typically have an incentive to put in the landscaping functionally equivalent to final stabilization as quick as possible to keep mud out of their homes and off sidewalks and driveways.); or
 - 3. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its pre-construction agricultural use. Areas disturbed that were previously used for agricultural activities, such as buffer strips immediately adjacent to surface waters of the state and which are not being returned to their pre-construction agricultural use, must meet the final stabilization criteria in (1) or (2) above.
- K. "Individual Lot NOI" means a Notice of Intent for an individual lot to be covered by this permit (see Part I of this permit).

- L. "Larger common plan of development or sale"- means a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan.
- M. "MS4" means municipal separate storm sewer system which means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) that are:
1. Owned or operated by the federal government, state, municipality, township, county, district(s) or other public body (created by or pursuant to state or federal law) including special district under state law such as a sewer district, flood control district or drainage districts or similar entity or a designated and approved management agency under section 208 of the act that discharges into surface waters of the state; and
 2. Designed or used for collecting or conveying solely storm water,
 3. Which is not a combined sewer and
 4. Which is not a part of a publicly owned treatment works.
- N. "National Pollutant Discharge Elimination System (NPDES)" means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits and enforcing pretreatment requirements, under sections 307, 402, 318 and 405 of the CWA. The term includes an "approved program."
- O. "NOI" means notice of intent to be covered by this permit.
- P. "NOT" means notice of termination.
- Q. "Operator" means any party associated with a construction project that meets either of the following two criteria:
1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or
 2. The party has day-to-day operational control of those activities at a project which are necessary to ensure compliance with an SWP3 for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWP3 or comply with other permit conditions).
- As set forth in Part I.F.1, there can be more than one operator at a site and under these circumstances, the operators shall be co-permittees.
- R. "Ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.
- S. "Owner or operator" means the owner or operator of any "facility or activity" subject to regulation under the NPDES program.

- T. "Permanent stabilization" means the establishment of permanent vegetation, decorative landscape mulching, matting, sod, rip rap and landscaping techniques to provide permanent erosion control on areas where construction operations are complete or where no further disturbance is expected for at least one year.
- U. "Percent imperviousness" means the impervious area created divided by the total area of the project site.
- V. "Point source" means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or the floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.
- W. "Qualified inspection personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls, who possesses the skills to assess all conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity.
- X. "Rainwater and Land Development" is a manual describing construction and post-construction best management practices and associated specifications. A copy of the manual may be obtained by contacting the Ohio Department of Natural Resources, Division of Soil & Water Conservation.
- Y. "Riparian area" means the transition area between flowing water and terrestrial (land) ecosystems composed of trees, shrubs and surrounding vegetation which serve to stabilize erodible soil, improve both surface and ground water quality, increase stream shading and enhance wildlife habitat.
- Z. "Runoff coefficient" means the fraction of total rainfall that will appear at the conveyance as runoff.
- AA. "Sediment settling pond" means a sediment trap, sediment basin or permanent basin that has been temporarily modified for sediment control, as described in the latest edition of the Rainwater and Land Development manual.
- BB. "State isolated wetland permit requirements" means the requirements set forth in Sections 6111.02 through 6111.029 of the ORC.
- CC. "Storm water" means storm water runoff, snow melt and surface runoff and drainage.
- DD. "Steep slopes" means slopes that are 15 percent or greater in grade. Where a local government or industry technical manual has defined what is to be considered a "steep slope," this permit's definition automatically adopts that definition.
- EE. "Surface waters of the state" or "water bodies" means all streams, lakes, reservoirs, ponds, marshes, wetlands or other waterways which are situated wholly or partially within the boundaries of the state, except those private waters which do not combine or effect a junction with natural surface or underground waters. Waters defined as

sewerage systems, treatment works or disposal systems in Section 6111.01 of the ORC are not included.

- FF. "SWP3" means storm water pollution prevention plan.
- GG. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
- HH. "Temporary stabilization" means the establishment of temporary vegetation, mulching, geotextiles, sod, preservation of existing vegetation and other techniques capable of quickly establishing cover over disturbed areas to provide erosion control between construction operations.
- II. "Water Quality Volume (WQ_v)" means the volume of storm water runoff which must be captured and treated prior to discharge from the developed site after construction is complete. WQ_v is based on the expected runoff generated by the mean storm precipitation volume from post-construction site conditions at which rapidly diminishing returns in the number of runoff events captured begins to occur.

