CITY OF FORT WAYNE MASTER UPDATED: 1/5/15

SECTION

NTS: This specification is intended to be used for access roads, streets, and other projects that experience standard traffic loads. Tailor it to fit actual project conditions. Although this section references standard roadway or highway specifications, it is not applicable for Contract Documents that include, partially or in their entirety, Indiana Department of Transportation or Allen County Highway Department specifications modified by special provisions.

This Master Specification is not a “Standard” specification and thus requires careful and experienced editing to fit your specific project needs. Ensure that this Section is coordinated with the Standard Details and with the requirements of the Authority Having Jurisdiction of the project area.

NTS: Currently temporary pavement repair is not covered in this Section. If project requires temporary pavement patching refer to and coordinate with Section 32 12 16 – Asphalt Pavement. Add additional requirements to this Section as necessary.

1. GENERAL
	1. DESCRIPTION
		1. The Work shall consist of the construction of plain non-reinforced rigid high-early strength concrete pavement on a prepared base in accordance with these Specifications and in close conformance with the lines, grades, thickness and typical cross sections shown on the plans or established by the Engineer.

NTS: Section “1.2” is to be included if project is bid on unit price basis. Section to be deleted or revised if project is to be bid on lump sum basis.

NTS: Insert at (--1--) and (--2--) below the rigid paving and joints to be used for project. Adjust Section “1.2” below for additional work item numbers as needed.

* 1. MEASUREMENT AND PAYMENT
		1. PCCP
			1. Work Item Number and Title

 **32 13 00-A (--1--) PCCP**

 **32 13 00-B (--2--) PCCP**

* + - 1. PCCP will be measured by the square yard of the thickness specified.
			2. The accepted quantities for this Work will be paid for at the unit price per square yard for the thickness specified and as listed on the submitted Bid schedule, complete in place.
			3. Removal and replacement of PCCP found to be deficient or damaged by freezing shall be completed with no additional payment.
			4. The cost of furnishing and placing all materials, not specified as a pay item, shall be included in the cost of PCCP.
			5. The cost of finishing and furnishing and placing curing materials shall be included in the cost of the PCCP.
		1. D-1 Contraction joints
			1. Work Item Number and Title

 **32 13 00-C (--1--) D-1 Contraction Joints**

* + - 1. D-1 contraction joints will be measured by the linear foot.
			2. D-1 contraction joints will be paid for at the unit price per linear foot as listed on the submitted Bid Schedule, complete in place, unless otherwise specified.

NTS: Edit “D” below for project specific requirements. Coordinate with Section 32 13 00 Rigid Paving if rigid and asphalt pavement are used on the same project. Measurement and Payment shall only be located in one section and should clearly state that payment of pavement markings include both asphalt pavement and rigid pavement.

NTS: Add additional work items as necessary for pavement markings types and layouts.

* + 1. Pavement Markings
			1. Work Item Title and Number

 **32 13 00-D (--1--) Pavement Markings**

* + - 1. This item is measured on a lump sum basis for work shown on the plans, otherwise specified, or necessary to complete work shown on the Drawings.
			2. Payment for pavement marking work shall be paid based on the percentage of the lump sum contract price corresponding to the percentage successfully completed of work specified in the Contract Documents or shown on the plans.
			3. Pavement marking layout shall be confirmed with City of Fort Wayne Traffic Engineering prior to construction of the markings.
			4. This work shall include all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, associated with pavement traffic markings work shown on the Contract Drawings and shall include the following: recording locations of existing pavement and curb markings prior to construction, cleaning pavement or curb to be painted or marked, furnishing and installing permanent pavement markings in accordance with City of Fort Wayne Traffic Engineering, and any other requirements to complete the Work in accordance with these Drawings and Specifications, unless otherwise classified by the Engineer as a separate Work item.
	1. REFERENCES

NTS: Retain all applicable standards below. Add others as required.

