S-5
CONCRETE CURB AND GUTTER SYSTEMS

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5.01 SCOPE OF WORK

This specification covers the requirements for the construction of concrete curb and gutter, setbacks, gutter outlets, and bullnoses together with the installation of catchbasin frames and grates that lie within the flow lines of the curb and gutter system.

5.02 REFERENCES

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

- S-4 Granular Base and Aggregates
- S-7 Concrete Pavement and Concrete Base
- S-9 Concrete
- S-14 Sodding
- S-15 Seeding
- S-34 Topsoil
- OPSS 353 and OPSS.MUNI 353
- OPSS.MUNI 1308
- AS 103

- AS-208 & 208A
- AS-216
- AS-506
- AS-535
- AS-546

5.03 MATERIALS

The Contractor will supply all materials. Materials shall meet the requirements of the following:

5.03.01 CONCRETE

Concrete shall be as per City of Windsor Standard Specification S-9 – Concrete.

5.03.02 JOINT MATERIALS, FORMS AND STEEL REINFORCEMENT

Joint materials, forms, and steel reinforcement shall be as per requirements of OPSS 353 and the following requirements:

The forms shall be of wood, metal, or other suitable material that is straight and free from warp, having sufficient strength to resist the pressure of the concrete without deflection or loss. Division plates shall be metal.

5.03.03 CATCH BASIN FRAMES AND GRATES

Catch basin frames and grates shall be according to OPSS.MUNI 353.

5.03.04 CURING COMPOUND

Curing compound shall be as per City of Windsor Standard Specification S-9 Concrete.

5.04 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.

5.04.01 GRANULAR BASE

Granular materials for the construction of a base shall be of the type and depth specified in the contract drawings and be according to City of Windsor Standard Specification S-4 Granular Base and Aggregates.

The foundation shall be excavated and filled with suitable material to the required grades and lines. Filled sections shall be compacted and extend a minimum of 0.3 metres (1 foot) outside the form lines.

Compaction shall be according to specified compaction requirements in the contract drawings, City of Windsor Standard Specification S-4 and OPSS.MUNI 353.

5.04.02 FORMWORK

Formwork shall be according to OPSS.MUNI 353 and shall be set true to the lines and grades specified in the contract documents and in direct contact with the granular foundation.

The front and back of the forms shall extend for the full depth of the concrete. All of the forms shall be braced and staked so that they remain in both horizontal and vertical alignment until their removal. They shall be cleaned and coated with an approved form-release agent before concrete is placed against them.

The concrete shall be deposited into the forms without segregation and then it shall be tamped and spaded or mechanically vibrated for through consolidation. Low roll or mountable curbs may be formed without the use of a face form by using a straightedge and template to form the curb face. When used, face forms shall be removed as soon as possible to permit finishing. Front and back forms shall be removed without damage to the concrete after it has set.

5.04.03 JOINTS

5.04.03(a) Contraction Joints

Transverse weakened-planed contraction joints shall be constructed at right angles to the curb line. When concrete curb and gutter is constructed adjacent to concrete pavement, the transverse joint spacing of the curb and gutter shall coincide with that of the concrete pavement. When concrete curb and gutter is constructed adjacent to asphalt pavement, transverse joints shall have a uniform spacing not exceeding 5m.

The width of the contraction joint shall be 3 to 5 mm and a minimum depth of 65 mm.

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.

5.04.03(b) Expansion (Isolation) Joints

Expansion joints shall be constructed between the curb and abutting immovable structures, including catchbasin frames, abutting sidewalks, driveways, gutter outlets or any other structures where cracking is likely to occur.

When the curb and gutter system is placed adjacent to the concrete pavement, longitudinal joints, as shown in the contract documents, shall be sawn between a curb and gutter system and concrete pavement. The joint shall be sealed with liquid joint sealer. All the work shall be according to City of Windsor Standard Specification S-9 Concrete and S-7 Concrete Pavement and Concrete Base.

Expansion joint material shall be set in place before concrete placement begins and shall be supported by removable forms. Filler material for isolation joint shall be furnished in a single 12-20mm thick piece for the full depth and width of the joint and meet the requirements of OPSS.MUNI 1308, except that cork expansion fillers will not be accepted.

Joint filler panels shall be set in a vertical position and, if for transverse joints, shall be set normal to the inside edge of the structure.

