

121. CONCRETE STREET PAVING:

121.1 **Description.** This work consists of removing and replacing existing concrete pavement and/or constructing new pavement. The concrete paving shall proceed in the following sequence for each street:

- Complete all water main and sewer activities by maintaining temporary pavement as specified.
- Perform roadway excavation in 500 feet length; to be immediately followed by the underdrain installation for the 500 feet length and connection to the catch basins; to be immediately followed by proof rolling and subgrade under cutting as determined by the Engineer and 6 inch aggregate base placement if specified. The sequence will minimize rain water seepage and its accumulation within the pavement surface. The contractor shall be responsible for any additional subgrade undercutting required prior to the concrete paving.
- Follow above described sequence in 500 feet segments for the remainder of the street. Do not perform roadway excavation in excess of 500 feet in length without placement of underdrains, subgrade undercutting and 6 inch aggregate base.
- Concrete paving. The concrete paving forms shall be removed and hauled away from the street within seven (7) days of concrete pour in order for the property owners to use the street while no active construction is performed in front of their houses.*Concrete paving of intersections and gaps shall be completed within two weeks of concrete pour of Main Street to provide for contiguous access to traffic including garbage and recycle collecting trucks.**
- Backfill excavation at least four (4) feet wide between the new curb and sidewalk/driveways for the property owners to access their houses within two (2) days after removing the concrete paving forms.*
- Driveway/Sidewalk /lawn restoration.

*The city reserves right to assess contractor \$750.00 per day as a penalty if the contractor fails in removing concrete paving forms and/or backfilling excavation four (4) feet wide between the new curb and sidewalk as indicated above.

** The city reserves right to assess contractor \$750.00 per day as penalty if the contractor fails to complete concrete paving of intersections and gaps within two weeks of concrete pour of Main Street.

121.2 Concrete paving of the streets specified for full width replacement shall be performed full width curb-to-curb, preferably by paving machine. **The Contractor shall notify the Engineer at least five (5) days in advance if the access to individual garage/driveways is blocked during concrete paving, sidewalk and driveway apron replacement.**

121.3 **Materials.** All concrete used shall meet the requirements of the MDOT 2020 Standard Specifications for Construction Grade P1/3500psi (2020 MDOT 1004-1) unless otherwise noted. In addition, all concrete furnished shall be resistant to excessive expansion caused by ASR (Alkali Silica Reactivity). . For the roadways within MDOT rights of way, the Contractor shall use Grade P-NC concrete mix (seven (7) sacks of cement per cubic yard of concrete) with non-chloride accelerator (2020 MDOT Sec. 903). Only aggregates from an MDOT certified pit or quarry that has been tested within the last two (2) years by MDOT and have been determined to be non-reactive shall be used.

1212.4 Supply Portland cement concrete from certified stationary concrete batch plant facilities meeting the requirements of the National Ready Mixed Concrete Association (NRMCA) Certification program for automatic Control and Authentic System. The NRMCA stationary concrete batch plant shall meet the requirements of Section 601 of the 2020 MDOT Standard Specifications for Construction.

121.41 Portable Concrete Batch Plants may be approved at the Engineer's discretion upon review of the Contractor abiding the following requirements.

- Portland cement concrete from certified portable concrete batch plant facilities shall meet the current requirements of the National Ready Mixed Concrete Association (NRMCA). Certification from NRMCA is required.
- It shall meet the requirements of Section 602 of the 2020 MDOT Standard Specifications for Construction.
- Transportation of concrete from the certified portable concrete plant shall be restricted to County and State Trunkline streets such as Telegraph Road, Michigan Avenue, Outer Drive, and Ford Road. The City's major and local roads shall not be used for the transportation of concrete.
- If the location of the certified portable concrete batch plant is to be located within the corporate limit of the City of Dearborn, a permit from the City's Economic and Community Development Department is required for the installation of concrete batch plant.
- If the location of certified portable concrete batch plant is located and/or to be located outside the corporate limit of the City of Dearborn, the Contractor shall submit to the Engineer the official address of the concrete batch plant with a copy of plant approval from the respective local agency.
- The portable concrete batch plant must abide by all local, county, state and federal regulations. The permit as required by the above mentioned agencies must be on display at all times.
- The Engineer will retain his own testing consultant stationed at the plant location during the batch plant inspection and during concrete production to monitor quality assurance.