**Temporary Sediment and Erosion Control Best Management Practices (BMP)
Unit Price Schedule, October 2013**

EROSION CONTROL PRICES

Item	Unit	Description	Project Identified EDA (acres)					Fixed Price	Comment
			<5	5 to 10	10 to 15	15 to 20	>20		
			Price (\$)						
832	Sq. Yd.	Construction Seeding and Mulching	1.00	0.92	0.83	0.75	0.74		Based on NOI acres
832	Feet	Slope Drains						12.00	
832	Cu. Yd.	Sediment Basins and Dams						13.50	[3]
832	Feet	Perimeter Filter Fabric Fence	4.05	3.10	2.85	2.55	2.30		Based on NOI acres
832	Feet	Filter Fabric Ditch Check						11.00	
832	Feet	Inlet Protection						11.25	
832	Cu. Yd.	Dikes						3.00	
832	Sq. Yd.	Construction Ditch Protection						2.50	
832	Cu. Yd.	Rock Channel Protection, Type C or D with Filter						55.00	[1]
832	Cu. Yd.	Rock Channel Protection, Type C or D without Filter						50.00	[1]
832	Cu. Yd.	Basin Sediment Removal						10.00	
832	Cu. Yd.	Miscellaneous Sediment Removal						15.50	
832	Feet	Construction Fence						5.75	
832	Sq. Yd.	Construction Mulching	0.79	0.71	0.58	0.56	0.54		Based on NOI acres
832	Sq. Yd.	Winter Seeding and Mulching	1.08	1.00	0.92	0.85	0.81		Based on NOI acres
832	Cu. Yd.	Construction Entrance						75.25	

[1] Add the following amount per cubic yard for the cost of Type C or D Rock materials.

[3] Add the amount for the appropriately sized surface dewatering device for sediment basin outlet.

BMP ROCK MATERIAL SCHEDULE

District [2]	Purchase & Delivered to Job		Produced on Job	
	Type C	Type D	Type C	Type D
1	\$ 60.00	\$ 58.00	\$ 27.50	\$ 27.50
2	\$ 60.00	\$ 58.00	\$ 27.50	\$ 27.50
3	\$ 67.00	\$ 65.00	\$ 27.50	\$ 27.50
4	\$ 71.00	\$ 68.00	\$ 27.50	\$ 27.50
5	\$ 63.00	\$ 60.00	\$ 27.50	\$ 27.50
6	\$ 65.00	\$ 63.00	\$ 27.50	\$ 27.50
7	\$ 65.00	\$ 63.00	\$ 27.50	\$ 27.50
8	\$ 65.00	\$ 63.00	\$ 27.50	\$ 27.50
9	\$ 66.00	\$ 65.00	\$ 27.50	\$ 27.50
10	\$ 70.00	\$ 68.00	\$ 27.50	\$ 27.50
11	\$ 65.00	\$ 63.00	\$ 27.50	\$ 27.50
12	\$ 71.00	\$ 68.00	\$ 27.50	\$ 27.50

[2] Based on the District in which the project is administered.

SEDIMENT BASIN SURFACE DEWATERING DEVICE

Device Size	Purchase & Delivered to Job
1 1/2"	\$598.00
2"	\$750.00
2 1/2"	\$915.00
3"	\$1,100.00
4"	\$1,590.00
5"	\$2,375.00
6"	\$3,650.00
8"	\$6,000.00

[3] Surface dewatering device sized appropriately for sediment basin

Designer Note:

Provide this Supplemental Specification on all plans.

Under the Erosion Control heading, provide the following Reference Items:

Item 832 Each Erosion Control - Provide an encumbered dollar value to be placed in the proposal for Item: 832 Each Erosion Control. This amount is for both the “quantity” and “total” fields. This amount should only be provided in the C2 Estimate, the Special Considerations Field on the Plan Package Submittal Form, and in the Plans.

Example: \$10,000 set up for Item 832 Each Erosion Control then 10,000 placed in the “quantity” and “total” fields.

Item 832 Lump Sum Storm Water Pollution Prevention Plan - Provide a Lump Sum item for Storm Water Pollution Prevention Plan for projects that have 1 or more acres of estimated Total EDA.

Delete all C&MS 207 Items and all SS 877 Items.

For additional guidance on the NPDES process for ODOT projects, see the NPDES Construction Permit Implementation Plan flowchart on the Office of Structural Engineering website.

For help estimating the encumbered dollar value for the Item 832 - Erosion Control, see the BMP Estimator on the DRRC website (<http://www.dot.state.oh.us/drrc/>).