Panels 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.MUNI 1308.

All concrete immediately above the filler material shall be carefully removed to form a 6 mm deep, 12 mm wide recess then finishing both edges of each joint to 5 mm radius with a suitable short edging tool.

Expansion joints in a slipformed curb or curb and gutter shall be constructed with an appropriate hand tool by raking or sawing through partially set concrete for the full depth and width of the section. The cut shall be only wide enough to permit a snug fit for the joint filler. After the filler is placed, open areas adjacent to the filler shall be filled with concrete and then trowelled and edged. Alternately, an expansion joint may be installed by removing a short section of freshly extruded curb and gutter immediately, installing temporary holding forms, placing the expansion joint filler, and replacing and reconsolidating the concrete that was removed. Contaminated concrete shall be discarded.

5.04.03(c) Construction Joints

A 5-mm bituminous fibre joint filler shall be placed at the point of interruption before recommencing the placement of concrete curbs and gutters.

5.04.04 CONCRETE PLACEMENT

Concrete placement shall be according to City of Windsor Standard Specification S-9 and the following requirements:

a) Concrete shall not be placed until the foundation and the forms or stringline have been inspected and approved by the City Engineer.

b) The concrete shall be placed and consolidated such that segregation of the aggregate does not occur. The concrete shall be placed and consolidated against all formwork; all entrapped air shall be eliminated.

c) Concrete shall be placed continuously. Contact with partially set concrete shall be avoided. When placement of concrete is interrupted, it shall be at a vertical form. 5 mm bituminous fibre joint filler shall be placed at the point of interruption before recommencing placement of concrete.

d) The concrete shall be placed either by an acceptable slipform/extrusion machine, or by formed method, or the combination of these methods. The forms or stringline shall be set true to the lines and grades specified in the Contract Documents and in direct contact with the subgrade or granular course.

The restriction of concrete placement shall be as per City of Windsor Standard Specification S-9 Concrete.

5.04.05 MACHINE PLACEMENT

The slipform/extrusion machine approved shall be so designed as to place, spread, consolidate, screed, and finish the concrete in one complete pass in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous concrete section. The machine shall shape, vibrate, and/or extrude the concrete section being placed. It shall be operated with as nearly a continuous forward movement as possible. All operations of mixing, delivery, and spreading concrete shall be so coordinated as to provide uniform progress, with stopping and starting of the machine held to a minimum.

5.04.06 CONCRETE FINISHING

Concrete finishing shall be according to City of Windsor Standard Specification S-9, OPSS.MUNI 353 and the following requirements:

a) The concrete on the upper surfaces shall be finished smooth, if necessary, by means of magnesium or aluminum trowels and then it shall be given a final surface texture using a light broom or burlap drag. The finished surfaces shall be free of open texturing, plucked aggregate and local projections.

b) Back edges shall be rounded by use of a 5 mm radius edging tool. Neat cement shall not be used as a drier to facilitate finishing. Care shall be taken to avoid over finishing or working more mortar to the surface than is actually required.

5.04.07 CONCRETE CURING AND PROTECTION

The curing and protection of the completed curbs and gutters, including winter protection for concrete, shall be according to City of Windsor Standard Specification S-9 and the following requirements:

a) The protection of concrete structures until their acceptance onto maintenance by the Corporation shall be the sole responsibility of the Contractor. The presence of footprints or other markings on the completed joint location of the curbs and gutters shall require saw cutting, removal, and replacement of the complete section at the Contractor's expense, unless otherwise directed by the City Engineer.

b) The deficiency markings on the non-joint locations shall be repaired by the Contractor at the Contractor’s expense at the direction of the City Engineer.

5.04.08 CONCRETE TOLERANCES

The exposed surfaces of the finished concrete shall be such that, when tested with a 3 m long straight edge placed anywhere along the surface parallel to the edge of curb face, there shall be no deviation greater than 3 mm between the bottom of the straight edge and the surface of the concrete nor shall there be any deviation from alignment in excess of 3 mm.

5.04.08(a) Temporary Asphalt Box Outs at Precast Catchbasins (Gutter outlet)

In staged construction where the surface asphalt will not be placed at the time of construction, the concrete box outs for standard pre-cast catchbasins shall not be constructed. The Contractor shall be required set catchbasin frames and covers with the base asphalt and construct a temporary asphalt box out with proper drainage grading and a raised curb behind the catchbasin. The length of the asphalt curb shall be included in the measurement of the catchbasin. No other payment will be made for this work. The costs for the work specified under this item shall be included in the tender item for the placement of catchbasin.