The Contractor will be responsible and pay for the cost of quality assurance required by the Engineer at the concrete batch plant site.

121.5 Concrete Mixture Requirements. The Contractor shall provide concrete mix design meeting the requirement of Grade P1 concrete with six (6) sacks of cement per cubic yard of concrete and Grade P-NC concrete with seven (7) sacks of cement per cubic yard of concrete. The mix design shall indicate the weight and proportion of cement, cement substitute, coarse aggregate, fine aggregate, water and other admixtures. The mix design shall also indicate the source and certification of materials. Include sufficient information on constituent materials and admixtures along with compressive strength test results to allow the Engineer to fully evaluate the expected performance of the concrete mix. Provide all supplying mix design documentation, including test reports and mix proportion adjustment calculations. All mix designs must be traceable to a certified laboratory. Submit each concrete mix design on forms acceptable to MDOT. List the source of materials, specific gravity of constituents, aggregate absorption, dry weights, dry loose or dry rodded unit weight of coarse aggregate, aggregate correction factors, batch weights and project specific and historic laboratory test data. The compressive strength of the concrete cylinders tested and /or reported as part of the mix design submitted must meet the verification requirements.

121.51 Concrete Mixtures Using Fly Ash and Ground Granulated Blast Furnace Slag. Ground granulated blast furnace slag (GGBFS) and Type F Fly Ash may be used as an optional portion of cementitious material with Type 1A or Type 1 Portland cement subject to the following.

- a) Submit a mix design, produced by a testing laboratory conforming to ASTM C 1077, for review by the Engineer. Include documentation of the 28-day compressive strength, slump and air content. Show that the concrete produces a 28-day compressive strength at least 500 psi higher than the requirements.
- b) Make, cure and test a minimum of three batches of each mix design according to ASTM C 192. Provide new laboratory data for approval by the Engineer for all subsequent changes in any of the mixture constituents.
- c) Use Type 1 or 1A Portland cement.
- d) Reduce the cement quantity; per MDOT most current specifications, to a maximum of 25 percent for fly ash substitution or up to 40 percent for GGBFS substitution.
- e) The fly ash or GGBFS weight additions must be equal to the weight of the cement reduction.
- f) For concrete containing Portland cement, fly ash and GGBFS in the same mix design, reduce the cement quantity up to 40 percent, with the maximum fly ash quantity not exceeding 15 percent.

121.6 The concrete for all full width pavement, curb to curb and street intersection to street intersection and for full length curb and gutter construction (2', 4' and 6' wide) shall be air-entrained and contain 6 sacks of cement per cubic yard and testing 3,500 psi at 28 days. Concrete shall meet the requirements of Grade P1 Concrete of the 2020 MDOT Standard

Specifications for Construction. Air entrainment in the mix shall be between 5% - 8% air. Coarse aggregate for concrete shall be 6AA meeting the requirement of the MDOT 2020 Standard Specifications for Construction. The term "sack" refers to a 94 pound sack of cement. Do not exceed a slump of 3.0 inches or the slump indicated in the Contractor's approved mix design. MDOT 2020 Grade P-NC concrete with non-chloride accelerator is required for the roadway within the MDOT rights of way.

121.7 **The concrete for pavement spot repairs and curb and gutter spot repairs** shall contain seven (7) sacks of cement per cubic yard and test 4,000 psi at 28 days (5%-8% air). Seven (7) sack cement of per cubic yard of concrete is applicable on city wide street pavement spot repair contracts.

