

S-7 CONCRETE PAVEMENT AND CONCRETE BASE

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7.01. SCOPE OF WORK

This specification refers to the requirements for the construction of concrete pavement and concrete base.

7.02. REFERENCES OR RELATED DOCUMENTS

This specification refers to the following standards, specifications, or publications:

- S-9 Concrete
- S-4 Granular Base and Aggregates
- OPSS 350
- OPSS 369
- OPSS 1306
- OPSS 1308
- OPSS 1441 & 1442
- OPSS.MUNI 908
- OPSS 919
- OPSS.MUNI 1350

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- OPSD 552.010
- OPSD 551.032
- AS – 210 and AS - 211
- AS – 225 to 227
- AS – 201
- AS – 553
- AS -103

7.03. MATERIALS

The contractor will supply all materials in accordance with this specification and the contract documents.

7.03.01 Concrete

All concrete shall meet the requirements of S-9 unless otherwise specified and pre-approved by the City Engineer.

7.03.02 Tie Bars and Load Transfer Devices

Tie bars shall be according to OPSS 1442.

Load Transfer Devices shall be according to OPSS 1441

7.03.03 Joint Filler Material.

Joint filler material shall be according to OPSS 1308

7.03.04 Burlap

All burlap used in surface texturing shall be according to OPSS 1306

7.03.05 Forms.

All forms shall be according to OPSS 919

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7.04. CONSTRUCTION

Prior to starting the work, documentation shall be submitted, verifying that the Contractor's representative of the placing crew shall be on site and shall have valid Municipal Exterior Flatwork Certification, ACI Flatwork Certification or an approved equivalent.

7.04.01 Granular Base

The type and thickness of the base shall be that which is specified in the contract documents and is to be according to S-4 Granular Base and Aggregates.

All design grades and tolerances must be approved by the City Engineer prior to concrete placement.

Before placing concrete on granular base, the granular immediately ahead of the concrete placing operation shall be wetted down thoroughly to the satisfaction of the City Engineer.

7.04.02 Formwork

Formwork shall be according to OPSS 919, be constructed wood or metal, and be of sufficient strength to resist springing, tipping or other displacement due to the placing of concrete and such other loads as may be superimposed during construction. Forms shall be free from warps, splits, holes, and bulges and all bolts, rivets and fittings shall be countersunk. Forms shall be erected without the use of internal ties and shall be sufficiently tight to prevent the leakage of mortar. The faces of forms against which concrete is to be placed shall, before the placing of concrete, be thoroughly cleaned and coated with an approved release agent or other approved material. Forms when tested with a 3-metre straight edge or curved template shall not deviate on the top surface more than 3mm nor on the inside faces more than 6mm from the testing edge of the template.

7.04.03 Maintenance holes and Utility Valves.

All maintenance holes in concrete pavement shall be according to telescopic manhole frame and cover drawing AS-553

All other valves or appurtenances shall be isolated from the pavement by means of a permanent and appropriately sized PVC or rigid plastic sleeve. The inside sleeve diameter is to match the diameter of the valve within 20mm. The sleeve is to be placed around the obstruction, ahead of the concrete placement and shall be true to the finished grade and extend continuously to the base.

Joint patterns and spacing shall be adjusted to accommodate manholes and sleeve isolated valves such that the projections fall on the center of a joint or at least 900mm away from a joint. When necessary, longitudinal and transverse joints can be skewed to satisfy these requirements as per OPSD 551.032.

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7.04.04 Joints

All joints shall be of the type and at the location shown on the contract drawings.

For typical joint detail drawings refer to OPSD 552.010 with the exception that there are no "key way" joints permitted.

7.04.05 Contraction Joints

Transverse weakened-planed contraction joints shall be constructed at or near right angles to the direction of pavement. Longitudinal contraction joints shall be mostly parallel to pavement direction. The width of the contraction joint shall be 3 to 5 mm and a minimum depth of 65 mm or at least one-third of the depth of the concrete slab. Contraction joints maybe sawed, hand-formed, or made by 3mm thick division plates in the formwork. Sawing shall be done early after the concrete has set to prevent the formation of uncontrolled cracking. The joints may be hand-formed either by (1) using a narrow or triangular jointing tool or a thin metal blade to impress a place of weakness into the plastic concrete, or (2) inserting 3mm thick steel strips into the plastic concrete temporarily. Steel strips shall be withdrawn before final finishing of the concrete. Where division plates are used to make contraction joints, the plates shall be removed after the concrete has set and while the forms are still in place.