* + 1. Standards referenced in this Section are listed below:
			1. American Concrete Institute (ACI):
				1. ACI 305R, Hot Weather Concreting.
				2. ACI 306, Cold Weather Concreting.
			2. ASTM International:
				1. ASTM C78, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
			3. Indiana Department of Transportation (INDOT) - Standard Specifications:
				1. Section 501, Quality Control/Quality Assurance, QC/QA, Portland Cement Concrete Pavement, PCCP.
				2. Section 502, Portland Cement Concrete Pavement, PCCP.
				3. Section 503, PCCP Joints.
				4. Section 901, PCC Materials.
				5. Section 904, Aggregates.
				6. Section 906, Joint Materials.
				7. Section 910, Metal Materials.
				8. Section 912, Concrete Curing Materials and Admixtures.
				9. Section 913, Soil Treatment Materials.
	1. QUALITY ASSURANCE
		1. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work in this Section.
		2. Provide testing during construction as required in the Indiana Department of Transportation (INDOT) Standard Specifications latest edition; Section 901.01 (b), Portland Cement.
		3. Provide Quality Control/Quality Assurance for Portland Cement Concrete Pavement (PCCP) per INDOT Standard Specifications latest edition, Section 502.
	2. SUBMITTALS
		1. Product Data: Within fifteen (15) calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
			1. INDOT Material and Test Division standard form “INDOT Concrete Mix Design Spreadsheet for English Contracts”, including mix design parameters and a list of all items proposed to be provided under this Section.
			2. Certificates, signed by the materials producer and the paving Subcontractor, stating that materials meet or exceed the specified requirements per INDOT Standard Specifications latest edition, Section 502.03.
1. MATERIALS AND PRODUCTS
	1. MATERIALS
		1. The materials used in concrete shall conform to the applicable INDOT Standard Specifications latest edition, Section 502 – Portland Cement Concrete Pavement and shall meet the requirements of the following subsections of INDOT Standard Specifications latest edition, Section 901.
			1. Portland Cement 901.01(b)
			2. Fine Aggregate, Size No. 23 904
			3. Coarse Aggregate, Class AP, Size 8 904.03
			4. Joint Materials 906
			5. Reinforcing Steel 910.01
			6. Concrete Curing Materials 912.01 & 912.02
			7. Air-Entrance Admixtures 912.03
			8. Water 913.01

NTS: Edit Article “2.2”: Pavement Marking Materials below, to suit the needs of the project. Including desires of Owner and Authority Having Jurisdiction over the pavement. Regarding Handicap parking space marking verify local requirements. Delete paint colors not required for project.

* 1. PAVEMENT MARKINGS
		1. Pavement marking materials shall be in accordance with INDOT Standard Specifications latest edition, Section 808 for Pavement Traffic Markings.
		2. Colors:
			1. Roadway Center Markings Between Opposing Traffic Lanes: Yellow.
			2. Roadway Side Striping: White, unless otherwise shown or specified. On roads with divided median, right-side striping of each direction shall be white, and left-side striping shall be yellow.
			3. Roadway Miscellaneous Lane Markings (turn lane arrows and text): White.
			4. No-Parking Areas: Yellow.
			5. Handicap Parking Spaces: Unless otherwise indicated with signs, provide handicap symbol on pavement with white paint on blue background.
	2. MIX DESIGN

NTS: Section “A” below contains requirements of INDOT Section 502.04.a for Portland Cement Concrete. Section “B” below contains requirements of INDOT Section 502.04.b for High-Early Strength Concrete. High-Early Strength Concrete should be considered for use in small patchwork concrete paving. Standard concrete should be considered for use in larger paving projects when the roadway can remain closed until paving can reach full strength. Edit or delete Sections “A” and “B” below as required.

* + 1. Portland Cement Concrete
			1. The mix design shall conform to INDOT Standard Specifications latest edition, Sections 502.04 and 502.05.
			2. Portland cement content 564 lbs/yd3

Maximum water/cementitious ratio 0.487

Maximum cement reduction for GGBFS replacement 30%

70 Fly Ash/portland cement substitution ratio 1.25 by weight

Maximum cement reduction for fly ash replacement 20%

GGBFS/portland cement substitution ratio 1.00 by weight

Slump, formed 2 in. to 4 in.

Slump, slipformed 1.25 in. to 3 in.

Air 5.0% to 8.0%

Minimum flexural strength, third point

loading, with fly ash 550 psi at 28 days

Relative yield 0.98 to 1.02

* + 1. High-Early Strength Concrete
			1. The mix design shall conform to INDOT Standard Specifications latest edition, Sections 502.04 and 502.05.
			2. Minimum Portland cement content (type I or III) 564 lbs/yd3

Maximum fly ash addition 10% of cement content

Maximum water/cementitious ratio (type I) 0.42

Maximum water/cementitious ratio (type III) .0.45

Maximum GGBFS addition 15% of cement content

Slump, formed 2 in. to 4 in.