121.8 Concrete paving shall be performed on alternating streets, leaving the adjacent street open to traffic and to allow parking for residents whose street is closed for paving. During this time, access to all driveways/garages shall remain open on all other streets.

121.9 Approved flexible forms and hand finishing will be required on all pavement where radius for the edge of pavement is less than 150 feet.

121.10 Concrete Driveway Opening - Detail M as shown on the plans shall be incidental to and included in the quantities of concrete pavement or concrete base course.

121.11 All longitudinal and transverse construction joints, expansion joints, transverse plane of weakness joints and expansion joints between pavement and driveway aprons shall be filled with hot rubber joint compound as specified in Sections 317.2 and 715 and shall be considered incidental to concrete street paving.

121.12 Joint Hook Bolts Joint Hook Bolts shall conform to the details and design shown on the standard plans or as otherwise approved by the Engineer. The bar used in the joint shall not be less than three-quarter inch (3/4") in diameter and shall be of hard grade steel. The tensile strength of the hook bolts and the coupling in the assembled unit shall not be less than 16,000 pounds. The coupling or the shank of the hook bolt shall provide a positive stop to prevent the shank of the hook bolt from being threaded beyond the center of the coupling. The joint hook bolt and coupling shall be equipped with an approved fastener for holding the coupling against the pavement form in the designated position during the placing and finishing of the concrete and permit the removal of the pavement forms without damage to the concrete or the hook bolt assembly. Hook bolts shall be placed in accordance with the drawings.

121.13 Tie Bars for Longitudinal Joints Bar reinforcement for pavement tie bars which are bent or require being at time of construction shall be deformed bars conforming to the requirements for structural grade steel of the current specifications for Billet-Steel bars for Concrete Reinforcement, A.S.T.M. Designation: A15; or Axle-Steel Bars for Concrete Reinforcement, A.S.T.M. Designation: A160, unless otherwise provided for on the plans or by authorization.

The use of hook bolts and/or tie bars on this project where required shall be considered incidental to all construction and should be reflected in said bid prices.

121.14 Bar reinforcement for straight pavement tie bars which do not require bending at the time of construction shall be deformed bars conforming to the requirements for hard grade steel of the current specifications for either Billet-Steel Bars for Concrete Reinforcement, A.S.T.M. Designation: A15, Axle-Steel Bars for Concrete Reinforcement, A.S.T.M. Designation: A160 or Rail-Steel Bars for Concrete Reinforcement, A.S.T.M. Designation: A16.

121.15 Do not use water to enhance finishing operations, applying the water as a fog spray or fine mist type of water application may be used in special cases with the Engineer's approval.

121.16 Contractor shall provide the asphalt mix design for Engineer's and their testing consultant's review. The mix design will be based on the Contractor's choice of materials from an MDOT approved source.

121.17 Concrete Pavement Construction. This work shall be constructed in accordance with Section 602 of the 2020 MDOT Standard Specifications for Construction and as modified herein.

Fixed-form paving machine operations shall be required for all reconstruction streets. Slip-form paving machine will not be allowed because of the proximity of trees in the residential neighborhood. The Contractor shall use paving machine for concrete paving operation. Full width or half width paving by vibratory screed and revolving tube will not be acceptable. Slip-form may be used for concrete curb and gutter sections. The use of vibratory paving screed and revolving tube are limited to concrete pavement patch repairs.

Immediately after removing the forms, all visible areas of honeycomb or minor defects shall be filled with mortar. The mortar shall consist of one part Portland cement and two parts of fine aggregate and shall be applied with a wood float. Immediate steps shall be taken by the Contractor to correct the conditions contributing to these defects.

All transverse joints in the concrete pavement shall extend entirely through the integral curb. Joints in the integral curb shall be sealed with Hot-Poured Rubber as specified in Section 602 of the 2020 MDOT Standard Specifications for Construction.

121.171 Equipment for Concrete Pavement/Concrete Base Course. Furnish and maintain all equipment necessary to complete the work.