Longitudinal panel lengths shall not exceed 4.5 m or be less than 2.0 m and are to be approved by the City Engineer prior to concrete placement.

Tie bars shall be placed where specified in the contract. Tie bars shall be at the midpoint of the pavements depth, be perpendicular to the joint are to be between 760mm and 600mm center to center. Tie bars across a longitudinal joint will not be placed within 600mm of a transverse joint that contains load transfer dowels.

Load Transfer devices / dowel bars shall be placed where specified in the contract. The location of the dowel bars shall be marked to ensure joint forming or cutting operations fall directly and precisely over the center of the dowels. Dowels shall be set within a tolerance of +/- 6mm in the vertical and horizontal planes of the pavement. Where transverse joints are skewed to accommodate utilities the dowels are to be similarly skewed so as to remain in the direction of the pavement. (Not necessarily perpendicular to the joint)

Dowels are to be placed at 300mm center to center and be between 300mm and 450mm from the panel's edge or any utility feature that falls on the joint.

No damaged or contaminated tie bars or load transfer devices shall be used.

All load transfer devises and tie tars location and condition are to be approved by the City Engineer prior to commencement of concrete placement.

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7.04.06 Expansion (Isolation) Joints

Isolation joints shall be formed with full-depth joint filler material meeting the requirements of OPSS 1308, except that cork expansion fillers will not be accepted. In all other areas, non-extruding and resilient bituminous type expansion joint is to be used, unless approved by the City Engineer. The thickness of the expansion joint material panels shall be at the discretion of the City Engineer and will not be less than 12mm. Expansion material shall extend the full depth of the pavement and be so placed as to eliminate all concrete to concrete contact at the joint. Panels of expansion joint material shall be pre-cut from a single piece to the shape of the cross-section as shown on the standard drawings, but so as to provide a 6mm recess on the exposed surfaces. Cutting and tolerances shall conform to OPSS 1308.

When an expansion joint falls at a transverse joint which contains load transfer devices, the ends of the dowels shall be fitted with approved isolation caps to provide a clear space at the end of the dowels that is at least equal to the thickness of the expansion joint filler material.

7.04.07 Construction Joints

A construction joint shall be formed or cut and is required at the end of the days paving or at a point of interruption. Such joints shall be full depth, vertical, be perpendicular to the pavement direction, are to include all specified bars or dowels and are to coincide with joint patterns in adjacent lanes.

7.04.08 Concrete Placement

Placement of concrete shall be according to S-9 and the following:

- a) Concrete shall not be placed until the foundation and the forms or string line have been inspected and approved by the City Engineer.
- b) No exposed concrete pavement shall be placed in the rain.
- c) Concrete is to be placed at or near its permanent location in such a manner so as to avoid segregation. The concrete shall be placed and consolidated against all formwork; all entrapped air shall be eliminated.
- d) Contact with partially set concrete shall be avoided.
- e) The concrete placing operation shall be continuous and at a speed that allows complete, proper, and timely finishing operations to follow. When an interruption of more than 45 minutes occurs, a true, vertical construction joint (OPSD 552.010) shall be formed.

The concrete shall be placed either by an acceptable slip form/extrusion machine, or by formed method, or the combination of these methods. The forms or string line shall be set true to the lines and grades specified in the Contract Documents and be in direct contact with the granular base course.

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The restrictions on concrete placement shall be as per City of Windsor Standard Specification S-9 – General Concrete Specification

7.04.09 Material Consolidation

All concrete pavements greater than 150mm thick shall be consolidated by means of handheld internal vibrators or machine mounted in the case of a paving machine. The vibrator shall be inserted at regular intervals along the width of pavement and are not to be operated longer than 15 seconds in a single location. Vibratory consolidation shall be completed within ten (10) minutes of the material being deposited.

In the case slip form machine paving, the vibrators shall not operate when the paver is stopped.

Vibrators shall not come into contact with the base material, the forms, tie bars or the dowel bar assemblies.

Pavement less than 150mm thick may be placed without hand held vibrators provided the material is struck off by means of an approved mechanical vibrating screed to the satisfaction of the City Engineer.

