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

SECTION

1. GENERAL
	1. DESCRIPTION
		1. The work shall consist of the construction of pervious rigid concrete paving (pervious concrete pavement) on a prepare permeable 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.
	2. MEASUREMENT AND PAYMENT
		1. Pervious Concrete Pavement (8 inches thick)
			1. Work Item Number and Title

 **32 13 13-A Pervious Concrete Pavement (8 inches thick)**

* + - 1. This bid item shall consist of pervious concrete pavement placed on a prepare coarse aggregate material subbase in accordance with the American Concrete Institute (ACI) 522.1-08 “Specification for Pervious Concrete Pavement” and as set forth per the concrete paving specification of the Contract Manual.
			2. The cost of furnishing an Indiana Ready Mixed Concrete Association (IRMCA) representative on the contract site during the pervious concrete pavement installation shall be included in the cost of this bid item.
			3. The cost of testing, contraction joints, construction joints, and isolation joints, and all necessary incidentals shall be included in the cost of “Pervious Concrete Pavement (8 inches thick)”.
			4. No additional pavement will be made for pervious concrete pavement which has an average thickness above that shown on the plans.
			5. Measurement: “Pervious Concrete Pavement (8 inches thick)” shall be measured by the square yard for the thickness specified, complete in place.
			6. Payment: The accepted quantities of “Pervious Concrete Pavement (8 inches thick)” shall be paid for at the contract unit price per square yard for the thickness specified, complete in place.
		1. No. 8 Coarse Aggregate (Subbase) – (for Pervious Concrete Pavement)
			1. Work Item Number and Title