Projects that require OEPA Watershed Specific Storm Water Permits (such as the Big Darby or Olentangy) will need to modify this specification by Special Provision Note.

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 904
FIBER OPTIC CABLE AND COMPONENTS**

July 19, 2013

904.01 Fiber Optic Cable.

Furnish loose-tube, single-mode, step-index dielectric cable. Cable shall be 8.1-8.3/125 um loose buffer, single-mode, step index optical fiber cable containing glass of type, Corning SMF-28e, AFL SR-15e, or approved equal, and that meets the following specifications:

1. ITU-T G.652 (Categories A, B, C and D)
2. IEC Specification 60793-2-50 Type B1.3
3. TIA/EIA 492-CAAB
4. Telecordia GR-20

All cables shall be free of material or manufacturing defects and dimensional non-uniformity that would:

- Interfere with the cable installation using accepted cable installation practices.
- Degrade the transmission performance and environmental resistance after installation.
- Inhibit proper connection to interfacing elements.
- Otherwise yield an inferior product.

A. Mechanical and Performance Requirements

The cable shall be a rugged all dielectric outdoor cable containing color coded buffer tubes with 12 single mode color-coded fibers per-buffer tube, dual window (1310 nm and 1550 nm) fibers with UV acrylate coating in color coded, gel-free, loose buffer tubes with the maximum outer diameter as shown in the chart below based on cable strand count.

Fiber Count	Maximum Outside Diameter (Inches)
6	0.45
12	0.45
24	0.45
48	0.45
72	0.45
144	0.65
288	0.75

The loose buffer tubes shall be stranded around an all-dielectric center strength element using a reverse oscillation lay, wrapped by water blocking core separator or functional equivalent. The maximum allowable attenuation of the fiber is .35 dB/km for 1310 nm and .25 dB/km for 1550 nm. Each buffer tube shall contain a water blocking element for water-blocking protection. No water blocking yarns are permitted to avoid accidentally cutting fibers. The water blocking

elements shall be non-nutritive to fungus, electrically non-conductive, and homogeneous; it shall also be free from dirt or foreign matter. This water blocking element will preclude the need for other water-blocking material; the buffer-tube shall be gel-free. Water swellable tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter. The cable manufacturer shall be TL 9000 registered. The optical fiber cable shall withstand water penetration when tested with a one-meter static head or equivalent continuous pressure applied at one end of a one-meter length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with EIA-455-82B.

B. Outer Jacket

Cables shall be all dielectric cable (with no armoring) and shall be jacketed (sheathed) with medium density polyethylene as defined by ASTM D1248, Type II, Class C, Category 4 and Grades J4, E7 and E8. If the project plans require armored cable, the cable shall have two jackets, one molded to the outside of the armor and one that floats freely within the armor and contains the buffer tubes and other fiber optic cable construction components as required.

Jacketing material shall be applied directly over the tensile strength members to provide mechanical protection, and to serve as the primary moisture barrier. This cable sheath shall be designed to meet or exceed the tensile criteria defined in EIA-455-89a. Each jacketed fiber shall have a tensile strength in excess of 50 lbs. The polyethylene shall contain carbon black to provide ultra-violet light protection, and it shall not promote the growth of fungus. The jacket or sheath shall be free of any holes, splits, or blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. The cable shall contain at least one ripcord under the sheath for easy sheath removal.

C. Crush Resistance

The non-armored optical fiber cables shall withstand a compressive load of 220 N/cm applied uniformly over the length of the cable. The average increase in attenuation for the fibers shall be ≤ 0.10 dB at 1550 nm for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after load removal. Testing shall be in accordance with EIA-455-41, "compressive loading resistance of fiber optic cable," except that the load shall be applied at the rate of 3 mm to 20 mm per minute and maintained for 10 minutes. Manufacturer's certification shall be submitted for approval.

D. Cyclic Flexing

The cable shall be capable of withstanding 25 cycles of mechanical flexing at a rate of 30 ± 1 cycles/minute. The average increase in attenuation for the fibers shall be ≤ 0.10 dB at 1550 nm at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. The test shall be conducted in accordance with EIA-455-104, except that the sheave diameter shall be a maximum diameter of 20 times the cable outer diameter (O.D.). The cable shall be tested in accordance with test conditions I and III of EIA-455-104. The cable shall withstand 25 impact cycles. The average increase in attenuation for the fibers shall be ≤ 0.20 dB at 1550 nm (single-mode). The cable jacket shall not exhibit evidence

of cracking or splitting. The test shall be conducted in accordance with EIA/TIA-455-25A. Manufacturer's certification shall be submitted for approval.

