

**Concrete and
Concrete Pavement Requirements
City of Steubenville - Public Works**

GENERAL

This specification consists of the proportioning, material, and construction requirements for Portland Cement Concrete with fiber reinforcement. The fiber reinforcement provides control of cracking due to drying shrinkage and thermal expansion. Concrete furnished under this specification shall meet the requirements of ODOT 499 Concrete and the following. In the case of conflict, the requirements of this specification shall govern.

MIX DESIGN CLASSES - All Classes of concrete shall develop seven (7) and twenty-eight (28) day average compressive strengths as shown:

	<u>Average Strength</u>
24 Hour (FS Only)	2500 psi
3 Day Test (MS Only)	2500 psi
7 Day Test	3000 psi
28 Day Test	4000 psi

Class C Concrete. Concrete shall be proportioned according to 499.03. When used for concrete pavement, sections may be opened to traffic after seven (7) days provided the concrete has obtained a average compressive strength shown in the table above. Joints (minimum 1/4 depth of slab) shall be sawed within 30 hours of casting.

Class MS Concrete. This class concrete shall be used where specified to obtain high early strength and when air temperatures are anticipated to go below 40 degrees F during the first three days of cure. When used for concrete pavement, sections may be opened to traffic after three(3) days provided the concrete has obtained a average compressive strength shown in the table above. Joints (minimum 1/4 depth of slab) shall be sawed within 18 hours of casting.

This mixture is a moderate-setting Portland cement concrete for accelerated strength development. The minimum cement content shall be 800 pounds per cubic yard and the maximum water-cement ratio shall be 0.43.

An approved admixture may be used at the rate recommended by the manufacturer provided it will produce the required strength in the allotted time.

Class FS Concrete. This class concrete shall be used where specified to obtain very high early strength. When used for concrete pavement, sections may be opened to traffic after 24 hours provided the concrete has obtained a average compressive strength shown in the table above. Joints (minimum 1/4 depth of slab) shall be sawed within 8 hours of casting.

This mixture is a fast-setting Portland cement concrete for accelerated strength development. The minimum cement content shall be 900 pounds per cubic yard and the maximum water-cement ratio shall be 0.40.

An approved admixture may be used at the rate recommended by the manufacturer provided it will produce the required strength in the allotted time.

MATERIAL - Materials used in the mix design shall be as follows:

Aggregate. Coarse aggregate shall meet the requirements of 703.02 and the following. The coarse aggregate may be any one of the following sizes: No. 57, No. 6, No. 67. or No. 8. Concrete shall contain 6 +/- 2 percent of total air. When No. 8 size aggregate is used, the entrained air content shall be 8 +/- 2 percent.

Fibers. Use only 100 percent virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured for use as concrete secondary reinforcement. Volume per cubic yard shall equal a minimum of 0.1 percent (1.5 pounds).

Physical Characteristics

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| 1. | Specific Gravity | 0.91 |
| 2. | Tensile Strength | 80-110 ksi |
| 3. | Fiber Length | Minimum of 1.5 inches |

Mixing

Fibers shall be introduced to the concrete mix at the time the concrete is batched in accordance with manufacturer's recommendations.

DELIVERY TICKETS - Each batch delivery ticket shall clearly state the following relative to its batch:

1. Location of Concrete Plant
2. Date and Time batch was made.
3. Fiber trade name, manufacturer's name and amount per cubic yard of fibrous concrete reinforcement material
4. Number of cubic yards
5. Weight of fine aggregate, gradation number & type
6. Weight of coarse aggregate, gradation number & type
7. Weight of Portland Cement
8. Weight of Water
9. Weight or quantity of any admixtures

SUBMITTALS - Prior to furnishing the fibrous concrete mix, the contractor shall submit the following for approval:

1. A concrete mix design showing the mix proportioning of all materials.
2. Certified test data in accordance with ODOT 101.03 from a recognized testing laboratory that shows the proposed proportioning will meet the average strength requirement.
3. Copies of manufacturer's printed data, clearly marked, showing the proposed fibrous reinforcement materials.

APPROVAL OF MIX DESIGN - The Engineer will approve the concrete mix design on the Contractor's submitted proportions and the foregoing information. Submittal by the Contractor will be made in sufficient time to allow approval of materials and mix design prior to placing concrete.

CURING - A wax based or pre-approved water based curing compound with white pigmentation shall be used and shall be applied to the finished surface after all free water is gone. Compound shall meet or exceed the requirements of ASTM C-309. Compound shall be applied at the rate recommended by the manufacturer but not less than 200 square feet per gallon.