1. Fixed Forms and Back-Up Rails. When paving with fixed forms, use back-up rails attached to the forms to raise equipment wheel flanges clear of previously cast pavement.

Use metal forms with sufficient section rigidity to support the paving equipment.

Use flexible or standard steel forms with flexible liners when the radius is less than 150 feet, except when temporary concrete pavement is specified.

2. **Form Tamper.** Use form tampers capable of thoroughly and uniformly compacting the base under fixed forms. Use mechanical form tampers for construction of concrete pavement. Use either hand tampers or mechanical tampers for adjusting short sections. For construction of concrete base course, miscellaneous concrete pavement, and temporary concrete pavement, use either hand tampers or mechanical tampers.
3. **Concrete Spreader.** Use an approved device to spread and strike off each layer of concrete and to finish the top layer of concrete. Provide sufficient weight and rigidity to properly strike off the concrete.
4. **Lane-Tie Installer.** Use a mechanical installation device unless the lane ties are placed on chairs. Manual installation methods are permitted for temporary concrete pavement.
5. **Reinforcement Bridge.** Transfer reinforcement, not placed on chairs or mechanically picked up off the grade, from the hauling equipment to a movable bridge which spans the pavement being cast. Provide a bridge that can carry the reinforcement load without deflecting the form or rutting the track line.
6. **Internal Vibrator.** Provide sufficient internal vibrators to consolidate the concrete. Use approved mechanical internal vibrators that visibly affect the concrete for a distance of approximately one foot from the vibrator head. Connect the vibrators to start automatically with the forward movement of the equipment and stop automatically when the forward movement stops.
7. **Floating and Finishing Equipment.** Shape, screed, and float the concrete to form a dense, homogeneous pavement, requiring only minimum hand finishing.

Provide hand floats and straightedges at least 10 feet long, rigid, and free from warping. Provide handles long enough to finish half the width of the pavement being placed. Provide box or channel hand floats with a floating face at least 6 inches wide.

Use of a roller screed or other manual or semi-automated finishing equipment is permitted, provided that use is limited to on one lane width or demonstrate to the satisfaction of the Engineer that the methods and equipment are according to the 2020 MDOT Standard Specifications for Construction subsections 602.03.

8. **Straightedges for Testing Surface Smoothness.** Furnish two 5-foot straightedges and one 10-foot straightedge, rigid and free from warping for the Engineer's use.
9. **Stencils.** Furnish a template device for imprinting the pavement. Provide numerals 3 to 4 inches high and at least ¼ inch deep.
10. **Foot Bridges.** Provide at least one moveable bridge for use in finishing the pavement, installing monument boxes, doing wet checks, and crossing the pavement. Foot bridges spanning slab widths of 16 feet or more must be equipped with wheels

unless these bridges are an integral part of the paving equipment. Design and construct foot bridges so they will not contact the concrete.

11. **Membrane Sprayer.** Use mechanical equipment to apply curing compound to all mainline and full lane width pavements. The equipment must be a fully atomizing type, self contained; self supported and ride on wheels or tracks located outside the paving lane. Provide continuous stirring of the compound during application. Apply a continuous uniform film of curing compound to all exposed surfaces.

The Engineer may approve hand spraying equipment for small and irregular shaped pours. This sprayer must be capable of applying a uniform film of atomized curing compound at the specified rate.

12. **Joint Sealing Equipment.**

- a) **Performed Neoprene Joint Seal.** Use either power or hand-operated equipment, as recommended by the joint seal manufacturer, for applying the lubricant and installing the preformed joint seal.
- b) **Splicing Preformed Neoprene Joint Seal.** Submit a copy of the supplier's splicing system details to the Engineer before sealing joints.
- c) **Hot-Poured Rubber-Asphalt Type Compound.** Furnish an indirect or double-boiler heating kettle for hot-poured rubber-asphalt type sealing compound, using oil as the heat transfer medium. Provide a thermostatically controlled heat source, built-in automatic agitator, and thermometers to show the temperature of the melted sealing material and the oil bath. The Engineer may require a demonstration that the equipment will consistently produce a joint sealant of proper pouring consistency.