E. Tensile Strength

Tensile strength shall be provided by high tensile strength aramid yarns and fiberglass, which shall be helically stranded evenly around the cable core. The cable shall withstand a tensile load of 2700 Newtons (N) [600 lbs.] without exhibiting an average increase in attenuation of greater than 0.10dB. The test shall be conducted in accordance with EIA-455-33A, using a maximum mandrel and sheave diameter of 560 mm. The load shall be applied for one hour in test condition II of EIA-455-33A. The optical fiber cable shall withstand a maximum pulling tension of 2700N (600 lbs.) during installation (short term) with no damage and 845N (190 lbs.) installed (long term). Manufacturer's certification shall be submitted for approval.

F. Temperature

The shipping, storage, installation, and operating temperature range of the cable shall meet or exceed -20 °F to +155 °F (-29 °C to +60°C).

G. Loose Buffer

Single-mode fibers shall be contained in a loose buffer tube. The configuration shall be dimensionally sized to minimize local stresses and microbend losses. Buffer tubes shall be 2.5mm in outer diameter. The optical fiber cable shall be an approved product of the U.S. Department Of Agriculture, Rural Electrification Administration in accordance with the requirements of REA-PE-90, or as otherwise indicated, and shall conform to EIA/TIA-598. Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding. Buffer tubes shall be polypropylene. Fillers shall be included in the cable core to lend symmetry to the cable cross section where needed. The central anti-buckling member shall consist of a glass reinforced plastic rod; the purpose of the central member is to prevent buckling of the cable.

H. Colors

All optical fibers shall be identifiable by standard color codes as defined in EIA/TIA-598. Each fiber shall be distinguishable, as determined by the maintaining agency, from others by means of color coding and shall conform to the following EIA/TIA sequence of colors:

- | | |
|-----------|------------|
| 1. Blue | 7. Red |
| 2. Orange | 8. Black |
| 3. Green | 9. Yellow |
| 4. Brown | 10. Violet |
| 5. Slate | 11. Rose |
| 6. White | 12. Aqua |

The colors shall be in accordance with the Munsell color shades. The fiber coloring shall be an ultraviolet (UV) curable ink which is applied to the outside of the optical fiber protective coating layer and shall not be an integral component of the coating layer itself in order to produce more distinguishable colored fiber.

Buffer tubes containing fibers shall also be color-coded with distinct and recognizable colors according to the following sequence of colors:

- | | |
|------------|---|
| 1. Blue | 13. Blue with black tracer |
| 2. Orange | 14. Orange with black tracer |
| 3. Green | 15. Green with black tracer |
| 4. Brown | 16. Brown with black tracer |
| 5. Slate | 17. Slate with black tracer |
| 6. White | 18. White with black tracer |
| 7. Red | 19. Red with black tracer |
| 8. Black | 20. Black with white tracer or black with yellow tracer |
| 9. Yellow | 21. Yellow with black tracer |
| 10. Violet | 22. Violet with black tracer |
| 11. Rose | 23. Rose with black tracer |
| 12. Aqua | 24. Aqua with black tracer |

The color formulation shall be compatible with the fiber coating and be heat stable. Color formulation shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

I. Cable Marking

The fiber optic cable outer jacket shall be capable of being marked by the vendor, on a project-by-project basis, with manufacturer's name, the year of manufacture, the words "optical fiber cable", fiber count, type of fiber, the name of the cable owner (e.g., "ODOT I.T.S."), Project ID number ("PID # xxxxx") and sequential linear foot markings. The markings shall be repeated every 3 feet. The actual length of the cable shall be within -0/+1% of the length marking. The marking shall be in a contrasting color to the cable jacket. The marking shall be 2.5 mm in height and must be permanent weatherproof and shall not wear off during the installation in the underground conduit system.

J. Quality Assurance Provision

The fiber optic cable shall meet or exceed the requirements of this specification when measured in accordance with the methods of the individual requirements or the following methods as defined in EIA-455-A:

1. Fiber dimensions
2. Attenuation
3. Numerical aperture
4. Fiber proof test
5. Crush resistance
6. Cable bending
7. Tensile load
8. Impact resistance
9. Attenuation vs. Temperature

904.05 Fan-Out Kit

Furnish a 900um fan-out kit assembly of size twelve fiber capacity. Minimum length shall be 24 inches. It shall be outdoor-rated for operation with a minimum operating temperature range of -40 °F to +149 °F (-30 °C to +65°C). Each assembly shall contain a Fan-Out Top, Fan-Out Bottom, Fan-Out Tubing, epoxy, syringe, and insert.