7.04.10 Finishing

No water or chemical agent shall be applied to the concrete surface for finishing purposes.

For concrete pavement that is formed or where concrete is placed adjacent to existing concrete the edge of the new pavement shall be finished with a radius of 6mm prior to surface texturing.

The surface of the concrete shall be shaped, smoothed, and finished to line and grade by means of machine and or hand floats such that the surface tolerance requirements are met after finish texture is applied. Care should be given not to “over work” the surface of the material.

The surface texture shall be uniform across the full panel width and be of the type specified in the contract drawings to the satisfaction of the City Engineer.

7.04.11 Finished Surface Tolerances

The exposed finished surfaces shall be uniform, true to grade and in all cases free from displaced aggregate particles and local projections.

The surface of the concrete shall be free of any deviation greater than 3mm when tested with a 3 m straight edge in any direction. This requirement holds true across all joints except those that are a designed grade changes. This requirement holds true across all utility valves and maintenance hole lids cast in the pavement structure.

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Diamond grinding may be required to ensure the concrete surface meets these requirements.

7.04.12 Identification Stamp

The Contractor shall imprint his official name and the date with a steel stamp, as per City of Windsor AS-103, once per block, per side and or at least one stamp per one hundred cubic metres.

The edge of the stamp shall be four hundred and fifty millimetres (450mm) from the face of the curb and not fall at a joint, with the one hundred and fifty millimetre (150mm) side parallel to the curb. The depth of imprint shall not be less than 6mm.

7.04.13 Curing

Concrete shall be cured according to S-9.

7.04.14 Joint Sealing

Joint sealant shall be of the type and at locations specified in the contract and shall be according to OPSS 369

7.04.15 Protection

The contractor is solely responsible for protection of the surface of the plastic concrete and shall further protect the concrete pavement from any loading until adequately set. Any damage or surface blemish from rain, work or pedestrian traffic what so ever is at the contractors cost.

The concrete pavement shall not be subjected to any loads other than required foot traffic and rubber wheeled joint cutting equipment until the compressive strength field cured cylinders attain 70 % of the specified 28 day design strength.

Any damage to existing, adjacent pavement or curb or new pavement from construction or other activities are the responsibility of the contractor until the pavement is accepted by the City Engineer.

7.04.16 Backfilling

No work shall be performed adjacent to freshly placed concrete pavement until sufficient strength has been attained. No vibratory compaction effort shall take place on materials placed near new pavement until the concrete as developed 70% of the design compressive strength.

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7.05. DAMAGE TO ADJACENT BOULEVARDS AND PAVEMENTS

The Contractor will be required to make good, as directed, all damage done to the adjacent roadway or pavements while the work is in progress.

The Contractor will be required to remove all rubbish and material from the pavement and boulevards adjoining the new concrete pavement or concrete base and restore the same to as good and clean condition as they were before commencing the work. Should the Contractor choose to use plastic as their method of cure protection, when removed from the concrete, all plastic is to be removed and disposed of at the Contractor's expense. If any of the sod beyond the area of construction is destroyed by the Contractor or his employees, he will be required to replace it, at his expense, with new sod to the approval of the City Engineer.

7.06. TESTING AND QUALITY ASSURANCE

The testing and quality assurance for all concrete pavements shall conform to the requirements contained in the S-9 for Concrete and the following requirements:

The Contractor shall be responsible for the line and grade of the forms as provided by the City Engineer or will be responsible to match existing conditions when required.

The Contractor shall be responsible for the concrete work during the curing time and when the forms are removed until the work is accepted by the City Engineer.

All areas not conforming to the requirements of this specification due to poor construction or finishing methods are to be corrected or replaced at the contractors expense to the satisfaction of the City Engineer.

7.07. MEASUREMENT OF PAYMENT

Measurement of payment for concrete will only be made of that material and work accepted by the City Engineer.

The unit of measurement will be that provided for in the tender.

7.08. BASIS OF PAYMENT

Payment will be made at the unit prices bid in the contract documents and for the quantities determined by the applicable method of measurement.

Such payment shall constitute full compensation for supplying, delivering, placing, finishing, curing, and protecting and any other cause whatsoever for all work performed in connection with the material and ant other incidentals necessary to complete the items that are not herein specified for payment otherwise.