Equip the kettle with a pressure pump, hose and nozzle that can force the sealing material to the bottom of the joint and completely fill it. Do not use direct flame heat on the nozzle to maintain the temperature of the sealing material.

- d) **Cold-Applied Joint Sealing Compound.** Apply cold-applied joint sealing compound with pressure equipment that can force the sealing material to the bottom of the joint and completely fill it. Do not spill or overfill the material onto the surface of the pavement.

121.172 **Base Preparation for Concrete Pavement/Concrete Base Course.**

Smooth, trim, compact and maintain the base to the required line, grade and cross section prior to pavement placement. Prepare the base far enough in advance of setting forms to allow for testing and acceptance of the base by the Engineer.

Place concrete on a moist base. Do not place concrete on any underlying layer that is frozen, or if the grade exhibits poor stability from excessive moisture levels. Place concrete on a moist base, that is not muddy, soft or frozen.

If construction equipment has been permitted to use the prepared grade, check the base and make necessary corrections before placing the concrete.

121.173 Placing Forms. Trim the compacted base close to the staked grade using base preparation equipment. Check the base on which the forms are to be placed for line and grade and correct irregularities before placing the forms. Thoroughly compact the base outside the area to be paved, to support the forms.

Set forms before placing concrete to provide time for the Engineer to check them. Provide uniform bearing of the forms directly on the base throughout their length and width. Join, lock, and stake all forms with at least three stakes per segment. During paving, do not allow vertical and horizontal movement to exceed 1/8 inch and 1/4inch, respectively. Brace flexible forms to prevent movement during concrete placement.

After the forms are set and cleaned of all hardened concrete or mortar, the Engineer will check them. When requested by the Engineer, fabricate stringlines for checking line and grade. Adjust form lines showing a variance from the staked line by more than 1/2 inch or from the staked grade by more than 1/8 inch.

Coat forms with a de-bonding compound before installing lane ties or placing reinforcement. Do not use oil as a de-bonding compound.

121.174 Placing Concrete. Set structure castings to grade and alignment before, or during, placement of concrete. Clean all structure castings thoroughly to permit adhesion of the concrete.

Keep the top of the forms free of concrete and other substances during placing and finishing.

Inspect vertical surfaces of previously placed concrete and the adjacent grade and clean off all materials that would prevent an adjoining concrete pour to properly consolidate or conform to the plan dimensions. Before an adjoining pour, inspect the open-graded base for contamination by fines or debris. The Engineer will determine whether the contamination is sufficient to require removal and replacement. All costs associated with removal and replacement will be borne by the Contractor.

When pavement is constructed on a base that could sustain damage from hauling units, mechanically transfer the concrete from the hauling units to the grade. This equipment must be self contained; self supported and ride on wheels or tracks located outside the paving lane.

Spread and strike off the concrete as soon as it is deposited on the base. Avoid segregation. Consolidate the concrete along the faces of fixed or sliding forms and next to transverse dowel bar assemblies with an internal vibrator. If use of a reinforcement installer attains sufficient compaction of the concrete, the use of vibrators along the faces of forms may be omitted.

With slipform method, for concrete curb and gutter, vibrate concrete for the full width and depth of the pavement. When the concrete is placed in two layers, the consolidation may be accomplished after the top layer has been placed.

Cease all vibratory and tamping action when the paving equipment stops.

Provide adequate labor, materials, and equipment to ensure continuity of the paving operation. The Engineer may limit the rate of production to prevent poor workmanship, overloading of equipment, or frequent delays if the equipment does not have sufficient capacity to keep pace with the other operations. Place the top layer of concrete within 30 minutes after the bottom layer is placed. In case of unavoidable interruption of the work for longer than 30 minutes, place a transverse end of pour joint.