QUALITY CONTROL - The contractor shall provide a technician and equipment to perform air and slump tests as well as to mold cylinders and test beams when concrete pavement or rigid replacement is being placed as well as large installations of curb and walk (20 cubic yards or greater). Air and slump tests shall be performed at the project site on delivered loads, randomly selected by the Project Inspector. Concrete cylinders and test beams will be required for pavement work only and shall be made on a random basis as directed by the Project Inspector. The City may take air content and slump tests and mold cylinders or test beams for concrete used for minor walks, minor curbs, fixture adjustments and incidental items (installations less than 20 cubic yards).

FALL AND WINTER SEASON RESTRICTIONS - When concrete which come in contact with snow and ice control road salts is placed after October 1st and prior to May 1st, a cure and seal compound which protects the concrete surface against road salts shall be used in lieu of a curing compound. Acceptable cure and seal compounds are Burke Chlorinated Rubber Cure-Seal-Hardener; Chem Masters Polyseal "4 in 1"; E-Poxy Industries EVA-POX Penetrating Curing Compound #14, W.R. Meadows CS- 309 Acrylic Curing and Sealing Compound or pre-approved equal.

COLD WEATHER RESTRICTIONS - When the air temperature is expected to go below 40 degrees F during pour and through four days following the pour, the following requirements shall be followed:

Class MS concrete shall be used.

All concrete materials and all reinforcement forms, fillers, and ground with which the concrete is to come in contact shall be free from frost.

All concrete placed in forms shall have a temperature of between fifty (50) and seventy (70) degrees F. and adequate means shall be provided for maintaining a temperature of not less than fifty (50) degrees F., for a minimum of three (3) days. No dependence shall be placed on salt or calcium chloride for prevention of freezing.

HOT WEATHER RESTRICTION - When the ambient temperature is above or is expected to be above 90 degrees F, hot weather restrictions shall apply. All concrete as it is placed in forms shall have a temperature of no greater than eighty (80) degrees F. Wet burlap shall be placed over the surfaces in order to keep the uncured surfaces moist. A means shall be provided to keep the burlap wet for a period of at least three (3) days. (499001)

Description. This work shall consist of pavement removal, subbase/subgrade correction, rigid pavement replacement in accordance with details shown in the drawings. Unless otherwise provided herein, the materials and work shall be in accordance with the provisions of ODOT 202, 304, 451, 452 and 499 as applicable. The requirements of 451.16 shall be waived for this work. The depth of pavement shall be described in the pay item.

Materials. Concrete provided under this item shall be Class MS with fibers as specified in "General Specification for Fibrous Concrete - City of Steubenville" and shall meet those requirements and those of Item 499. In the case of conflict, the specifications of this note shall govern.

Joint sealer shall meet the requirements of 705.04. Certification that the material furnished meets the specification shall be furnished to the Project Inspector.

Nonshrink nonmetallic grout shall meet the requirements of 705.20. Certification that the material furnished meets the specification shall be furnished to the Project Inspector.

Full Depth Pavement Sawing. The limits of all repairs shall be located and marked by the Project Inspector. Rigid pavement areas exhibiting deterioration at the surface shall be marked one (1) foot minimum beyond the limits of deterioration but in no case shall the minimum dimension of the Rigid Repair be less than shown in the drawings. Pavement designated to be removed shall be sawed full depth transversely and along the longitudinal joint using a self-propelled concrete saw equipped with a diamond saw blade.

Rigid Pavement Removal. Pavement shall be removed by a method approved by the Project Inspector. If adjacent pavement is damaged during the pavement sawing or rigid pavement removal, an additional full depth diamond blade saw cut shall be made the full width of the lane at a length that will encompass the damaged pavement. This additional work will be performed at no additional cost to the City including the rigid pavement replacement.

Subbase/Subgrade Correction. Prior to placing the concrete for the Rigid Replacement, any subbase/subgrade material that is disturbed below the desired level of cleanout shall be removed and the patch area compacted to the satisfaction of the Project Inspector. The contractor shall replace the subbase/subgrade material removed with concrete as part of the Rigid Replacement at no additional cost to the City.

Furnishing and Placing New Steel. All reinforcement, dowels and tie bars shall be of the size indicated in the drawings. Dowel bars shall smooth and epoxy coated as per 709.13. The tie bars shall be round deformed bars and epoxy coated as per 709.13. Dowel and tie bar holes shall be drilled with hydraulic or electric drills without spalling or damaging the existing concrete. All drill holes shall be blown clean with oil and moisture free compressed air prior to grouting the dowel and tie bars. The air compressor shall be equipped with a built-in oil separator and a water separator for the air line(s). The drilled holes shall be in a straight line parallel to the pavement surface and the centerline of the pavement lane. The dowel and tie bars shall be permanently anchored into the existing pavement with grout. Grout shall be pneumatically or mechanically injected into the rear portion of the drilled holes. Enough material shall be injected to provide complete coverage around

the dowel and tie bars to ensure they are permanently anchored into the existing pavement. Dowels shall be inserted to the back of the hole and twisted one full turn to surround its entire embedment length with grout. A satisfactory method shall be used to hold the dowel and tie bars in proper alignment until the grout has hardened.