904.06 Drop Cable

All drop cable shall meet the requirements of 904.01, except for 904.01.I, Cable Marking. All Drop Cable shall be marked by the vendor with the manufacturer's name, year of manufacture, the words "Optical Fiber Cable" or similar, fiber count, type of fiber, and sequential linear foot marking. The markings shall be repeated every 3 feet. The actual length of the cable shall be within +/-1% of the length marking. The marking shall be in contrasting color to the cable jacket, minimum 2.5mm in height, permanent and weatherproof, and shall not wear off during installation in the underground conduit system.

904.07 Fiber Optic Patch Cord

The optical patch cords furnished shall consist of a single fiber jacketed cable equipped with optical connectors at each end. Each patch cable shall have a unique identification label on each end. Labels shall be marked in indelible ink and shall not crimp, kink or otherwise harm the patch cable. Patch cords for connection between two Fiber Distribution Panels (FDPs) shall be equipped with approved connectors on each end. The sheath shall be flame retardant and coded NFR in accordance with the national electric code. The patch cord jacket shall be resistant to ultraviolet radiation. Optical fiber connectors shall satisfy the interface parameters of the equipment components as defined by the transceiver equipment specifications. All connectors shall be of Type UPC or APC. No SPC-type connectors shall be permitted.

904.08 Fiber Termination Panel

A. NEMA Cabinet Type

Fiber termination panels shall house and protect the connectors on each pigtail. The optical connectors on each pigtail shall be inserted securely in a connector panel that is manufactured to be mated with the LC (UPC) connector type. The connector panel shall be made by the housing manufacturer and be designed for the specified housing. Maximum optical loss across the connection shall be 0.25dB. The fiber optic cable shall be of a sufficient length that will allow the cable to be pulled from the cabinet through conduit to adjacent overhead or underground splice enclosures and fusion spliced to the trunk fiber optic cables as depicted in the communications splicing diagrams, leaving 75 feet of slack at the splice enclosure and 15 feet of slack in the cabinet. The termination panel shall use LC connectors for the equipment side and specified connectors shall be core-aligned fusion spliced or factory pre-connectorized to the fiber optic drop cable that leads to the splice enclosure.

The fiber termination panel shall be compact, rugged and shelf mountable to ensure secure mounting within existing NEMA controller cabinets. 24-fiber termination panels shall not exceed 10 inches Length x 4.5 inches Width x 2.5 inches Depth.

48-fiber termination panels may consist of two side-by-side 24-fiber termination panels. Panel shall be manufactured by Corning, Gatorpatch, AFL, or approved equal.

B. Caltrans (332,334,336) Cabinet or AASHTO/ITE/NEMA ITS Cabinet Type

The fiber termination panel enclosure shall consist of a self-contained enclosure including LC style fiber optic connectors. Outdoor rated fiber optic cable shall be pre-terminated to the patch

panel. Fiber optic cable shall be of a sufficient length that will allow the cable to be pulled from the cabinet through conduit to adjacent overhead or underground splice enclosures and fusion spliced to the trunk fiber optic cables as depicted in the communications splicing diagrams, leaving 75 feet of slack at the splice enclosure and 15 feet of slack in the cabinet..

All connector terminations shall be ceramic UPC connectors. Dimensions of patch panels shall mount inside a standard EIA 19-inch rack.

Patch Panel Enclosures shall be equipped with a locking mechanism for front and back of patch panel assembly to prevent unauthorized access.

Patch Panels shall utilize modules capable of housing 12-24 fiber optic LC-type connectors. The modules shall interface with the cabinet equipment via LC connectors and the fiber optic trunk cable via MTP connectors. The fiber optic cable shall be secured in a manner that no strain is presented to the MTP connector.