5.04.08(b) Temporary Road Drainage at Curb Inlet Catchbasins (setbacks)

Where curb inlet catchbasins are installed as per AS-546 and the surface asphalt course will not be placed until the following year, a temporary “V” groove shall be left in the concrete pan of the curb inlet box out for temporary road drainage purpose or as directed by the City Engineer. The costs for the work specified under this item shall be included in the tender item for the placement of catchbasin.

5.05 BACKFILLING

As soon as the City Engineer permits, the Contractor shall backfill the spaces in front and back of curbs with suitable material to the required elevation. The fill material shall be thoroughly tamped in layers.

Where boulevard restoration is required, it shall be done as described in the following City of Windsor Standard Specifications:

- S-34 for Topsoil
- S-14 for Sodding
- S-15 for Seeding.

5.06 DAMAGE TO ADJACENT BOULEVARDS AND PAVEMENTS

The Contractor will be required to make good, as directed, all damage done to the 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 curb and gutter system 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 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.

5.07 TESTING AND QUALITY ASSURANCE

The testing and quality assurance for all concrete poured for curb and gutter system shall conform to the requirements contained in the City of Windsor Standard Specification S-9 for Concrete and the following requirements:

a) 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.

b) 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.

c) In no case shall ponding water over allowable drainage duration or exceed the specified grade at gutter lines be accepted. All areas with pond water or having insufficient/excessive cross fall, including those caused by poor construction and finishing methods, shall be removed and replaced at the Contractor's expense.

5.08 MEASUREMENT FOR PAYMENT

5.08.01 CONCRETE CURBS AND GUTTERS

Measurement will be made in linear meters along the base of the curb or along the flow of the gutter, of the total length of curb and gutter installed whether straight or circular and without separation into types.

5.08.02 SETBACKS AND GUTTER OUTLETS

For measurement purpose, a count will be made of the number of setbacks (curb-inlet catchbasin) and gutter outlets (standard catchbasin) installed without separation into types.

5.08.03 CONCRETE SPILLWAYS

Measurement shall be made in metres along the flow line from the end of the gutter outlet to the spillway termination.

5.08.04 GRANULAR BASE COURSE

Measurement shall be made in tonnes. This item shall be included in the measurement and unit price submitted for the supply and placement of granular materials.

5.08.05 WATER

This item shall be included in the unit price submitted for the placement of the new concrete curb and gutter system since no separate measurement and payment shall be made for this item.

5.08.06 REMOVAL OF OLD CURB AND GUTTER

Measurement shall be made in square meters of the total hard surface area removed as directed by the City Engineer. This item shall be included in the measurement and unit price submitted for the removal of existing road pavement, unless otherwise listed in the contract documents.

5.09 BASIS OF PAYMENT

- Concrete Curbs and Gutters – Item
- Setbacks (Curb in-let Catch Basin) – Item
- Concrete Gutter Outlets (Standard Catch Basin) – Item
- Concrete Spillway – Item

The Contract prices for the various components making up the curb and gutter system will be full compensation for supplying all labour and equipment and completely installing in accordance with this specification, the curb and gutter system as called for in the plans and for supplying all materials.

Excavation required to set the various components to the required line and grade will be considered as part of the work of installing the curb and gutter system; however, should such excavation overlap excavation required for any other work under the contract, then payment shall be made in accordance with the specification for such other work as though no excavation were required for the curb and gutter system construction.

There will be no separate payment item for concrete used for fillets in bullnoses. The costs shall be included under this item unless otherwise specified in the contract documents.

5.09.01 GRANULAR BASE COURSE – INCLUDED IN ITEM FOR GRANULAR MATERIALS

Payment will be made at the contract unit price per tonne for the measured quantities. This item shall be paid under a separate item for the supply and placement of granular materials; therefore the item shall be excluded in the unit price submitted for the construction of curbs and gutter unless otherwise stated in the tender documents.

5.09.02 HOT MIX ASPHALT

Hot mix asphalt used in the construction of curb and gutter system shall be paid for at the Contract price for the appropriate Hot Mix Asphalt tender item.