Rigid Replacement. The rigid replacement shall not be placed until the grout around the dowel or tie bar has hardened. Forms shall be used to provide a straight and neat edge at open sides. Each patch shall be cast in one continuous full-depth operation. The concrete shall be consolidated in place by the use of an internal type vibrator. The concrete shall be consolidated around the edges of the patch and internally. Internal vibrators for consolidating the concrete shall be an approved mechanical spud type. The vibrators shall be capable of visibly affecting the concrete for a distance of 12 inches from the vibrator head.

Finishing and Texturing. Patches that are less than 12 feet in length shall be screeded either transversely or longitudinally as directed by the Project Inspector. For patches over 12 feet in length, the screed shall be placed perpendicular to the centerline.

The contractor shall test the surface of the plastic concrete for trueness and for being flush with the edges of adjacent slabs by use of a 10 foot straight edge. For patches 10 feet or less in length, the straight edging shall be done by placing the straight edge parallel to the pavement centerline with the ends resting on the existing pavement and drawing the straight edge across the patch. The straight edge should be in contact with the existing pavement while drawing it across the patch. Any high or low areas exceeding 1/8 inch in 10 feet shall be corrected. If any corrections are made, the surface shall be rechecked.

The surface of the concrete shall be textured in accordance with 451.09.

Curing. Concrete curing compound shall be applied to the rigid replacement surface in accordance with 451.10 and the City of Steubenville General Specification for Fibrous Concrete. The curing compound shall be furnished with white tracer pigment.

Joints. Joints in eight (8) and nine (9) inch repairs shall be in accordance with the drawings and ODOT Standard Drawing BP-2.5. Joints in seven (7) inch repairs shall be in accordance with the drawings and City of Steubenville "Joint Details for Concrete Local Streets." Longitudinal joints for seven (7), eight (8) and nine (9) inch repairs against existing concrete shall be in accordance with ODOT Standard Drawing BP-2.1.

Where new concrete pavement is placed adjacent to existing concrete pavement, transverse contraction joints shall be provided in the new pavement so as to form a continuous joint with that in the existing pavement. All joints in new pavement shall be constructed according to the drawings. In no case shall joint spacing be greater than fifteen (15) feet. All joints shall be sawed to a minimum depth of one fourth of the pavement thickness. Joint sawing shall take place as specified in the City of Steubenville General Specification for Fibrous Concrete.

Prior to placing sealer in the joints, both faces of the joint shall be thoroughly cleaned by abrasive blasting to the depth of the bottom of the proposed sealer. The joints cleaning operation shall be

such that, when completed, the joint shall be dry and completely free of all dirt, dust, tar and bituminous material, curing compound, abrasive blasting material, discoloration and stain, as well as any and all other forms of contamination, leaving a clean newly exposed concrete surface. The top of the freshly placed sealant shall be 1/4 inch (+/- 1/16 inch) below the pavement surface. The shape factor (depth to width ratio) of the sealant shall be between one (1) and two (2). For example, a 3/8" wide joint shall have joint sealer installed to a depth between 3/8" and 3/4". Backer rod, compatible with the sealant used, may be needed to achieve the correct shape factor.

All catch basins shall be separated from the pavement and curb by boxing out around the fixtures as shown on the drawings. Expansion joint material shall extend completely through curb and slab. Manhole and valve box castings within the pavement limits shall be boxed in like manner.

When a joint falls within five (5) feet of or contacts catch basins, manholes, or other structures, shorten one or more panels either side of opening to permit joint to fall on round structures and at or between corners of rectangular structures. The Project Inspector shall review placement of joints with the contractor and the inspector's decision shall be final.

All transverse joints must extend through curbs and must be continuous across pavement, except tied transverse construction joints.

Curb. Where curb is to be replaced or is integral to slab being repaired, the curb shall be replaced with like type. Curb, whether separate or integral, shall be paid as a separate item.

Opening to Traffic. The Rigid Replacement may be opened to traffic when new concrete has attained a modulus of rupture of 500 P.S.I. Beams shall be cast by the contractor to determine the modulus of rupture. A minimum of two (2) beams shall be cast per day. On days when more than three truckloads will be placed, additional sets of beams shall be molded on a random basis. The beam test is the responsibility of the contractor. All beam tests shall be witnessed by City personnel. The contractor may elect to cast cylinders for testing by a certified test lab. Cylinder breaks shall meet the requirements of the "City of Steubenville - General Specification for Fibrous Concrete".