904.09 Fiber Optic Connectors

All optical fiber termination components shall meet or exceed the applicable provisions of EIA/TIA-455-A. All optical fiber connectors shall be of industry standard and of type for single-mode optical fiber and shall meet or exceed the applicable provisions of EIA/TIA-455-2b, EIA/TIA-455-5a, and EIA-455-34. All connectors shall be compliant with industry standard ANSI/TIA/EIA-568B.3. The connector shall comply with TIA/EIA fiber optic connector intermateability standard (FOCIS) document, TIA/EIA-604-3. Single-mode pigtailed shall be provided with factory pre-connectorized single-mode connectors. Connectors shall have a maximum loss of 0.5 dB through each mated pair of single-mode fibers. Each connector shall be capable of 100 repeated matings with maximum increase in splice loss limited to 0.2 dB per connector. Single mode fiber optic pigtailed shall be provided. Optical fiber cable used for pigtailed shall be of the tight buffered type protected by aramid fibers. The pigtail jacket shall be resistant to ultraviolet radiation. Connector reflectance shall be measured at the factory to be = -40 dB for super physical contact (SPC), -55 dB for ultra physical contact (UPC), and -60 dB for angle polished contact (APC). Strain-relief boot color shall be white for SPC, blue for UPC, and green for APC. Manufacturer shall be ISO 9001 and TL 9000 registered. All connectors shall be LC-type UPC. No SPC type connectors shall be permitted.

904.10 Splice Enclosure

The splice enclosure shall be weatherproof, corrosion resistant, rodent proof, re-enterable, and crush resistant. The splice enclosure shall be of clam-shell design with upper and lower pieces that are tightened down and sealed using screws / bolts. The splice enclosure shall easily fit into a 32 inch pull box along with loops of slack cable in box (approximately 100 ft.). The splice enclosure shall be a complete kit including all components and hardware for installation. The splice enclosure shall be suitable for application in the temperature range of -40 °C to +70 °C. The splice enclosure shall provide space, allowing entry of fiber optic cable without exceeding the minimum bend radius of the cable. The enclosure shall have provisions for cable and pigtail strain-relief, and shall be equipped with strain-relief hardware. The splice enclosure shall be designed to permit selective fiber splicing (looping a backbone cable in and out while only cutting into the desired fibers). The size of the enclosure shall allow all the fibers of the largest

optical fiber trunk cable to be fusion spliced to a second cable of the same size, plus additional pigtailed. The splice enclosure shall allow splicing of all fibers up to the maximum number.

904.11 Fiber Optic Media Converter

Operating temperature range shall be -20 °F to +155 °F (-29 °C to +68 °C). Electrical power for freestanding units shall be provided by NEMA 5-15 compatible plug and/or Class 2 switching power supply with a minimum cord length of 6 feet. Established and documented MTBF shall be 100,000 hours, minimum.

A. Fiber Optic to Ethernet Media Converter

Converter shall provide RJ-45 interface compatible with 100BaseT-TX: Cat. 5, EIA/TIA-568 100-Ohm UTP cable.

B. Fiber Optic to RS-232 Media Converter

Converter shall provide a RS232 Asynchronous communications channel using a 9-pin D-sub or RJ-45 connector using industry-standard pin configuration or a plug-in module connection to a controller unit. The FO Module shall be one of the following, per project operational requirements:

1. A free-standing, shelf-mounted enclosed unit.
2. A plug-in module compatible with an ODOT-approved Caltrans or NEMA controller unit, and approved in writing by the manufacturer of the controller.

904.12 Fiber Optic Fusion Splicer

The Fiber Optic Fusion Splicer shall be one of the following types:

1. AFL FSM-70S
2. CORNING M90e-XSM-T-P
3. SUMITOMO TYPE-Q101-CA
4. Or Approved Equal, that meets the following minimum specifications as determined by the ODOT Department of Traffic Engineering:
 - Splicing Method – Core Alignment
 - Applicable Fibers – SM, MM, DS, NZ-DS
 - Cladding Diameter – 80-125 um
 - Splice loss estimation using Core Alignment
 - Camera Axis – X and Y
 - Typical Splicing time of Single-Mode Fiber less than or equal to 13 seconds
 - Operating Temperature – (-10 to +50 C)
 - Color LCD Monitor
 - High wind velocity protection
 - Average Splice Loss (dB) – 0.02 SM, 0.01 MM, 0.04 DS
 - Internal Battery w/ AC adapter– capable of performing minimum of 100 splices on full charge
 - Ability to download splice data to PC via USB
 - Internal Splice Data Storage = 2,000 splice results
 - Maximum Dimension (inches)– 8 x 9.5 x 6
 - Carrying Case – Hard if available

904.13 Fiber Optic Optical Time Domain Reflectometer (OTDR)

The Fiber Optic OTDR shall be one of the following types and shall include adapters for FC, ST, SC, and LC type connectors:

1. AFL M210-25K-01-HC2
2. CORNING OV-MiniXK-TK
3. FLUKE OFP-100-QI
4. Or Approved Equal, that meets the following minimum specifications as determined by the ODOT Department of Traffic Engineering:
 - Shall have a Built-in Optical Power Meter
 - Shall have a Built-in Visual Fault Locator
 - Internal Memory storage – 500 traces
 - Color Display
 - Multi-mode and Single-mode fiber testing capability
 - Ability to download splice data to PC via USB
 - Rugged Construction
 - Carrying case, Hard when available
 - Operating Temperature – (-10 to +45 C)
 - Li-Ion Battery w/ AC adapter
 - Digital Fiber Scope for video inspection that is compatible with the UPC and APC types of connectors.
 - Maximum Dimension (inches)– 11 x 5.5 x 3

904.14 Fiber Optic Cleaver

The Fiber Optic Cleaver shall be one of the following types:

1. AFL CT-30A
2. CORNING FBC-012
3. SUMITOMO FC-7
4. Or Approved Equal, that meets the following minimum specifications as determined by the ODOT Department of Traffic Engineering:
 - Fiber Blade Life – 24,000
 - Fiber scrap collection-free with use of integrated scrap container
 - Carrying Case, Hard if available

904.15 Fiber Optic Power Meter

The Fiber Optic Power Meter shall include dual optical light sources (LED / LASER) and shall be one of the following types:

1. AFL OPM4
2. CORNING LTK-400SD
3. FLUKE FTK1450
5. Or Approved Equal, that meets the following minimum specifications as determined by the ODOT Department of Traffic Engineering:
 - Calibration Wavelengths (nm) – 850, 1300, 1310, and 1550
 - Include SC, ST, and LC adapters
 - Measurement range – (+6 TO -50 dBm)
 - Accuracy – ± 0.25 dB
 - Resolution – 0.01 dB

- Measurement Units –dBm, W
- Power – AA Batteries
- Operating Temperature – (-10 to +50 C)
- Maximum Dimensions (inches) – 7.5 x 4 x 2.5
- Carrying Case – Hard if available

904.16 Fiber Optic Visual Fault Locator

The Fiber Optic Visual Fault Locator shall be one of the following types:

1. AFL VF12-01-0900PR
2. CORNING VFL350
3. FLUKE VisiFault with NF380 adapter
4. Or Approved Equal, that meets the following minimum specifications as determined by the ODOT Department of Traffic Engineering:
 - Emitter Type – Laser Class II
 - Wavelength – 650 nm ± 20 nm
 - Maximum Output Power – 1.3 mW (into single-mode fiber)
 - Modulation – 2-3 Hz or CW selectable
 - Operating Temperature – (-10 to 40 C)
 - Maximum Dimensions (inches) – 7 x 2.5 x 1.5
 - Power – AA or AAA Batteries
 - Connection Ferrule Diameter – 2.5 mm and 1.25 mm
 - Compatible Fiber Optic Connectors – SC, LC, and ST
 - Carrying Case – Hard if available

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 907
VIDEO DETECTION SYSTEM**

January 20, 2012

Provide a 60-month warranty or the manufacturer's standard warranty, whichever is greater, for the following equipment:

1. Camera Heads
2. Combined Camera Head/Processor Units
3. Processors
4. Rack Mount Cards
5. Hubs
6. Portable Interface Devices

Ensure that the warranty period begins on the date of shipment to the project. Ensure that each system has a permanent label or stamp indicating the date of shipment.

The warranty to include technical support which shall be available from the supplier, at no cost, via telephone within 4 hours of the time a call is made, from factory-certified personnel or factory certified installers.

The warranty is to include updates to the video detection processor firmware and application software which shall be available from the manufacturer without charge.

A. Functional Capabilities. Provide camera systems able to transmit video signals up to 1,000 feet.

Furnished video detection system configuration shall utilize video processors with 1 or more video inputs and 1 video output, responding to specific site applications, camera locations and detection zones shown on the project plans.

B. Interface. Provide video inputs that accept signals from an external video source. Provide an interface connector located on the front of the video processing unit.

Provide an indication of the presence of the video signal. The indicator shall assert upon valid video synchronization and turn off when the presence of a valid video signal is removed.

Provide one video output per processor module. The video output shall have the capability to show text and graphical overlays to aid in system setup. The overlays shall display real-time actuation of detection zones upon vehicle detection or presence. Control of the overlays and video switching shall also be provided. The video output interface connector shall be BNC, RCA, VGA, or DVI type.

Provide a communications port on the front panel. The port shall use a DB9 or RJ45 type connector. The communications interface shall allow the user to remotely configure the system and/or to extract calculated vehicle/roadway information.

Furnish interface software. The interface protocol shall support multi-drop or point-to multipoint communications. Each video detection system shall have the capability to be individually IP addressable either built in or with third party video server units.