Operate equipment to prevent damage to pavements and bridge decks and to maintain proper grade in transitioning from the pavement to the deck.

Do not permit vehicles or equipment, other than joint saws or ride quality measurement equipment, on new pavement, or portions of it, until the concrete strength complies 70% of design compressive strength.

Keep existing pavements clean of materials that may interfere with finishing operations or cause damage to the surface.

Finish all concrete placed each day during daylight unless sufficient artificial light is provided. All costs associated with providing this artificial light will be borne by the Contractor.

Where gapping of concrete pavement is specified for maintaining traffic, either leave the gaps or place a temporary bridge or pavement crossing as approved by the Engineer.

121.175 Placing Pavement Reinforcement. Place the reinforcement from a reinforcement bridge, or by other approved means that will not contaminate the concrete. Place only reinforcement that is free of loose rust and other contaminants.

121.176 Constructing Joints

1. Longitudinal Lane Tie Joints with Straight Tie Bars. Place tie bars at the required depth, parallel to the finished surface, at right angles to the joint and at the spacing called for on the plans. Install lane tie bars, except in temporary concrete pavement, using approved chairs or mechanical devices. Do not place lane tie bars in the concrete by hand methods.

2. Longitudinal Bulkhead Joints. Install epoxy coated bent bars parallel to the surface of the pavement and approximately at right angles to the edge of the pavement. Install the bent bars to allow consolidation around the bar without causing an edge slump. Straighten bent tie bars after the concrete has gained sufficient strength. Straighten tie bars to be approximately parallel to the surface of the pavement and approximately perpendicular to the edge of the pavement. Install and straighten bent tie bars so that the epoxy coating is not torn or

loosened within 6 inches of the joint face. Repair all tears or loosening of the epoxy within 6 inches of the joint face using the coating material recommended by the coating manufacturer.

121.177 Finishing of Concrete Surface. Screed or extrude the finished concrete surface to a smooth, sealed, and uniform appearance in accordance with the final cross section shown on the plans. The surface shall be finally finished by the use of burlap or by canvas belting or approved equal method approved by the Engineer. The finished concrete shall be free from porous, open spots, popouts or scaling.

121.178 Curing of Concrete.

1. **Membranous Curing.** After finishing of the concrete, it shall be cured with a white membranous compound applied uniformly over the entire pavement area. The entire surface of the concrete shall be adequately and completely covered with the material which generally will mean a greater amount than the minimum standards as recommended by the Manufacturer. The compound shall consist of a finely graded white pigment and vehicle, ready mixed for immediate use, held in solution in a volatile solvent, and shall not settle out hard on continued standing. The compound shall form a membrane which will adhere to moist concrete. It shall become dry to touch within four hours when applied to the concrete under ordinary conditions and shall not be tacky nor track off the concrete when walked upon nor impart a slippery appearance to the surface. It shall be suitable for application to a pressure of not to exceed fifty lbs. per square inch at a minimum temperature of 40° and shall be sufficiently low in viscosity to assure an even uniform coating when applied by spraying. The compound when applied to a new concrete surface, shall present a uniform white appearance and shall effectively obscure the original color of the concrete, but shall leave no permanent coloring of the concrete. Spraying shall follow immediately upon completion of finishing. It shall meet the current specifications of the Michigan Department of Transportation.

121.179 Sidewalk and Driveway Apron Stamping

1. The Contractor shall have available on the job a metal stamp with the Contractor's name and current year engraved on it. The Contractor shall use this stamp in stamping the sidewalk and new driveway aprons replaced as per the following:

- Stamp individual flag of sidewalk if only one flag of sidewalk is replaced at a specific location.
- Stamp at least two locations at each end if four flags of sidewalk are replaced contiguous.
- Stamp every third flag of sidewalk if more than four flags of sidewalk are replaced contiguous.
- Stamp individual driveway apron replaced.
- Stamp individual driveway replaced behind the sidewalk.