Traffic Safety for Eight (8) and Nine (9) Inch Repairs. When traffic is maintained in adjacent lanes, the contractor shall schedule his work such that the Rigid Replacement is placed within 72 hours of the pavement removal. When the pavement has been removed and the contractor is unable to complete the required Rigid Replacement within the time specified above, the excavation shall be filled with a commercially available bituminous mixture or other suitable temporary patch material with a durable surface as directed by the Project Inspector. The contractor will be required to maintain the patches while they are in service. The cost of placing, maintaining, removing and disposing of the temporary patches will be at the contractor's expense.

Traffic Safety for Seven (7) Inch Repairs. The contractor shall schedule his work such that the Rigid Replacement is placed within seven (7) days of the pavement removal. When the pavement has been removed and the contractor is unable to complete the required Rigid Replacement within the time specified above, the excavation shall be filled with a commercially available bituminous mixture or other suitable temporary patch material with a durable surface as directed by the Project Inspector. The contractor will be required to maintain the patches while they are in service. The

cost of placing, maintaining, removing and disposing of the temporary patches will be at the contractor's expense.

Method of Measurement and Basis of Payment. The quantity of full depth Rigid Pavement Removal and Rigid Replacement to be paid for shall be the number of square yards of Rigid Pavement removed to the limits established by the Project Inspector. Accepted quantities will be paid for at the contract unit price per square yard which price and payment shall be full compensation for all pavement removal, subbase/subgrade correction, rigid replacement, furnishing and placing new steel, joints and material and all incidentals necessary to complete this item.

The quantity of full depth pavement sawing to be paid for shall be the number of linear feet of transverse and longitudinal full depth saw cuts completed at the designated limits of repair. Payment for this work shall be at the unit price bid for:

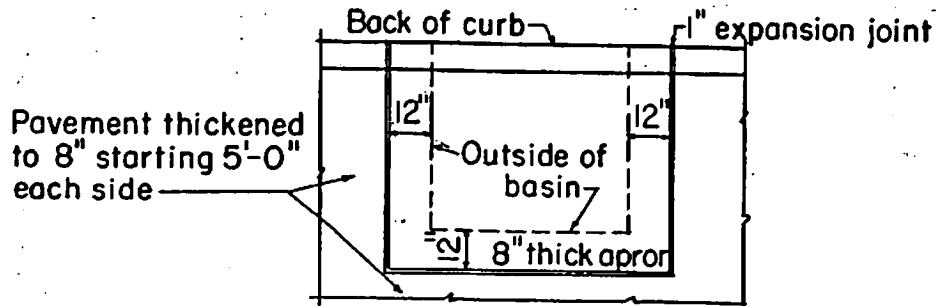
Item	
Special	Full Depth Concrete Pavement Repair, By Depth
Special	Full Depth Pavement Sawing
609	Curb, By Type

SUBBASE/SUBGRADE FAILURES

If, after removal of the rigid pavement, the Project Inspector determines that the subbase or subgrade has failed or is pumping, he shall direct the contractor to excavate the unsuitable material and replace it with compacted 304 Aggregate Base. Payment for this work shall be the unit prices bid for:

Item	
203	Excavation Not Including Embankment Construction
304	Aggregate Base

(255001)



All catch basins shall be separated from the pavement and curb by boxing out around basins as shown above. Expansion joint material shall extend completely through curb and slab. Manhole castings within the pavement limits shall be boxed in like manner.

When a joint falls within five (5) feet of or contacts basins, manholes, or other structures, shorten one or more panels either side of opening to permit joint to fall on round structures and at or between corners of rectangular structures.

All transverse joints must extend through curbs and must be continuous across pavement, except tied transverse construction joints. Expansion joints will not be required except at structures or as shown on the plans.

Maximum transverse joint spacing shall be fifteen (15) feet or as shown on the plans.

All soft and yielding material and other portions of the subgrade which will not compact readily when rolled or tamped shall be removed as directed and replaced with Item 304 and compacted. Cost of removal shall be included in the price bid for the Item 304 material.

The subgrade shall be thoroughly compacted in accordance with ODOT 203.13.

All sewer trenches and structure excavations shall be backfilled to natural or finished subgrade as soon as conditions permit. All backfill shall be compacted with mechanical or vibratory tampers in layers of not over six (6) inches loose material. In order to prevent differential heave the backfill material shall be the same material as that of the subgrade adjacent to the trench.