**32 13 13-B No. 8 Coarse Aggregate (Subbase) – (for Pervious Concrete Pavement)**

* + - 1. This bid item shall include all costs to furnish all labor, materials, equipment, tools, protection of existing facilities and structures, and necessary incidentals required to place coarse aggregate material on prepared subgrade as described and shown on the Drawings and in accordance with the contract specification for concrete paving, section 2.5.
			2. Removal and disposal of native material prior to installation of aggregate shall be included in the cost of common excavation.
			3. Measurement: The quantity of “No. 8 Coarse Aggregate Material (Subbase for Pervious Concrete Pavement)” in place shall be the number of tons installed.
			4. Payment: The accepted quantities of “No. 8 Coarse Aggregate Material (Subbase for Pervious Concrete Pavement)” shall be paid for at the contract unit price per ton, for the type specified, complete in place.
	1. RELATED DOCUMENTS
		1. Pervious Concrete Pavement: American Concrete Institute (ACI) 522.1-08 “Specification for Pervious Concrete Pavement” as published by ACI, Farmington Hills, Michigan, apply to this Section. See attached copy of the ACI 522.1-08 “Specification for Pervious Concrete Pavement”.
	2. DEFINITIONS
		1. Pervious Concrete Pavement: consists of a porous concrete surface underlain by a storage reservoir placed on compacted subgrade to facilitate stormwater infiltration. The storage reservoir shall consist of a stone bed of uniformly graded, clean, and washed course aggregate with a void space of approximately 40 percent. Pervious concrete pavement is well suited for parking lots, walking paths, sidewalks, and other similar uses.
	3. QUALITY ASSURANCE
		1. Ready-Mix-Concrete Manufacturer Qualifications: A firm **with a National Ready Mixed Concrete Association (NRMCA) certification for pervious concrete and** experienced in manufacturing pervious concrete products and complies with ASTM C 94/C 94M requirements for production facilities and equipment.
		2. Pervious Concrete Pavement Installer:
			1. Installation shall be by a Contractor and Crew with at least three years of experience or with relevant experienced as approved by the Owner in placing pervious concrete pavement on projects of similar size and one of the following:
				1. Contractor shall provide one full-time on-site supervisor with National Ready Mixed Concrete Association (NRMCA) Pervious Concrete Craftsman certification for placement of pervious concrete overseeing each placement crew during all concrete pavement, or
				2. Contractor shall provide three full-time on-site National Ready Mixed Concrete Association (NRMCA) Certified Pervious Concrete Installers working as members of each placement crew during all concrete placement, or
				3. Contractor shall provide five full-time on-site National Ready Mixed Concrete Association (NRMCA) Certified Pervious Concrete Technicians working as members of each placement crew during all concrete placement unless otherwise specified.
			2. **If the requirements set forth in items 1.5B-1a thru 1.5B-1c, listed above as part of this section cannot be met, the Contractor must submit alternative documentation indicating their pervious concrete experience for approval by the Owner. The alternative documentation must be submitted for review with the sealed Bids and the Quality Assurance form.**
			3. The Contractor shall provide a qualified representative from the Indiana Ready Mixed Concrete Association (IRMCA) on the contract site during the pervious concrete pavement installation operations to assist the Contractor. The IRMCA representative shall also be available during the construction when required by the Engineer or Contractor. A copy of the manual for installation shall be furnished to the Engineer.
	4. SUBMITTALS
		1. Product Data: For each type of product used, including but not limited to:
			1. Cementitious materials.
			2. Admixtures.
			3. Aggregates.
			4. Fibers.
			5. Pigments.
			6. Joint fillers.
		2. Pervious Concrete Pavement:
			1. Contractor shall obtain written acceptance of submittals by the Engineer before using the materials or methods requiring acceptance.
			2. Before starting construction, Contractor shall submit to the Engineer:
				1. Qualifications of Contractor related to construction of pervious concrete pavements.
				2. Proposed concrete mixture proportions and density.
				3. In-place pavement test results from previous related pervious concrete pavement projects completed in the last 12 months, including design void content, density, and concrete mixture proportions.
				4. Two test panels, as described in ACI 522.1-08 “Specification for Pervious Concrete Pavement”, Section1.6.2.
				5. Construction drawings depicting proposed joint layout in accordance to Section 3.5H of this specification.
			3. Contractor shall submit to the Engineer a copy of the manufacturer's manual for the concrete pervious pavement installation.
			4. **If the requirements set forth in items 1.6B-2a and 1.6B-2c, listed above as part of this section cannot be met, the Contractor must submit alternative documentation for approval by the Owner.**
		3. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
		4. Qualification Data: For qualified ready-mix concrete manufacturer.
		5. Testing Agency qualifications and test and inspection results.
	5. PROJECT CONDITIONS
		1. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities as shown on the plans for different construction phases/stages.
		2. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F. See Section 32 12 16 Asphalt Paving for additional requirements for pavement markings.
		3. Contractor shall take care when working with loose materials such as soil, shredded hardwood mulch, landscape stones, other concrete and steel materials, other parking lot features, etc. in areas adjacent to completed pervious concrete and provide protection when necessary to avoid damaging and clogging the pervious concrete porous spaces/voids during the remainder of the parking lot construction.
1. PRODUCTS
	1. FORMS
		1. Contractor shall make the forms for pervious concrete material installation with steel, wood, or other material that is sufficiently rigid to maintain specified tolerances, and capable of supporting concrete and mechanical concrete placing equipment.
		2. Forms shall be clean and free of debris of any kind, rust, and hardened concrete.
	2. CONCRETE MATERIALS
		1. See ACI 522.1-08 “Specification for Pervious Concrete Pavement” and comply with ASTM C94/C94M and the following requirements::
			1. Aggregates: Nominal maximum aggregate size shall not exceed 1/3 of the specified pavement thickness.
			2. Admixtures: Chemical admixtures that facilitate the production and placement of pervious concrete shall be permitted. The use of such admixtures shall be notified and approved by the Engineer.
			3. Fibers: The use of such fibers in pervious concrete mixtures shall be notified and approved by the Engineer.
			4. Pigments: The use of such pigments in pervious concrete mixtures shall comply with ASTM C979, if specified as part of the Contract Documents for this project.