110 Slump, slipformed 1.25 in.to 3 in.

Air content 5.0% to 8.0%

Minimum flexural strength, third point

Loading 550 psi at 2 days

Relative yield 0.98 to 1.02

1. EXECUTION
	1. SUBGRADE
		1. The construction of the subgrade shall conform to the lines, grades and cross sections as shown on the plans and INDOT Standard Specifications latest edition, Section 502.07 and provisions thereto for subgrade preparation.
		2. The subgrade material shall be brought to a firm and unyielding condition with a uniform density. All soft and yielding material that will not compact readily when rolled or tamped shall be removed and replaced with suitable material. Paving material shall not be placed on a soft, spongy, frozen or otherwise unsuitable subgrade, sub-base or base.
		3. During subgrade preparation and after its completion, adequate drainage shall be provided at all times to prevent water from standing on the sub-grade.
		4. Prior to placement of concrete, the subgrade or subbase shall be thoroughly moistened, but the method of moistening shall not be such as to form mud or pools of water.
		5. A leveling course is not required as long as the finished sub-grade conforms to the lines, grades and cross sections as shown on the plans. However, should a leveling course be used, it shall be the material as specified for the subbase.
		6. Prior to placement of the pavement, proof rolling of the subgrade shall be required as evidence that the sub-grade is in a firm and unyielding condition and completed with a uniform density. Should the subgrade, including any portion of the construction of an embankment or required cut, not meet the compaction requirements, field density tests shall be taken to demonstrate 95 percent compaction has been achieved, based upon the maximum wet density.
	2. FORMS
		1. The subgrade beneath the forms shall be cut to grade and compacted so that the forms, when set, will be firmly in contact for their whole length and at the required elevation. The forms must be set and secured so as to resist springing, settlement or other movement resulting from the placement of concrete against them or from the weight or vibration of any equipment they support.
	3. CURING
		1. Curing shall conform to INDOT Standard Specifications latest edition, Section 502.15 and provisions thereto providing for curing.
		2. Concrete shall be cured by protecting it against loss of moisture, rapid temperature change or mechanical injury for at least 96 hours after placement.
		3. Approved materials for use in curing include burlap cloth, waterproof paper blankets, white burlap polyethylene sheets and liquid membrane forming compounds.
		4. Other methods may be approved; however, the Engineer's prior approval is required.
	4. JOINTS
		1. Joints shall be in accordance with INDOT Standard Specifications latest edition, Section 503 and provisions thereto providing for joints. Longitudinal and transverse joints are required for all concrete pavements.
		2. The length between transverse contraction joints (Type D-1 contraction joint) shall not exceed 20 feet and in no case shall a transverse construction joint be placed less than 10 feet apart.
		3. Longitudinal and transverse sawed joints shall be cut to 25 percent of the full depth of pavement and filled with joint sealer.
		4. A 1 day preformed expansion joint shall be placed at the end of each day’s Work and a ½ inch preformed expansion joint shall be made around all box outs for manholes and/or inlets and other structures.
		5. Transverse contraction joints shall be placed at every inlet, manhole or other structure in line of the pavement. The location of these structures shall determine the exact location of the joints. All joints shall be extended throughout the pavement section and curbs to the full width.
		6. Transverse joints shall match existing adjacent joint patterns.
		7. Whenever the width between forms of pavement under construction is greater than 12 feet, longitudinal joints shall be constructed so as to divide the pavement into strips.

NTS: Specifier must discuss with Owner prior to retain Paragraph “H”. In addition, this section must comply with any detail(s) included as part of the proposed construction plans.

* + 1. Retrofitted tie bars shall conform with INDOT Standard Specifications latest edition, Section 503.
	1. COLD WEATHER TEMPERATURE LIMITATIONS
		1. No concrete shall be placed during the period November 15 to April 15 without prior authorization.
		2. PCCP operations shall not begin until the ambient temperature is 35 degrees Fahrenheit and rising. PCCP operations shall be discontinued when the ambient temperature is descending and is 40 degrees Fahrenheit or below. PCCP may occur outside these temperatures when authorized in writing. Regardless of placement temperature, sufficient means shall be taken to prevent the PCCP from freezing prior to attaining opening to traffic strengths in accordance with INDOT Standard Specifications latest edition, Section 502.18. Any PCCP damaged by freezing shall be removed and replaced.
		3. No concrete shall be deposited on a frozen subgrade or subbase.

NTS: Specifier must discuss with Owner to determine if retaining section 3.6 is applicable for the project and edit to suit the project. If not used in the project delete.