Provide open collector outputs meeting NEMA TS2 requirements. The open collector output will be used for vehicle detection indicators as well as discrete outputs for alarm conditions.

Provide LED status indicators on the front panel. The LEDs shall illuminate when an output is asserted. Provide one output LED for each output.

Provide a dedicated mouse compatible port on the front panel of the video processing unit. The mouse port shall be used as part of the system setup and configuration. Provide a compatible mouse with each video detection system.

C. Functionality. Detection zones shall be programmed via an on-board menu displayed on a video monitor and a pointing device connected to the video detection processor. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters.

The video detection processor shall detect vehicles in real time as they travel across each detection zone and provide indication on the video display.

The video detection processor shall default to a safe condition, such as minimum recall, fixed recall or a constant call on each active detection channel, in the event of unacceptable interference with the video signal or low visibility conditions.

A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

A minimum of 24 detection zones per camera input shall be possible, and each detection zone shall be capable of being sized to suit the site and the desired vehicle detection region/type.

The video detection processor's memory shall be non-volatile to prevent data loss during power outages.

The video detection processor shall maintain normal operation of existing detection zones when one zone is being added or modified. The video detection processor shall output a constant call on any detector channel corresponding to a zone being modified and shall resume normal operation upon completion.

The video detection processor shall output minimum recall, fixed recall or constant call for each enabled detector output channel if a loss of video signal occurs. The recall behavior shall be user selectable for each output. The video detection processor shall output a constant call during the background "learning" period.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

Up to six detection zones per camera view shall have the capability to count the number of vehicles detected, measure classification and speed. The data values shall be internally stored within the processor module for later retrieval through the communication port. The data collection interval shall be user

definable in periods of 5, 15, 30, or 60 minutes or by intersection cycle. Real-time data shall be retrieved by the PC-based software provided with the system.

Cameras shall be completely compatible with the video detection processor and shall be certified by the manufacturer to ensure proper system operation.

The camera shall use a color CCD sensing element with resolution of no less than 470 lines horizontal and 400 lines vertical.

The camera shall include mechanisms to compensate for changing of lighting by using an electronic shutter and/or auto-iris lens.

The camera shall include a motorized variable focal length lens with factory preset focus that requires no field adjustment. If zooming of the camera lens to suit the site geometry by means of a portable interface device is required, the portable interface shall be provided. The horizontal field of view shall be adjustable from 10 to 45 degrees minimum.

The camera electronics shall include automatic gain control (AGC) to produce a satisfactory image at night.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -30°F to +140°F (-34 °C to +60 °C) and a humidity range from 0% RH to 100% RH.

The camera enclosure shall be equipped with weather-tight connections for all cables.

The cable provided shall be as recommended by the manufacturer for optimal video detection performance. The cable shall be either multi-paired jacketed cable or coaxial cable. Coaxial cable can be used between the camera and the video detection processor in the traffic signal controller cabinet and shall be as recommended by the manufacturer, or a Department approved 75 ohm precision video cable with 20 AWG solid bare copper conductor (9.9 ohms/M), RG-59, U-Type, solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and light blue polyethylene jacket previously proven to provide successful operation with the video detection system.

For coaxial cable, the signal attenuation shall not exceed 0.78 dB per 100 feet (30 m) at 10 MHz.

Coaxial cable shall be suitable for installation in conduit and in exposed sunlight environment. 75-ohm BNC plug connectors shall be used at both the camera and cabinet ends. The coaxial cable, BNC connector, and crimping tool recommended by the manufacturer of the video detection system shall be used and installed per the manufacturer's recommended instructions to ensure proper connection.

Multi-paired jacketed cable shall include a minimum of four individually paired No. 19 AWG communication cables with an overall shield. Pairs shall not be individually shielded. Paired cable and power cables may be installed under the same outer jacket.

Power cable, if required, shall be rated for 90°C, 300 volt, 16 AWG, stranded, three conductor cable with a nominal outside diameter of approximately 0.330 inches (8 mm). Conductor insulation color code shall be black, white and green. Outside jacket shall be black.

Camera power cable shall be suitable for installation in conduit and in exposed sunlight environment, and UL listed.

The power and video cable may be installed under the same outer jacket.

Provide surge protection devices for all new or added video detection devices as recommended by the manufacturer. Coaxial cable shall be protected with an inline or panel mounted surge suppressor as recommended by the manufacturer, or approved equal. Surge suppressor shall be installed and grounded per video detection manufacturer's recommendations.