Retain paragraph below for integrally colored concrete paving.

* 1. CURING MATERIALS
		1. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
		2. Water: Potable.
	2. RELATED MATERIALS
		1. Isolation Joint Material for Pervious Concrete: comply with ASTM D994, D1751, or D1752.
		2. Joint Fillers ASTM D 1752, cork or self-expanding cork in preformed strips.
		3. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
		4. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
			1. Types I and II, non-load bearing; Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
	3. COARSE AGGREGATE SUBBASE FOR PERVIOUS CONCRETE PAVEMENT
		1. General: All coarse aggregate material used as part of a pervious concrete pavement typical section as the storage drainage layer shall be in accordance with the Indiana Department of Transportation (INDOT) Standard Specifications latest edition, applicable requirements for Section 302 and Section 904. Use materials and gradations that have performed satisfactorily in previous installations.
		2. The No. 8 stone coarse aggregate subbase layer shall consist of 100% crushed stone or air-cooled blast furnace slag (ACBF) and shall meet the size and grading requirements as shown on the Contract Documents. Contractor shall not use slag and local aggregate material.
		3. The coarse aggregate subbase layer shall be compacted in accordance with the INDOT Standard Specifications latest edition, Section 302.06(b).
1. EXECUTION
	1. EXAMINATION
		1. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
		2. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
			1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
			2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
			3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."
		3. Proceed with installation only after unsatisfactory conditions have been corrected.
	2. PREPARATION
		1. Comply with the following requirements:
			1. Prepare subgrade in accordance with the INDOT Standard Specifications latest edition, Section 207.
			2. Contractor shall construct subgrade to ensure that as specified in the Construction Documents the required pavement thickness is obtained.
			3. Contractor shall maintain all traffic off the subgrade during construction to the maximum extent practical. Regrade and recompact subgrade disturbed by concrete delivery vehicles or other construction traffic, as needed.
	3. EDGE FORMS AND SCREED CONSTRUCTION
		1. See ACI 522.1-08 “Specification for Pervious Concrete Pavement” and comply with the following requirements:
			1. Contractor shall set, align, and brace forms for pervious concrete hardened pavement meets the tolerances specified in Section 3.10 of this specification.
			2. Contractor shall apply form release agent to the form face, which will be in contact with concrete, immediately before placing concrete.
			3. The vertical face of previously placed concrete may be used as a form.
			4. Protect previously placed pavement from damage.
			5. Contractor shall not apply form release agent to previously placed pervious concrete.
			6. Placement width shall be as specified in Contract Documents. Concrete placement width shall not exceed 20 ft. unless otherwise specified.
	4. CONCRETE PLACEMENT
		1. Before placing concrete, inspect and complete formwork installation and items to be embedded or cast-in.
		2. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
		3. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place pervious concrete pavement around manholes or other structures until they are at required finish elevation, alignment and concrete collar around structure has been constructed appropriately.
		4. Comply with the following requirements:
			1. When hot weather is anticipated, Contractor shall submit to Engineer a detailed procedures for the production, transportation, placement, protection, curing, and temperature monitoring of concrete during hot weather.
			2. In cold weather, Contractor shall comply with ACI 306.1, recording concrete temperature no less than twice per 24-hour period.
	5. PERVIOUS CONCRETE PAVEMENT EXECUTION
		1. See ACI 522.1-08 “Specification for Pervious Concrete Pavement”.
		2. Batching, mixing, and delivery: Batch and mix in compliance with ASTM C94/C94M except that discharge shall be completed within 60 minutes of the introduction of mixture water to the cement. Increase time to 90 minutes when using an extended set control admixture. Water addition is permitted at the point of discharge.
		3. Placing and finishing fixed-form pavement:
			1. Deposit pervious concrete either directly from the transporting equipment or by conveyor onto the prewetted subgrade or subbase, unless otherwise specified.
			2. Do not place pervious concrete on frozen coarse aggregate subbase or subgrade.
			3. Deposit concrete between the forms to an approximately uniform height.
			4. Spread the pervious concrete using a come-along, short-handle, square-ended shovel, or rake.
			5. Do not allow foot traffic on the fresh concrete.
			6. Strike off pervious concrete between forms using a form-riding paving machine or vibrating screed. Other strike-off devices may be used when accepted.
			7. Do not use steel trowels or power finishing equipment.
			8. Finish the pavement to the elevations and thickness specified in the Contract Documents and comply with the pervious concrete pavement tolerances in Section 3.10 of this specification.
		4. Placing and finishing slipform pavement:
			1. Slipform equipment is permitted.
			2. Do not place pervious concrete on frozen coarse aggregate subbase or subgrade.
			3. Deposit concrete between the forms to an approximately uniform height.
			4. Do not allow foot traffic on the fresh concrete.
			5. Finish the pavement to the elevations and thickness specified in the Contract Documents and comply with the pervious concrete pavement tolerances in Section 3.6 of this specification.
		5. Final Surface Texture:
			1. Contractor shall compact fresh concrete to stay within the tolerances described in Section 3.6 of this specifications.
			2. Contractor shall compact the pervious concrete along the slab edges with hand tools.
			3. Compact material to a dense, pervious surface.
		6. Edging: Edge top surface to a radius of not less than ¼ inch.
		7. Curing:
			1. Begin curing within 20 minutes of concrete discharge unless longer working time is accepted by the Engineer.
			2. Completely cover the pervious concrete pavement surface with a minimum 6 mil (0.15 mm) thick polyethylene sheet. Cut sheeting to a minimum of a full placement width.
			3. Contractor shall cover all exposed edges of pavement with polyethylene sheet.
			4. Secure curing cover material without using dirt.
			5. Cure pavement for a minimum of seven uninterrupted days, unless otherwise specified.
		8. Joints: Contractor shall prepare drawings describing proposed jointing at the locations, depths, and with horizontal dimensions in accordance with the following requirements:
			1. Indicate locations of contraction joints, construction joints, and isolation joints.
			2. Contraction Joints:
				1. Spacing between contraction joints shall not exceed 20 ft.
				2. Contraction joint depth shall be 1/4 to 1/3 of the pavement thickness. Minimum joint width for saw-cutting is 1/8 inches. When using an early-entry dry-cut saw, the depth of the cut shall be at least 1 inch.
				3. Create contraction joints by one of the following methods:

Tool contraction joints to the specified depth and width in fresh concrete immediately after the concrete is compacted.

Sawcut pervious concrete after concrete has hardened sufficiently to prevent aggregate from being dislodged and soon enough to control pavement cracking. To minimize drying, ensure that curing materials are removed only as needed to make cuts.

* + - 1. Isolation Joints:
				1. Use isolation joints only where pavements abuts fixed objects, such as manholes, foundations, and buildings.
				2. Extend isolation joints through the full depth of the concrete pervious pavement. Fill the entire isolation joint with isolation joint material.
			2. The larger horizontal dimension of a slab panel shall not exceed 125% of the smaller dimension.
			3. The angle between two intersecting joints shall be between 80 and 100 degrees.
			4. Joints shall intersect pavement free edges at 90-degree angles and shall extend straight for a minimum of 1-1/2 ft. from the pavement edge where possible.
			5. Align joints of adjacent pavement panels.
			6. Align joints in attached or adjacent curbs within ¼ inch of joints in pavement.
		1. No construction activity shall begin until the proposed joint layout drawings submitted by the Contractor are approved by the Engineer.
	1. PAVING TOLERANCES
		1. See ACI 522.1-08 “Specification for Pervious Concrete Pavement” and construct pavement to comply with the following tolerances:
			1. Elevation: Plus 3/4 inch, minus 0 inch.
			2. Thickness: Plus 1-1/2 inch, minus 1/4 inch.
			3. Contraction joint depth: Plus ¼ inch, minus 0 inch.
			4. Mechanically sweep concrete pavement before testing for compliance with tolerances.
	2. FIELD QUALITY CONTROL
		1. Testing Agency: The Contractor will engage a qualified testing agency to perform tests and inspections and submit results to the Engineer and Owner for approval.
		2. Prepare test and inspection reports.
		3. Testing:
			1. Contractor shall test and inspect concrete materials and operations as the project progresses. Failure to detect defective work or material early will not prevent rejection if a defect is discovered later, nor shall it constitute final acceptance.
			2. Contractor shall notify and coordinate with Engineer at least 48 hours before starting pervious concrete placement.
			3. Testing agencies that perform testing services on pervious concrete materials shall meet the requirements of ASTM C1077.
			4. The agencies performing inspection for this project shall meet ASTM E329 requirements.
			5. Testing agencies performing the testing shall be accepted by the Engineer before performing the work.
			6. Field tests of pervious concrete shall be performed by an individual certified as both an NRMCA Certified Pervious Concrete Technician or equivalent and an ACI Concrete Field Testing Technician – Grade 1 or equivalent :
				1. Obtain a minimum 1 ft3 sample for acceptance test in accordance with ASTM C172. Measure a minimum of one density test during each day’s placement in accordance with ASTM C138/C138M following the consolidation procedures described in ASTM C29/C29M, Jigging Procedure.

Determine density using a minimum 0.25 ft3 cylindrical measure. Fill and compact the measure in accordance with ASTM C29/C29M, Jigging Procedure.

A fresh density shall be within ± 5 lb/ft3 of the specified fresh density.

* + - * 1. Remove three cores from each lot of 5,000 ft2 in accordance with ASTM C42/C42M, not less than 7 days after placement of concrete pervious pavement.

Cores shall be a minimum nominal 4 in. diameter.

Select three locations in accordance with ASTM D3665.

Measure the core for thickness in accordance with ASTM C42/C42M and density in accordance with ASTM C140.

After thickness determination, trim and measure the cores for density in the saturated condition as described in Paragraph 9.3, Saturation of ASTM C140.

Immerse the trimmed cores in water for 24 hours, drain for one minute, remove surface water with a damp cloth, then weight immediately.

* + - * 1. Tolerance for thickness and density reported as the average of three cores of each lot shall be as follows:

The compacted thickness shall not be more than ¼ in. less than the pervious concrete pavement thickness specified in the construction documents, with no single core exceeding ½ in. less than the specified thickness; nor shall the average compacted thickness be more than the 1-1/2 in. more than the specified thickness.

* + 1. When a lot is outside one or more of the limits described in item 6.c above on this section, the lot shall be subject to rejection, removed and replaced at the Contractor’s expense and with no additional cost to the Owner.
		2. Core holes shall be filled with concrete preblended grout.
	1. REPAIRS AND PROTECTION
		1. Contractor shall take care when working with loose materials such as soil, shredded hardwood mulch, landscape stones, other concrete and steel materials, other parking lot features, etc. in areas adjacent to completed pervious concrete and provide protection when necessary to avoid damaging and clogging the pervious concrete porous spaces/voids during the remainder of the parking lot construction.
			1. No Traffic (Pedestrian, Equipment, or Vehicular) on pervious concrete material until the concrete has cured for at least seven uninterrupted days and until the pavement is accepted by the Engineer for opening to traffic.
			2. The Contractor shall be responsible for damage or injury to property resulting from defective work or materials and from any act, omission, or misconduct in its manner or method of executing the work. When direct or indirect damage or injury is done, such property shall be restored with no additional payment to a condition similar or equal to that existing before such damage or injury, or such damage or injury shall be made good in an acceptable manner and at no additional cost to the Owner.

+ + END OF SECTION + +