* 1. HOT WEATHER CONCRETING
		1. Hot weather conditions will produce a rapid rate of evaporation of moisture from the surface of the concrete and accelerated setting time. Adjustment will need to be made to the PCCP mix to ensure proper handling, placing, finishing, and curing as the weather becomes just slightly warmer and climatic factors of high winds, low relative humidity, solar radiation are present at the Project Site and as temperatures rise above 75 degrees fahrenheit.
		2. In the case of hot weather conditions, effective precautions shall be implemented and conform to the American Concrete Institute (ACI) 305R Standard Specifications latest edition, Hot Weather Concreting and following procedures:.
			1. Modify PCCP mix design as appropriate. Retarders, moderate heat of hydration cement, pozzolanic materials, slag, or other proven local solutions may be used. Reduce the cement content of the mixture as much as possible, while ensuring the concrete strength will be attained.
			2. Have adequate manpower to quickly place, finish, and cure the concrete.
			3. Limit the addition of water at the job Site and add water only on arrival at the job Site to adjust the slump. Water addition shall not exceed about 2 to 2 ½ gallons per cubic yard. Adding water to concrete that is more than 1 ½ hours old should be avoided.
			4. On dry and/or hot days, when conditions are conducive for plastic shrinkage cracking, dampen the subgrade, forms and reinforcement prior to placing concrete, but do not allow excessive water to pond.
			5. Begin final finishing operations as soon as the water sheen has left the surface; start curing as soon as finishing is completed. Continue curing for at least 3 days; cover the concrete with wet burlap and plastic sheeting to prevent evaporation or use a liquid membrane curing compound described in ACI 306, or cure slabs with water. Retention of moisture will optimize the cement hydration process and allow the concrete to develop its full strength potential. Failure to keep exposed surfaces from drying excessively fast may result in cracking and shrinking, and jeopardizes the PCCP integrity.
			6. Do not use accelerators unless it is common practice to avoid plastic shrinkage cracking and expedite finishing operations.
		3. Pavement shall be closed to traffic for 14 days after it is placed. Unless test beams are taken and tested to indicate a modules of rapture of at least 550 psi. The beams shall be tested as simple beams with third point loading in accordance with ASTM C78 except:
			1. The beam size shall be measured to the nearest 1/16 inch instead of 1/10 inch.
			2. The test results shall be discarded when the break occurs outside the middle 1/3 of the beam.
	2. CONSTRUCTION REQUIREMENTS
		1. All construction requirements shall be in accordance with applicable provisions of the INDOT Standard Specifications latest edition, Section 501.
	3. PAVEMENT THICKNESS AND SUBBASE

NTS: PCCP thickness varies depending on the roadway classification. Retain Paragraphs “A”, “B”, and “C”, as applicable. Specifier must discuss typical PCCP roadway section with Owner prior to selecting Paragraph(s) “A”, “B”, and/or “C”. In addition, this section must comply with any detail(s) included as part of the proposed construction plans.

* + 1. Minimum thickness for local streets shall be 7 inches.
		2. Minimum thickness for a collector street shall be 9 inches.
		3. Minimum thickness for an arterial or industrial street shall be 12 inches.
		4. Subbase, if part of the typical roadway section, shall be 4 inches to of coarse aggregate No. 53.
	1. NORMAL CROWN
		1. The pavement crown for all streets shall be computed at a minimum rate of 1/4 inch per foot, except as otherwise noted on the plans.
	2. CONDITIONING OF EXISTING SURFACES
		1. When the surface of the existing pavement or existing base is irregular, it shall be brought to uniform grade and cross-section as directed by the Engineer.
	3. FIELD QUALITY CONTROL
		1. Site Testing Services:
			1. Contractor shall employ independent testing laboratory to perform field quality control testing for concrete. Engineer will direct where Samples are obtained.
			2. Testing laboratory will provide all labor, material, and equipment required for sampling and testing concrete.
			3. Contractor shall provide curing and necessary beam storage. Actual curing in the pavement shall be closely paralleled.
		2. Quality control testing during construction
			1. Flexural Strength Test shall be done in accordance with ASTM C78 except:
				1. The beam size shall be measured to the nearest 1/16 inch instead of 1/10 inch.
				2. The test results shall be discarded when the break occurs outside the middle 1/3 of the beam.
			2. A set of three test beams shall be made once every 150 cu yd. or once per day pouring is occurring, whichever is more frequent.
				1. Beams shall be tested for compliance with flexural strength requirements at the following cure times:

One test at 7 days

One test at 10 days

One test at request of Engineer

* + - 1. Pavement shall be closed to traffic until such time a flexural strength of 550 psi is achieved, per ASTM C78 and the Field Quality Control requirements of this specification.
			2. Air Test shall be done in accordance with ASTM C231; one for every two concrete loads at point of discharge, and when a change in the concrete is observed.
			3. Slump Test shall be done in accordance with ASTM C143/C143M; one test for each concrete load at point of discharge.
	1. PAVEMENT MARKINGS
		1. All pavement markings removed or damaged during the course of construction shall be replaced.
		2. . Pavement Markings: Provide pavement markings where shown or indicated.
			1. Preparation:
				1. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt.
				2. Do not begin marking bituminous concrete pavement until approved by Engineer.
				3. When reflective glass beads are required, mix with paint prior to paint application.
			2. Application:
				1. Using mechanical equipment, provide uniform, straight edges in two separate coats. Apply in accordance with paint manufacturer's recommendations.

+ + END OF SECTION + +

NTS: See below attached example of the INDOT concrete mix design spreadsheet for English contracts form. Delete prior to inserting this Section into the project manual.

